

City of Shoreline
Aurora Interurban Trail Bridge Study:
N 155th St to N 160th St

Summary of Findings

October 2003

CH2MHILL

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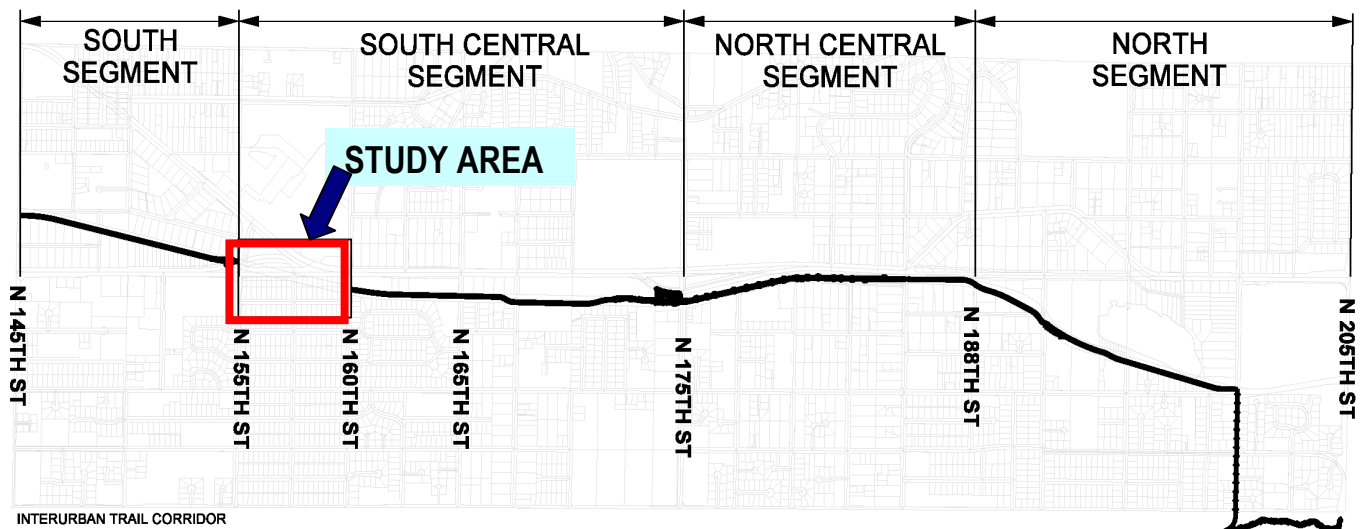
1.0 Introduction

The Shoreline Interurban Trail corridor extends for approximately three miles from the south city limits at N 145th Street to the north city limits and county line at N 205th Street. The trail is located entirely within the City of Shoreline and King County within the historic Interurban electric trolley corridor which is now owned and maintained by Seattle City Light. This Interurban corridor crosses Aurora Avenue between N 155th Street and N 158th Street. The Aurora Interurban Trail Pedestrian and Bicycle Crossing Study was conducted to develop a preferred alignment for the Interurban Trail to cross N 155th Street and Aurora Avenue North at this location.

Interurban Trail Background

The development of the Interurban Trail through Shoreline has been envisioned as an important regional goal since the early 1970's. Segments of the Interurban Trail have been developed in Seattle, Lynnwood, Edmonds, Everett, Mountlake Terrace, King County, and Snohomish County. The Shoreline segment will resolve an important "missing link" within the overall system. The trail will create an important non-motorized linkage to the north and south of Shoreline. The trail will strengthen connections to and from schools, neighborhoods, businesses and other destinations within the Aurora Corridor. The trail will enhance the connections within community and between community and commerce.

The Shoreline Interurban Trail project is being implemented in segments. Construction for the South Segment, from N 145th Street to N 155th Street, is expected to be completed by early 2004. Construction for the South Central Segment (N 160th Street to N 175th Street) and the North Segment (N 188th Street to N 205th Street) is planned for completion by mid 2004. The North Central segment alignment, which extends from N 175th Street to N 188th Street, will be studied further, and may be constructed in 2006 or later.



Project background

The Interurban Trail Design Report, prepared in February 2001, recommended an elevated bridge concept to connect the South Segment west of Aurora Avenue to the South Central Segment east of Aurora Avenue. The concept alignment ran from the southwest quadrant of 155th Street, over N 155th Street to the “Triangle” area between Aurora Avenue and Westminster, then crossing diagonally over Aurora Avenue to connect with Interurban alignment at N 158th Street. The estimated cost of this option is beyond the \$3.6 million budget allocated in the City Capital Improvement Program (CIP).

Since the Design Report bridge alignment proposal was beyond the CIP budget for the project, and reaction to this proposal from many of the project stakeholders was not favorable, in June 2003, the City of Shoreline began a formal Trail Bridge Study to develop and analyze alternatives for the Interurban Trail crossing of N 155th Street and Aurora Avenue.

Funding

Funding for this project has been allocated from the following five sources: WSDOT Target Zero, the Federal Highways Congestion Mitigation and Air Quality Improvement Program (CMAQ), the Interagency Committee for Recreation (IAC) Grant, the Federal STP grant, and the City of Shoreline Roads Capital Fund. The total funding for the project to date is \$3,634,292.

Relationship to Project Area

The topography of the Interurban Corridor south of 155th Street is bermed approximately 10 feet to 15 feet higher in elevation than the intersection of 155th Street and Aurora Avenue. The Triangle area adjacent to Aurora is a low point in the vicinity topography. A steep embankment exists on the east side of Aurora Avenue where the Interurban Corridor crosses, and the elevation of the corridor at this location is about 14 feet higher than the Aurora roadway.

Improvements are planned for Aurora Avenue in the Bridge Study project area, and are expected to be constructed in 2005 and 2006. These improvements in the project area include the construction of business access and transit lanes, sidewalks and amenity zone adjacent to the roadway, illumination, landscaping improvements, and intersection improvements at 155th Street and 160th Street. The South Segment of the Interurban Trail is

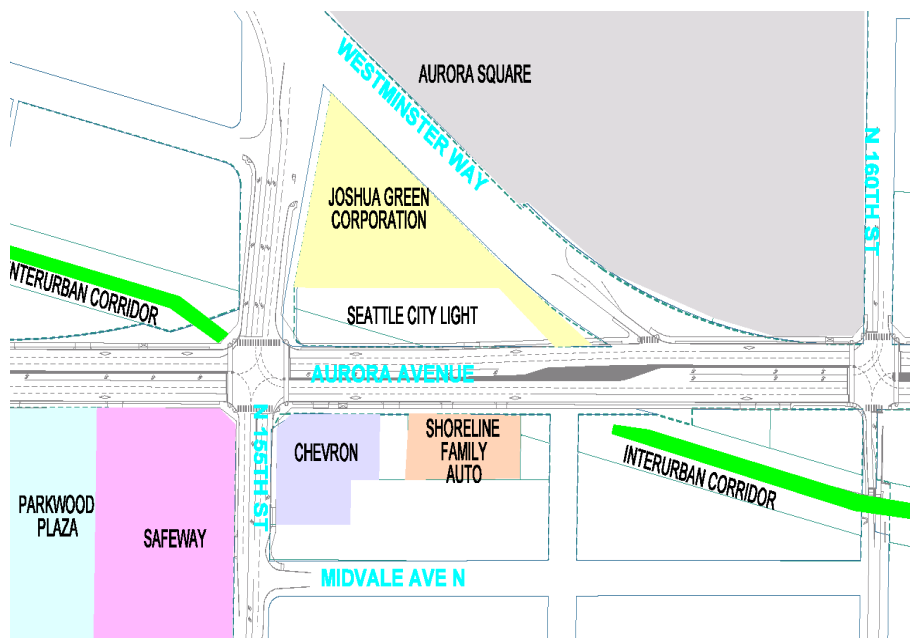


Figure 1.1 Project Area Map

being constructed to match to the sidewalk and at-grade crossing at 155th Street. With Aurora Avenue being widened to seven lanes, trail uses crossing at-grade must cross these seven lanes of traffic on Aurora Avenue and six lanes of traffic on 155th Street.

Property owners and merchants in the project study area are stakeholders in this project. The Interurban corridor is owned and maintained by Seattle City Light. The Triangle area between Aurora Avenue and Westminister Way is owned by the Joshua Green Corporation. Aurora Square merchants, located west of Westminister, are also considered as stakeholders in this project. Safeway and Parkwood Plaza are located on the east side of Aurora Avenue south of 155th Street. Businesses on the east side of Aurora north of 155th Street include Chevron and Shoreline Family Auto.

A list of key driving issues and evaluation criteria were established early on in the project. Twenty five alignment proposals were developed and screened based on the key issues and evaluation criteria. Five of these options were selected for further study and analysis. These five options were presented at the Public Open House on September 17, 2003.

2.0 Study Purpose, Goals and Objective

The purpose of the Trail Bridge Study is to arrive at a recommended conceptual design for the Interurban Trail from N 155th Street to N 160th Street in Shoreline through a comprehensive process that includes community, business and agency involvement and thorough technical analysis.

Project Key Issues and Evaluation Criteria

To develop a preferred alternative that met City goals for the project in line with long term goals for the trail, for commerce, and for the community, key driving issues for this project were identified as follows:

1. Meet design criteria, standards, and requirements
2. Trail connectivity
3. Visibility to businesses
4. Impacts to properties (parking, right of way, walls, etc.)
5. Vertical clearance – over roadway and under power lines
6. Span length
7. Historical Interurban alignment
8. Access to businesses
9. Americans with Disabilities Act (ADA) accessibility and vertical grades
10. Cost (\$3.6 million or less)
11. Relationship to Aurora
12. Enhance/express community identity and character
13. Washington State Department of Transportation (WSDOT) buy-in
14. Respects Seattle City Light ownership
15. Leverage redevelopment opportunities and Aurora project

The design alternatives developed addressed issues such as trail access and safety, ease of at-grade connections, constructability, aesthetics, integration with existing and future

development, and the connections to commerce. Based on the Key Issues identified and input from City Council and other key stakeholders, Evaluation Criteria were established to assess alignment options and to determine a preferred option for the project. Below is the Evaluation Criteria for the project and the factors considered.

Environmental documentation and final design engineering will follow directly upon the Shoreline City Council's approval of the results of this study.

EVALUATION CRITERIA

1 Safety of Trail

Factors to be measured:

- Trail conflicts with motorized vehicles

2 Access / connectivity provided

Factors to be measured:

- Logical and efficient route
- Ease of at-grade connections
- Grade changes
- Provides access to businesses

3 Constructability

Factors to be measured:

- During construction impacts
- Feasibility of construction
- Compatibility with power lines and future expansion

4 Meets Agency Guidelines

Agencies involved:

- WSDOT
- ADA and Federal design guidelines
- Seattle City Light clearances

5 Expresses Community Identity

Factors to be measured:

- Aesthetics (including relationship with power lines)
- Gateway/landmark structure
- Opportunity to express theme

6 Visual Impacts to Businesses

Factors to be measured:

- Transparency of structure
- Visibility of businesses
- Gateway/entrance

7 Anticipates/Promotes Future Development

8 Cost

Factors to be measured:

- Meets budget
- Leverages federal funding
- Life cycle costs

3.0 Alternatives

Initially, over 25 alternatives of crossing alignments were developed by the staff and consultant team. These 25 concepts are described in Appendix C Table C.1, including a list of pros and cons for each concept. Sketches of these concepts are shown in Appendix C. Of these 25 concepts, five were selected for detailed analysis and evaluation. These five concepts are described in the following section of this report.

Once the five alternatives were set for evaluation, additional development was required to measure the costs and impacts of each. In order to generate the required detail, each of the five alternatives was designed to a conceptual level for the project area. Plan-view drawings over an aerial photography base were prepared for the five alternatives and used by the project team to further understand and refine the design alternatives. The conceptual plans for the alternatives located in Appendix A illustrate the type of plan view drawings used. In addition to plan-view drawings, perspective sketches were used to visually represent the alternative and how it could look when constructed.

In order to compare the potential costs to develop each of the alternatives, concept-level cost estimates were prepared. These can be found in Appendix B. Cost summaries are shown below in Table 3.1.

Option A2: At Grade Option

Description

Option A2 proposes to cross Aurora Avenue at the 155th Street intersection at-grade. This option would construct a paved path adjacent to the sidewalk on the south side of 155th Street along the Safeway property. Right-of-way would need to be acquired for this and parking at Safeway would be impacted. This option proposes a realignment of Midvale to line up with the Safeway entrance, and a traffic signal would be installed at this location on 155th Street. After crossing 155th at-grade, the trail would share the roadway with Midvale Avenue to 160th Street. This option proposes to construct bike lanes and sidewalks along Midvale. At 157th Street, a trailhead would be constructed and a path paved to bring the trail to the Interurban corridor.

Pros/Cons

Several at-grade options were explored in this Project Study. Option A2 was considered further because of its added benefits of improving the Midvale/Safeway/155th intersection. The benefits of this option are that it provides trail users with at-grade access to businesses, and it can be constructed without visual impacts to businesses. This option also does not limit or restrict future development opportunities. However, the At-Grade option does not improve safety for trail users. At-grade crossings are not desirable for safety of trail users and for ease of use for bike riders. This option also makes trail users share Midvale Avenue with vehicles. The at-grade slope along Midvale is very steep and exceeds ADA guidance for acceptable slopes for wheelchair users. Other concerns with this option are impacts to Safeway parking, which is already limited, and right-of-way acquisition needs at the Safeway property and the vacant parcel north of Safeway.



Figure 3.1 "At-Grade" Option alignment plan

Cost

This Option is estimated to cost approximately \$2.3 million. It is important to note that since the At-Grade Option does not include a bridge crossing, this alternative is likely to cause the City to forfeit grant funding for the project.

Option D1: Elevated Option

Description

Option D1 proposes an elevated trail along the traditional Interurban alignment. The trail would be a concrete bridge structure from the Pershing bulkhead through the Seattle City Light right-of-way adjacent to Aurora Avenue, and diagonally crossing Aurora Avenue and touching down within the Interurban corridor on the east side of Aurora south of 160th Street.

Pros/Cons

This option presents the most efficient and logical route for trail users. Because the entire trail is elevated, this option provides the most safety benefits for trail users, limiting conflicts with vehicles. The trail option does not negatively affect access to business, however, it does not provide access to businesses or access to at-grade connections. Because of the structure type and thickness, it presents negative visual impacts to "Triangle" businesses. It also potentially presents conflicts with Seattle City Light future expansion.

Cost

Option D1 is estimated to cost approximately \$4.5 million, which exceeds the current project budget of \$3.6 million.



Figure 3.2 "Elevated" Option alignment plan

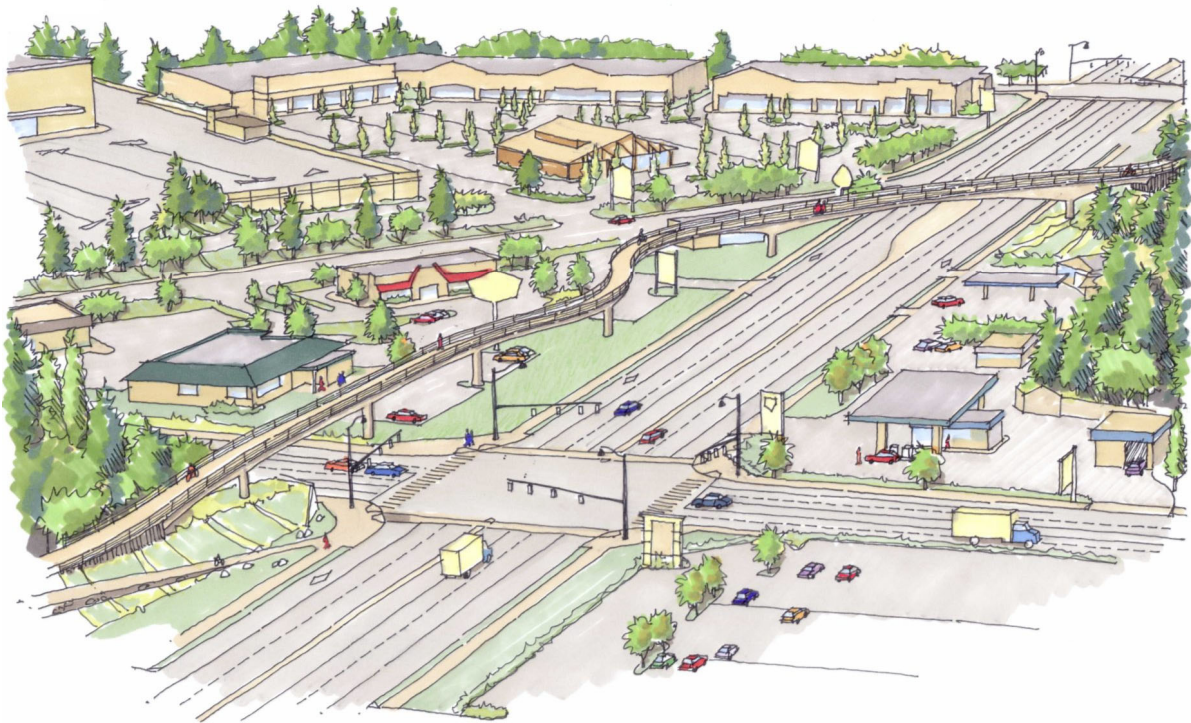


Figure 3.3 "Elevated" Option perspective sketch LOOKING NORTH

Option D5a: Loop Ramp Option

Description

The Loop Ramp Option presents a phased approach to completing a trail connection through the Interurban corridor. This option proposes to construct Trail bridges over 155th Street and Aurora Avenue. Ramps would bring trail users down to grade through the Triangle area between the two bridges. Stairs would also be constructed at the ramp locations so that trail users would have the option to use the stairs or the ramps to go from the bridges to the trail at-grade. This option proposes steel arch bridges, steel truss bridges, or a combination of these bridge types.



Figure 3.4 "Loop Ramp" Option alignment plan

Pros/Cons

This option provides safety benefits of grade separated crossings for trail users, yet it does not have the visual impacts that the Elevated Option would have. Other benefits of this option are that it provides access to businesses and provides access to at-grade connections. This option does not limit development opportunities in the Triangle area, and future development could integrate the trail into the development. The long-term vision of the trail may be to keep it elevated without slopes up and down to grade, and this option could allow that to happen in phases with redevelopment. The types of bridges proposed for this option have a likelihood of generating positive reaction and present the opportunity to construct a "landmark" or "gateway" element.

The ramps as proposed in this option are not desirable for bike riders, since they would require users to make sharp turns and go up or down a steep incline. The design does meet

ADA and agency design guidance. This Option also presents parking impacts to Pizza Hut property that could be mitigated.

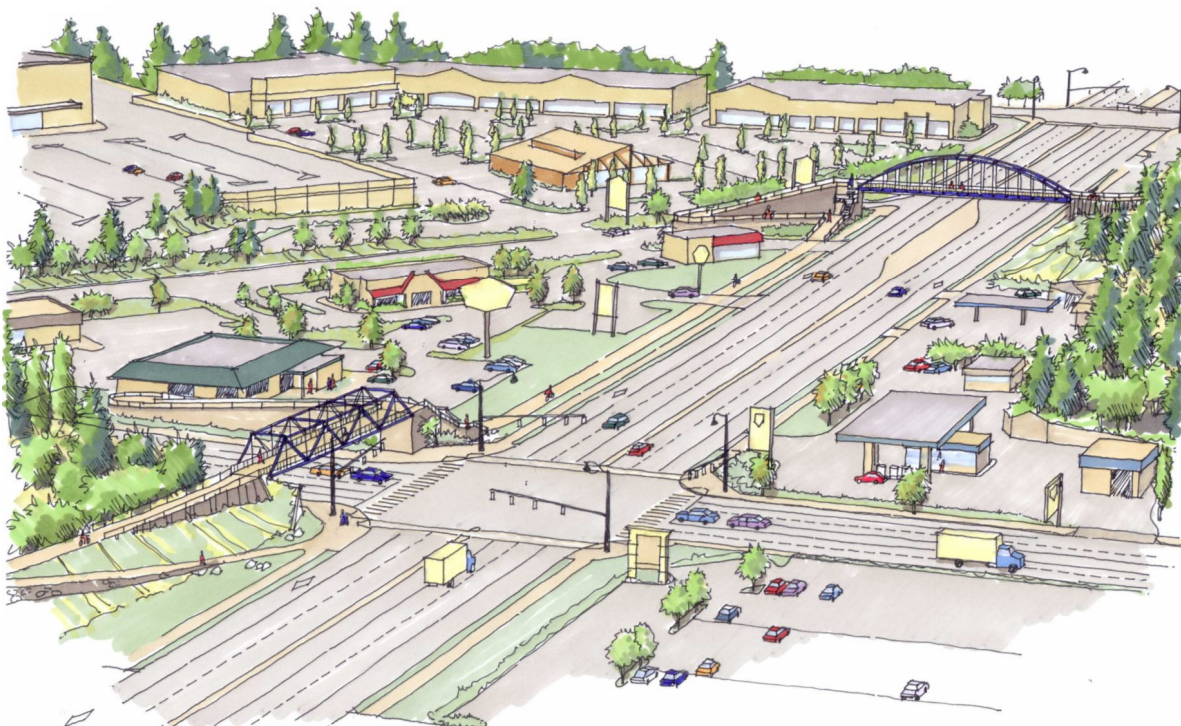


Figure 3.5 "Loop Ramp" Option perspective sketch LOOKING NORTH

Cost

Option D5a is estimated to cost approximately \$3.8 million. However, costs can be reduced to complete the project within the current \$3.6 million budget. An example would be for the Aurora project to construct some elements of this project, such as the having the Aurora sidewalk serve as the trail in the section between the two ramps (this would reduce the costs to approximately \$3.64 million).

Option D5b: Westminster Option

Description

The Westminster Option is similar to the Loop Ramp Option except that the alignment is proposed to go around the Triangle area and along Westminster Way. This option proposes to construct Trail bridges over 155th Street and Aurora Avenue. Ramps would bring trail users down to grade around the Westminster Triangle area between the two bridges. This option proposes steel arch bridges, steel truss bridges, or a combination of these bridge types.

Pros/Cons

This option provides safety benefits of grade separated crossings for trail users, yet it does not have the visual impacts that the Elevated Option would. Other benefits of this option

are that it provides access to businesses and provides access to at-grade connections. This option does not limit development opportunities in the Triangle area, and future development could integrate the trail into the development. The long term vision of the trail may be to keep it elevated without slopes up and down to grade, and this option could allow that to happen in phases with redevelopment. The types of bridges proposed for this option have a likelihood of generating positive reaction and present the opportunity to construct a “landmark” or “gateway” element.



Figure 3.6 “Westminster” Option alignment plan

The ramps as proposed in this option are not desirable for bike riders, since they would require users to make sharp turns and go up or down a steep incline. The design does meet ADA and agency design guidance.

Cost

Option D5b is estimated to cost approximately \$3.8 million. However, as with the Loop Ramp Option, costs can be reduced to complete the project within the current \$3.6 million budget.

Option E2: Midvale Option

Description

The Midvale Option proposes an elevated trail alignment from the Pershing bulkhead at 155th Street over Aurora Avenue south of the 155th street intersection, over the north end of the Safeway parking lot then crossing 155th street and connecting at-grade with Midvale Avenue. This option proposes a steel arch or steel truss bridge over Aurora Avenue with the remaining elevated trail to be concrete structure over Safeway parking lot and 155th Street. After connecting to Midvale avenue, the trail would share the roadway with Midvale Avenue to 160th Street. This option proposes to construct bike lanes and sidewalks along Midvale. At 157th Street, a trailhead would be constructed and a path paved to bring the trail to the Interurban corridor.



Figure 3.7 "Midvale" Option alignment plan

Cost

This option provides safety of separating trail users from street crossings of Aurora Avenue and 155th Street. However, this option proposes trail users share Midvale Avenue with vehicles. The option does not limit development opportunities at Westminster Triangle, however, it would present negative visual impacts to Safeway and Parkwood Plaza. This option does not provide access to businesses or access to at-grade connections with the Aurora Corridor. The option would also have significant parking impacts to Safeway.

Option E2 is estimated to cost approximately \$4.0 million, which exceeds the current project budget of \$3.6 million.

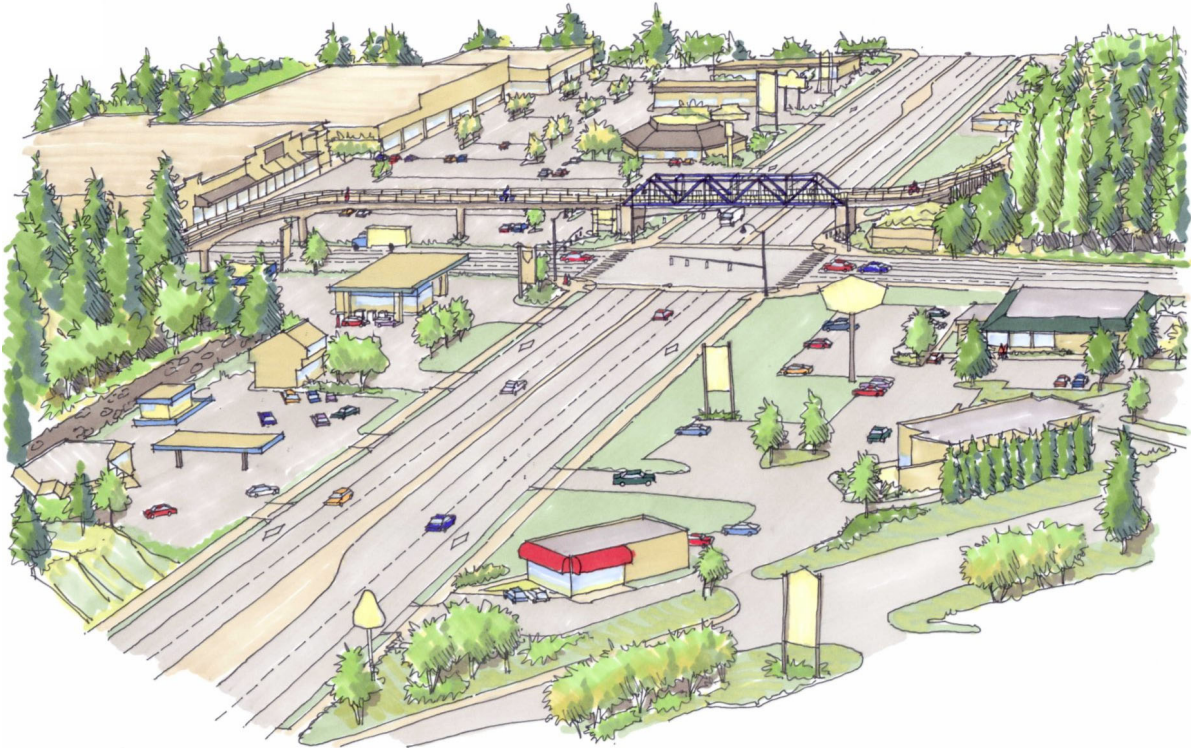


Figure 3.8 "Midvale" Option perspective sketch LOOKING SOUTH

Cost Comparison

Cost estimates have been generated for each alternative. The costs for right-of-way and design have been inflated to year 2004, and the construction costs to year 2005. The cost estimates include right-of-way (when needed), construction administration, and a 30% contingency.

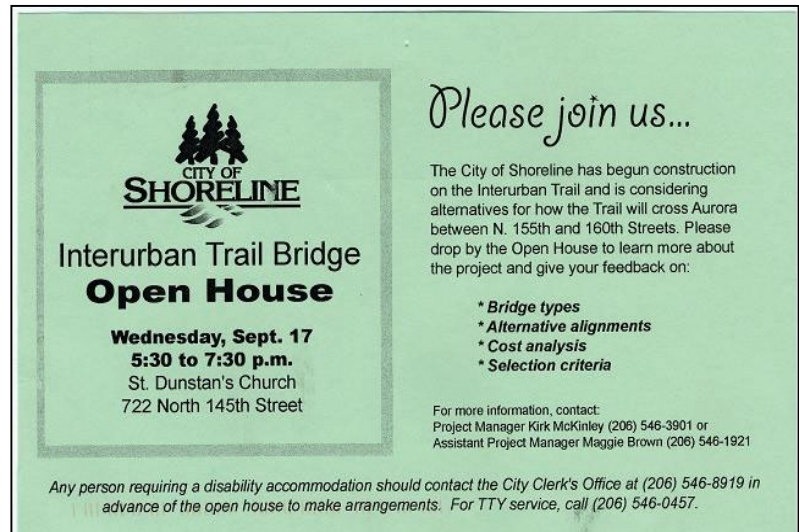
TABLE 3.1 Interurban Trail Crossing Options Cost Summary					
	Option A1 At-Grade Option	Option D1 Elevated Option	Option D5a Loop Ramp Option	Option D5b Westminster Option	Option E2 Midvale Option
Right of Way Costs	\$645,000	\$0	\$248,000	\$248,000	\$760,000
Total Estimated Project Cost	\$2,252,000	\$4,510,000	\$3,800,000	\$3,800,000	\$4,030,000

4.0 Community and Stakeholder Involvement

The City has been engaged in an active community involvement program for this project that included a public open house, individual meetings with project stakeholders, and two presentations at City Council meetings. Opportunities for community input to the concepts were meaningful and frequent. Comments from these meetings and other communications to the City were gathered and considered in the design and evaluation.

Open House

The City held a public Open House for the project on September 17, 2003. The five options considered for further study were presented along with benefits and concerns for each option. Boards showing the 25 original design concepts were displayed as well. Other information provided at the Open House included a discussion and examples of bridge types. Attendees were also given the opportunity to comment on the Evaluation Criteria for the project. Over 50 people from the community and area merchants attended.



Open House Flyer

Significant concerns from the public comments were most commonly regarding access issues to the trail, safety for trail users, maintaining an efficient route, and project cost.

Stakeholder Input

In addition to the Open House on September 17, the project team met with key property and business owners, and has continued to keep them involved throughout the alternatives analysis. Stakeholders were first interviewed as the study was initiated to find out key issues, concerns and questions. Interviews were held with Seattle City Light, Safeway, Joshua Green Corporation, Shoreline Family Auto, Parkwood Plaza, and Central Market. Stakeholders were also invited to attend the Open House, and follow-up conversations and meetings have been held with Safeway, Joshua Green Corporation, and Seattle City Light. Safeway does not support the Midvale Option because of the structure blocking views to their business and impacts on parking. Joshua Green has expressed concern about options that impact their property, but have indicated that they object most to the Elevated Option and they support the Loop Ramp Option. Input was also solicited from project area neighborhood associations and community bicycle groups.

Significant concerns from the merchant stakeholders were most commonly regarding access issues to the trail and visual impacts to properties.

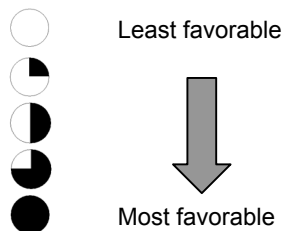
5.0 Evaluation of Alternatives

The purpose of the evaluation process for the Aurora Interurban Trail Crossing Study was to evaluate a range of potential design alternatives and arrive at a preferred alternative for recommendation to the City Council. The evaluation process is designed to ensure that the preferred alternative will directly address key issues identified in Section 2 and fulfill the project goals.

Evaluation was performed on the five candidate alternatives. The evaluation criteria, as described in Section 2 of this report, were used in the analysis of the design alternatives to identify a preferred alternative to be recommended to the City Council. The criteria chosen represent factors unique to the Shoreline community as well as typical factors that would be addressed during environmental assessment.

Each criterion was divided into a five-rating scale. Each rating is made up of several reproducible quantitative and qualitative measures relating to the criterion. In order to facilitate visual comparison of alternatives, a graphic scale was used to differentiate the rating values. For each criterion, an open circle represents the least favorable rating and a completely filled circle represents most favorable. Filling of the circle by quarters represents the three intervening rating values. This is similar to the “Consumer Reports” style of ranking.

Rating Scale



The following Table 5.1 contains the evaluation results for comparison between the five design options. Bullet items of note related to each respective criterion are also provided in the table.

Summary of Results

Option D1 was found to have the highest score in terms of safety for trail users. This option proposes a completely separate elevated trail. The “Loop Ramp” and “Westminster” Options scored well because of proposed grade separated crossings, however portions of the trail at-grade posed conflicts at some driveways. The Midvale Option proposed a shared roadway with the trail which is not an optimal design in terms of safety, and the At-Grade Option does not meet project safety goals.

In Terms of access and connectivity provided, Option D5a, the Loop Ramp Option, scored the highest. This option maintains a logical and efficient alignment and also provides connections to access business in the Aurora Avenue area.

Factors that affect constructability are construction impacts to businesses, such as parking impacts, and cumulative impacts to Aurora Avenue traffic control. Option A2, the At-Grade Option, and Option D5b, the Westminster Option scored best for this criterion.

Option D1 scored highest in terms of ability to meet agency design guidance. The alignment for this option is most desirable for bikes. The other bridge options scored well, however the alignments propose sharp bends at the bridge ramps which is not most desirable for bikes.

Options D5a and D5b were found to have the highest score in terms of expressing community identity. Both these options were found to provide maximum opportunity to construct a visually pleasing landmark structure, create a gateway, and integrate a theme that would generate positive reaction from the community.

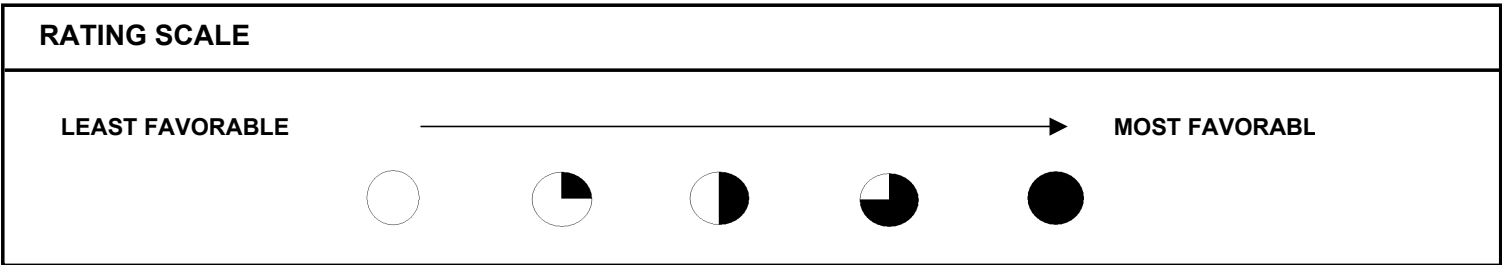
Option A2 was found to score highest in terms of visual impacts to businesses, however, the trail use of Midvale would change the character of this residential street. Option D1 scored the lowest on this criterion because of its visual impacts to Westminster Triangle businesses.

Options D5a and D5b were found to have the highest score in terms of anticipating and promoting future development. The configuration of these options does not limit development possibilities and can be integrated with future development while providing access to businesses. The other options did not score well for this criterion.

In terms of cost, Options D5a and D5b scored the highest. The estimate for Elevated Option D1 is beyond the current project budget. Options D5a and D5b can likely be implemented within the project budget of \$3.6 million. The estimate for Option A2 is well below the project budget, however, this option may forfeit grant funding for the project.

Evaluation Results

Screening Matrix Interurban Trail Bridge Options										
	Option A2		Option D1		Option D5a		Option D5b		Option E2	
Criteria	At-Grade Option		Elevated Option		Loop Ramp Option		Westminster Option		Midvale Option	
Safety of Trail Users		- Does not provide safety benefits - at-grade trail crossings on arterial roads - trail shares Midvale with vehicles		- Safest option, completely separate, elevated trail		- grade separated crossings - crosses driveways at Pizza Hut and SCL		- grade separated crossings - crosses driveways at Dennys and Pizza Hut		- grade separated crossings - driveway conflicts/shares roadway with cars on Midvale
Access/ Connectivity Provided		- provides at-grade connections - provides access to businesses - does not provide efficient route - has significant grade slope at Midvale		- provides logical and efficient route - no significant grade changes - Does not provide access to at-grade connections - Does not provide access to businesses		- provides logical and efficient alignment - provides at-grade connections - provides access to businesses - grade changes are not desirable		- provides at-grade connections - provides access to businesses - alignment is not most efficient - grade changes are not desirable		no significant grade changes - does not provide access to businesses - does not provide at-grade connections - alignment is not efficient
Constructability		- no conflicts with power lines - construction is feasible - no significant traffic control/construction impacts to Aurora ave traffic - Significant impacts to Safeway parking		- construction is feasible - no significant construction impacts to businesses - cumulative construction/traffic control impacts on Aurora Avenue - fixed location may be conflict with future SCL expansion		- option does not present conflicts with power lines construction is feasible - construction will result in cumulative impacts on Aurora Avenue during construction - Parking impacts to Pizza Hut - these can be mitigated.		- option does not present conflict with power lines - construction is feasible - option does not present significant impacts to businesses		- option does not present conflict with power lines - options presents impacts to Safeway parking - construction will result in cumulative traffic control impacts during construction
Meets Agency Guidelines		steep grades on Midvale - steeper than min ADA guidelines		Most desirable geometry for bikes		Meets agency guidelines, but bends at ramps are not desirable for bikes		Meets agency guidelines, but bends at ramps are not desirable for bikes		Meets agency guidelines, but bends at ramps are not desirable for bikes
Expresses Community Identity		no structure		concrete bridges may be visual pleasing may be landmark structure concrete structure is more economical, not considered as visually pleasing, not as transparent as truss or arch structure		steel truss or steel arch maximum opportunity to express community identity, construct visually pleasing landmark structures, create gateway, and integrate theme that would generate positive reaction		steel truss or steel arch maximum opportunity to express community identity, construct visually pleasing landmark structures, create gateway, and integrate theme that would generate a positive reaction		combination - steel arch/truss over Aurora, concrete structure over Safeway and 155th - may be visually pleasing - may be landmark/gateway structure - opportunity to express theme with bridge over Aurora The structure will impair sight distance at 155th
Visual Impacts to Businesses		no impacts, no benefits route uses residential street and construction will change character of Midvale		- Significant visual impacts at Westminster triangle and Aurora Square		- Ramps may have visual impacts at Denny's and Pizza Hut - Bridge may provide "gateway" or landmark benefit for businesses		- Ramps may have visual impacts at Denny's and Pizza Hut - Bridge may provide "gateway" or landmark benefit for businesses		- This option will have significant visual impact to Safeway and Parkwook Plaza. - The bridges may provide landmark benefit for businesses
Anticipates/Promotes Future Development		does not limit development, does not promote future development		may provide landmark benefit for businesses - This option is not flexible to be integrated into future development - Does not provide access to development - Limits development around the alignment		- does not limit - can be integrated with development - provides access to business development - opportunity for landmark to promote business		- does not limit - can be integrated with development - provides access to business development - opportunity for landmark to promote business		may provide landmark benefit for businesses - This option is not flexible to be integrated into future development - Does not provide access to development - Limits development around the alignment
Cost		\$1.9 to \$2.6 million This option may forfeit grant funding		\$3.8 to \$5.2 million This option does not fit within the current budget		\$3.2 to \$4.4 million provides ability to phase project to meet budget constraints		\$3.2 to \$4.4 million provides ability to phase project to meet budget constraints		\$3.4 to \$4.6 million this option cost is likely beyond current project funding



6.0 Preferred Alternative and Next Steps

Overall, Option D5a, the “Loop Ramp” Option, was found to most closely meet project goals and satisfy key issues for this project.

This option provides safety for trail users by grade separating the Trail crossings of N 155th Street and Aurora Avenue. This options provides a logical route alignment that is consistent with the historical Interurban corridor alignment.

The Loop Ramp Option provides at-grade connections to enable access to businesses and access. This helps meet a City goal of providing a non-motorized connection of neighborhoods with local commerce and businesses.

This option does not limit development opportunities in the Westminster Triangle area, and future development could integrate the trail into the development. The long-term vision of the trail may be to keep it elevated without slopes up and down to grade, and this option could allow that to happen in phases with redevelopment.

The truss bridges, as proposed for this option, have a likelihood of generating positive reaction and present the opportunity to construct a “landmark” or “gateway” element. The truss type bridge, often associated with railway, also presents an opportunity to express a theme or connection to the historical use of the Interurban corridor.

The Loop Ramp option is affordable within the current project budget. And since the trail alignment runs adjacent to the proposed Aurora Avenue sidewalk to be constructed in 2005, there is also an opportunity to leverage the Aurora Avenue project to construct a shared path in place of the Aurora sidewalk and Interurban Trail.

On October 20, 2003 23 the Shoreline City Council accepted the recommended Loop Ramp option, and directed the City staff to proceed with Final Project development for this design. The Council also directed City staff to pursue a truss bridge type for the 155th Street crossing and the Aurora Avenue crossing. The Council’s decision brought to closure the Aurora Interurban Trail Bridge Study and authorized the next steps of implementation.

6.1 Environmental Process Recommendation

The Interurban Trail Bridge project will provide a more formal and permanent connection of the trail between the intersection of North 155th Street/ Aurora Avenue North and where the Seattle City Light right-of-way meets the east side of Aurora Avenue at roughly North 158th Street. This section of the trail has been anticipated in prior environmental documents, to travel along North 155th Street, Midvale Avenue North, and North 158th Street as an interim route. However, potential impacts of a future bridge crossing were not addressed due to a lack of design information. As a new facet of the Interurban Trail not previously addressed in the approved environmental documents, the potential impacts of the bridge project must be assessed and reported.

Because the trail bridge project will use federal funding, NEPA as well as SEPA documentation must be completed. The “Loop Ramp” bridge project can be viewed as a change in the project description rather than a new and separate project since construction

of the southern section of the trail is not complete. This allows use of some of the earlier environmental documentation submitted and approved for the Interurban Trail. A NEPA Documented Categorical Exclusion (DCE) and SEPA Checklist (followed by a Determination of Non-Significance) were completed for the southern segments of the trail, from 145th Street to 175th Street.

NEPA allows for certain documents to be revised and appended, but a DCE is not among them. This is because a DCE is not truly an environmental document, but instead an explanation of why an environmental document (an Environmental Assessment or Environmental Impact Statement) is not needed for a particular project. Because of this, the bridge project would need new documentation to satisfy NEPA procedures.

“Pedestrian and bicycle facilities” are one type of project that qualifies as categorically excluded (23 CFR 771.117(c)(3)) under federal regulations. A brief conversation with WSDOT has confirmed that the bridge project would qualify as a bicycle facility and could be processed with a DCE. Other federal requirements associated with NEPA documentation would still need to be fulfilled including Section 106 Consultation (historical review for the Interurban Bulkhead) and Endangered Species Act (ESA) compliance. Both Section 106 and ESA consultation letters written for the Interurban Trail could be amended as long as the impact determination would still be valid with the bridges in place.

The content of the DCE should also carefully and explicitly describe how the remainder of the Interurban Trail would still be able to function and operate without impact during the construction of the bridges. Impacts to recreational amenities such as the Interurban Trail, even if that impact is due to construction of an additional part of that same amenity, would trigger additional documentation in the form of a Section 4(f) Evaluation. This should not be an issue with the bridge project because users would be able to use the trail during bridge construction, but this fact would need to be clearly stated.

The most efficient way to document the impacts of the bridge project for SEPA is to submit a new SEPA Checklist with the intention of the project to be issued a Revised Determination of Non-Significance (DNS) that also adopts the new NEPA DCE. A Revised DNS can be used to document changes to a proposal that will not result in any likely significant adverse environmental impacts. It is anticipated that the bridge project would not result in significant environmental impacts.

Summary Recommendation:

- Consider the trail bridge project a change in the Interurban Trail project description
- Submit a new NEPA Documented Categorical Exclusion, including
 - Amended ESA No Effect Letter
 - Amended Section 106 Consultation Letter
- Submit a new SEPA Checklist

6.2 Aurora Interurban Trail Bridge Project Next Steps

The Aurora Interurban Trail Bridge Project involves several phases of development before construction can begin. The concept, now adopted by the City Council will move into phases of environmental review and final design engineering which is to commence in the early 2004. Final plans, specifications and estimates will be prepared and right of way acquired for construction. These phases will take about a year to complete. After the plans have been approved and the right of way acquired, a construction contract for the first stage will go out to bid. Once a bid has been awarded, construction could be complete in 8 to 12 months. It is likely that the construction of the Interurban Trail Bridge project will occur concurrent with the construction of the Aurora Avenue project in 2005 and 2006.

Appendix A: Option Plans



LEGEND

- trail at-grade
- trail ramp
- trail bridge structure

Trail At-Grade

Realignment of
Midvale Avenue

New traffic signal

Sidewalk and
bike lanes

Trail At-Grade

"AT GRADE" OPTION
Trail Option A1-A
Interurban Trail Bridge Options
Scale 1:120
August 19, 2003



LEGEND

- trail at-grade
- trail ramp
- trail bridge structure

Match to trail at-grade

Pedestrian bridge structure

Future widening for right turn lane

Pedestrian bridge structure

Trail At-Grade

"ELEVATED" OPTION
Trail Option D1
Interurban Trail Bridge Options
Scale 1:120
August 19, 2003



LEGEND

- trail at-grade
- trail ramp
- trail bridge structure

Match to trail at-grade

Pedestrian bridge structure

Future widening for right turn lane

Pedestrian ramp

Pedestrian bridge structure

Trail At-Grade

"LOOP RAMP" OPTION
Trail Option D5-A
Interurban Trail Bridge Options
Scale 1:120
August 19, 2003



LEGEND

- trail at-grade
- trail ramp
- trail bridge structure

Match to trail at-grade

Pedestrian bridge structure

Future widening for right turn lane

Pedestrian ramp

Pedestrian bridge structure

Trail At-Grade

"WESTMINSTER" OPTION
Trail Option D5-B
Interurban Trail Bridge Options
Scale 1:120
August 19, 2003



LEGEND

- trail at-grade
- trail ramp
- trail bridge structure

Match to trail at-grade

Pedestrian ramp

Future widening for right turn lane

Pedestrian bridge structure

Trail At-Grade

Sidewalk and bike lanes

"MIDVALE" OPTION
Trail Option E2-A
Interurban Trail Bridge Options
Scale 1:120
August 19, 2003

Appendix B: Cost Estimates

City of Shoreline Interurban Trail Option A1A

Summary and Escalation Calculations

ORDER OF MAGNITUDE COST - *Draft*

CH2M HILL

Date: Sep-03

Date of Cost Index: 2003

165th Street N to 185th Street N

Categories	Factors		Escalated Costs
I. RIGHT OF WAY	Date of Cost Index	2003	\$645,000
	Year of Escalation	2005	
	Escalation Factor/Year	5.00%	
	Overall Escalation Factor	110.25%	
	Cost @ Date of Cost Index	\$585,000	
II. CONSTRUCTION	Date of Cost Index	2003	\$1,291,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$1,205,000	
III. DESIGN TOTAL (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)	Date of Cost Index	2003	\$187,000
	Year of Escalation	2004	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	103.50%	
	Cost @ Date of Cost Index	\$180,750	
IV. CONSTRUCTION MANAGEMENT TOTAL (Engineering Assistance During Construction, Construction Administration, Inspection)	Date of Cost Index	2003	\$129,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$120,500	
V. TOTAL ESTIMATED COST (2003)			\$2,091,250.00
VI. TOTAL ESTIMATED COST (Escalated Dollars)			\$2,252,000.00

City of Shoreline
Interurban Trail Option D1
 Summary and Escalation Calculations
ORDER OF MAGNITUDE COST - Draft

CH2M HILL

Date: Sep-03

Date of Cost Index: 2003

165th Street N to 185th Street N

Categories	Factors		Escalated Costs
I. RIGHT OF WAY	Date of Cost Index	2003	\$0
	Year of Escalation	2005	
	Escalation Factor/Year	5.00%	
	Overall Escalation Factor	110.25%	
	Cost @ Date of Cost Index	\$0	
II. CONSTRUCTION	Date of Cost Index	2003	\$3,624,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$3,383,000	
III. DESIGN TOTAL (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)	Date of Cost Index	2003	\$525,000
	Year of Escalation	2004	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	103.50%	
	Cost @ Date of Cost Index	\$507,450	
IV. CONSTRUCTION MANAGEMENT TOTAL (Engineering Assistance During Construction, Construction Administration, Inspection)	Date of Cost Index	2003	\$362,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$338,300	
V. TOTAL ESTIMATED COST (2003)			\$4,228,750.00
VI. TOTAL ESTIMATED COST (Escalated Dollars)			\$4,511,000.00

City of Shoreline
Interurban Trail Option D5-A
 Summary and Escalation Calculations
ORDER OF MAGNITUDE COST - Draft

CH2M HILL

Date: Sep-03

Date of Cost Index: 2003

165th Street N to 185th Street N

Categories	Factors		Escalated Costs
I. RIGHT OF WAY	Date of Cost Index	2003	\$248,000
	Year of Escalation	2005	
	Escalation Factor/Year	5.00%	
	Overall Escalation Factor	110.25%	
	Cost @ Date of Cost Index	\$225,000	
II. CONSTRUCTION	Date of Cost Index	2003	\$2,873,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$2,682,000	
III. DESIGN TOTAL (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)	Date of Cost Index	2003	\$416,000
	Year of Escalation	2004	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	103.50%	
	Cost @ Date of Cost Index	\$402,300	
IV. CONSTRUCTION MANAGEMENT TOTAL (Engineering Assistance During Construction, Construction Administration, Inspection)	Date of Cost Index	2003	\$287,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$268,200	
V. TOTAL ESTIMATED COST (2003)			\$3,577,500.00
VI. TOTAL ESTIMATED COST (Escalated Dollars)			\$3,824,000.00

City of Shoreline
Interurban Trail Option E2-A
 Summary and Escalation Calculations
ORDER OF MAGNITUDE COST - Draft

CH2M HILL

Date: Sep-03

Date of Cost Index: 2003

165th Street N to 185th Street N

Categories	Factors		Escalated Costs
I. RIGHT OF WAY	Date of Cost Index	2003	\$761,000
	Year of Escalation	2005	
	Escalation Factor/Year	5.00%	
	Overall Escalation Factor	110.25%	
	Cost @ Date of Cost Index	\$690,000	
II. CONSTRUCTION	Date of Cost Index	2003	\$2,626,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$2,451,000	
III. DESIGN TOTAL (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)	Date of Cost Index	2003	\$381,000
	Year of Escalation	2004	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	103.50%	
	Cost @ Date of Cost Index	\$367,650	
IV. CONSTRUCTION MANAGEMENT TOTAL (Engineering Assistance During Construction, Construction Administration, Inspection)	Date of Cost Index	2003	\$263,000
	Year of Escalation	2005	
	Escalation Factor/Year	3.50%	
	Overall Escalation Factor	107.12%	
	Cost @ Date of Cost Index	\$245,100	
V. TOTAL ESTIMATED COST (2003)			\$3,753,750.00
VI. TOTAL ESTIMATED COST (Escalated Dollars)			\$4,031,000.00

Appendix C: Alignment Options

Aurora Interurban Trail Bridge Study

Table C.1: Summary of Options Considered

	ID	Description	Pros	Cons
1	A1	At grade ped crossing at Safeway Realigning Midvale	Minimal construction impacts to Aurora Helps provide solution for Safeway/155th Does not impair visibility to businesses	Right-of-way acquisition needed Trail route on neighborhood street Not an efficient route for trail users Trail route follow on steep grades Safety concerns: at-grade crossings Does not express community identity Significant parking impacts at Safeway City will lose grant funding for project
2	A2	Bridge structure at Intersection At grade ped crossing at Midvale Helix at SE corner	Improves safety for trail users crossing Aurora Helps provide solution for Safeway/155th Does not limit future development	Not an efficient route for trail users Steep ramps on the trail for bridges Safety concerns: at-grade crossings at 155th Does not express community identity 90-degree bend is not desirable for bicycles Impacts to properties behind Chevron and Aurora businesses May impact visibility of Safeway/Parkwood Plaza
3	A3	Tunnel at Intersection At grade ped crossing at Safeway	Provides minimal conflicts with vehicles for trail users - Safety Does not limit future development	General fear for personal safety in tunnel Utilities must be relocated Construction impacts are significant May not be feasible due to utility impacts High cost (tunnels are highest type of structure option) Safety concerns: at-grade crossings at 155th 90-degree bend is not desirable for bicycles
4	A4	No Signal at Safeway Overflow parking at Safeway All elevated crossings	Provides minimal conflicts with vehicles for trail users - Safety Efficient Route for trail users Does not limit future development	May impact visibility of Safeway/Parkwood Plaza Significant parking impacts at Safeway Impacts to properties behind Chevron and Aurora businesses Right-of-way acquisition required Trail on slope behind businesses may be costly to construct
5	B1	Bridge Structure over intersection diagonal	One bridge with smaller span may help costs to be lower Provides minimal conflicts with vehicles for trail users - Safety Efficient Route for trail users Opportunity for community identity statement	May affect visibility to Safeway Impacts to properties behind Chevron and Aurora businesses Significant impact to Chevron Right-of-way acquisition required Trail on slope behind businesses may be costly to construct
6	B2	Tunnel under intersection diagonal	Efficient Route for trail users	General fear for personal safety in tunnel Utilities must be relocated Construction impacts are significant May not be feasible due to utility impacts High cost (tunnels are highest type of structure option) Safety concern for trail users and business access along Aurora
7	C1	Bridge Structure over 155th (W of Aurora) Bridge Structure diagonal over Aurora (N of 155th)	Continuous, direct, grade separated trail is ideal for bikes Provides minimal conflicts with vehicles for trail users - Safety Efficient Route for trail users Opportunity for community identity statement	May affect visibility to Safeway and Westminster Triangle businesses Impacts to properties behind Aurora businesses Property impacts to Shoreline Family Auto Right-of-way acquisition required
8	D1	The Design Report Option	Continuous, direct, grade separated trail is ideal for bikes Efficient Route for trail users Provides minimal conflicts with vehicles for trail users - Safety	Reduced visibility to businesses Larger span means increased cost Parking impacts to Westminster Triangle businesses Does not provide access to businesses Not perpendicular to the road
9	D2	Bridge Structure over 155th (W of Aurora) Bridge Structure along Aurora (W side) Bridge Structure across Aurora (S of Westminster) Helix at NW corner Aurora/155th Helix at SW corner Aurora/Westminster	Continuous, direct, grade separated trail is ideal for bikes Provides minimal conflicts with vehicles for trail users - Safety Efficient Route for trail users Potential to phase project and not build 155th	Reduced visibility to businesses Larger span means increased cost Property impacts at Westminster Triangle

Aurora Interurban Trail Bridge Study

Table C.1: Summary of Options Considered

10	D3	<p>Bridge Structure over 155th (W of Aurora)</p> <p>At grade along Aurora (W side)</p> <p>Bridge Structure across Aurora (S of Westminster)</p> <p>Helix at NW corner Aurora/155th</p> <p>Helix at SW corner Aurora/Westminster</p>	<p>Provides minimal conflicts with vehicles for trail users - Safety</p> <p>Opportunity for special bridge(s) to express community identity</p> <p>Lessens visual impact for Westminster Triangle businesses</p> <p>Does not limit development opportunities</p> <p>Aurora sidewalk could be replaced (cost)</p> <p>Potential to phase project and not build 155th</p>	<p>Steep ramps for bridges do not provide efficient route for Trail users</p> <p>Access conflicts with driveway and trail at business driveway</p> <p>Helix structures are not desirable for bicycle users</p> <p>Parking impacts at Pizza Hut</p> <p>Right of Way acquisition required (minor)</p>
11	D4	<p>Donut Option</p> <p>2 Helix (SE & NW corners) / 2 Ramp (NE & SW)</p>	<p>Provides grade separation for street crossings</p> <p>Provides access/ramps at each intersection corner</p>	<p>Property impacts at the intersection</p> <p>Right-of-way acquisition required</p> <p>Parking impacts at Shoreline Family Auto</p> <p>Not an efficient route for trail users</p> <p>Helix structures are not desirable for bicycle users</p> <p>Safety concern for trail users and business access along Aurora</p>
12	D5a	<p>Berm at grade; could replace sidewalk</p> <p>Bridge Structure across 155th (W of Aurora)</p> <p>Bridge Structure across Aurora (S of Westminster)</p>	<p>Provides minimal conflicts with vehicles for trail users - Safety</p> <p>Opportunity for special bridge(s) to express community identity</p> <p>Lessens visual impact for Westminster Triangle businesses</p> <p>does not limit development opportunities</p> <p>Aurora sidewalk could be replaced (cost)</p> <p>Potential to phase project and not build 155th</p>	<p>Steep ramps for bridges do not provide efficient route for Trail users</p> <p>Access conflicts with driveway and trail at business driveway</p> <p>Right of Way acquisition required (minor)</p> <p>Parking impacts at Pizza Hut</p>
13	D5b	<p>Trail around Westminster</p> <p>Bridge Structure across 155th (W of Aurora)</p> <p>Bridge Structure across Aurora (S of Westminster)</p>	<p>Provides minimal conflicts with vehicles for trail users - Safety</p> <p>Opportunity for special bridge(s) to express community identity</p> <p>Lessens visual impact for Westminster Triangle businesses</p> <p>does not limit development opportunities</p> <p>Aurora sidewalk could be replaced (cost)</p> <p>Potential to phase project and not build 155th</p>	<p>Steep ramps for bridges do not provide efficient route for Trail users</p> <p>Access conflicts with driveway and trail at business driveway</p> <p>Right of Way acquisition required (minor)</p> <p>Parking impacts at Pizza Hut</p>
14	E1	<p>Signal at Safeway</p> <p>At grade crossings</p>	<p>No structures mean lower cost</p> <p>Minimal construction impacts to Aurora</p> <p>Trail does not negatively affect access to businesses</p> <p>Does not impair visibility to businesses</p> <p>Helps provide solution for Safeway/155th</p>	<p>\$2 million of grants lost</p> <p>Safety concerns: at-grade crossings</p> <p>Alignment does not provide efficient, direct route for bicycle riders on trail</p> <p>Does not express community identity</p> <p>Trail uses a residential street</p> <p>Significant parking impacts at Safeway</p> <p>Trail follows on steep route</p>
15	E2	<p>Bridge Structure across Aurora (S of 155th)</p> <p>Bridge Structure diagonal at Safeway (E of Aurora)</p> <p>Bridge Structure W of Midvale</p> <p>Helix across 155th from Safeway (W of Midvale)</p>	<p>Grade separates street crossings for Trail users = safety</p> <p>Does not limit development opportunities at Westminster Triangle</p>	<p>Alignment does not provide efficient, direct route for bicycle riders on trail</p> <p>Visual impacts, visibility to Safeway and Parkwood Plaza businesses</p> <p>Parking impacts at Safeway</p> <p>Right of Way acquisition required</p> <p>Trail uses residential street</p>
16	E3	<p>Bridge Structure across Aurora (S of 155th)</p> <p>Helix at SE corner Aurora and 155th</p> <p>At grade crossing at Midvale</p>	<p>Improves safety for trail users crossing Aurora</p> <p>Does not limit future development</p> <p>Helps provide solution for Safeway/155th</p>	<p>Not an efficient route for trail users</p> <p>Steep ramps on the trail for bridges</p> <p>Safety concerns: at-grade crossings at 155th</p> <p>Does not express community identity</p> <p>Parking impacts to Safeway</p> <p>Trail uses residential street</p> <p>Visual impacts, visibility to Safeway and Parkwood Plaza businesses</p>
17	F1a	<p>Bridge Structure across 155th (W of Aurora)</p> <p>At grade through to Westminster</p> <p>Bridge Structure across Aurora (S of Westminster)</p>	<p>Provides minimal conflicts with vehicles for trail users - Safety</p> <p>Opportunity for special bridge(s) to express community identity</p> <p>Lessens visual impact for Westminster Triangle businesses</p> <p>Does not limit development opportunities</p> <p>Potential to phase project and not build 155th</p>	<p>Right of Way acquisition required (minor)</p> <p>Steep ramps on the trail for bridges</p> <p>Alignment does not provide efficient, direct route for bicycle riders on trail</p> <p>Trail through parking lot is not an efficient route</p> <p>Two bridges: Increased cost</p>

Aurora Interurban Trail Bridge Study

Table C.1: Summary of Options Considered

18	F1b	At grade across 155th (W of Aurora) At grade through to Westminster Bridge Structure across Aurora (S of Westminster)	Provides minimal conflicts with vehicles for trail users - Safety Opportunity for special bridge to express community identity Lessens visual impact for Westminster Triangle businesses Does not limit development opportunities Potential to phase project and not build 155th	Alignment does not provide efficient, direct route for bicycle riders on trail Steep ramps on the trail for bridge Trail through parking lot is not an efficient route Right of Way acquisition required (minor)
19	F2	Bridge Structure across 155th (W of Aurora) Helix at NW corner 155th and Aurora At grade through parking lot Helix at SW corner of Aurora and Westminster Bridge Structure across Aurora (S of Westminster)	Provides minimal conflicts with vehicles for trail users - Safety Opportunity for special bridge(s) to express community identity Lessens visual impact for Westminster Triangle businesses Does not limit development opportunities Potential to phase project and not build 155th	Alignment does not provide efficient, direct route for bicycle riders on trail Helix ramps are not desirable for bicycle users Trail through parking lot is not an efficient route Right of Way acquisition required (minor)
20	G1	Bridge Structure Midblock 155th (W of Aurora) Ramp down to grade in parking lot Ramp up to bridge structure at Westminster/Aurora Bridge Structure across Aurora (S of Westminster)	Provides minimal conflicts with vehicles for trail users - Safety Opportunity for special bridge(s) to express community identity Lessens visual impact for Westminster Triangle businesses Does not limit development opportunities Potential to phase project and not build 155th	Right of Way acquisition required Alignment does not provide efficient, direct route for bicycle riders on trail Two bridges: Increased cost Trail through parking lot is not an efficient route Steep ramps on the trail for bridges
21	G2	At grade midblock crossing on 155th At grade through parking lot Berm up to structure at Westminster Structure across Aurora (S of Westminster)	Provides minimal conflicts with vehicles for trail users - Safety Opportunity for special bridge to express community identity Lessens visual impact for Westminster Triangle businesses Does not limit development opportunities Potential to phase project and build 155th later	Safety concerns: at-grade crossings Not an efficient route for trail users Pizza Hut impacts - access and parking Right of Way acquisition required (minor)
23	H1	At grade along west side of Aurora to 160th	No structures mean lower cost Does not impair visibility to businesses Trail does not negatively affect access to businesses	Steep grade for bicycles on trail at 160th \$2 million of grants lost Does not express community identity Safety concerns: at-grade crossings Negatively affects traffic through intersection
24	H2	At grade along east side of Aurora	No structures mean lower cost Does not impair visibility to businesses Trail does not negatively affect access to businesses	Does not express community identity Safety concerns: at-grade crossings Safety concern for trail users and business access along Aurora \$2 million of grants lost Negatively affects traffic through intersection
25	H3	Intersection Scramble All at grade	Signalized crossings in all directions allows for a more direct connection No structures mean lower cost Provides direct trail connection for bicycles	Safety concern for trail users and business access along Aurora Negatively affects traffic through intersection Does not express community identity \$2 million of grants lost

Appendix D: Design Guidance

Design Criteria for Aurora Interurban Trail Bridge Project

DATE: July 28, 2003

Design Matrix:

SR 99 is an NHS Routes (per WSDOT DM Figure 325-2a ENG Feb 2002). Therefore use Design Matrix 3 (WSDOT DM Figure 325-6 ENG Sept 2002)

Shared use path (accommodate both bicycle and pedestrian) is assumed.

Criteria		Reference
Path Width	10 ft min. 12 ft preferred	WSDOT DM Fig 1020-13 ENG May 2001
Shouder Width	2 ft graded each side total of 4 ft.	WSDOT DM Fig 1020-13 ENG May 2001
Structures	10 ft min. bike path + 2 ft shoulder on each side	WSDOT DM 1020.05(2)(m) ENG May 2001
Horizontal Clearance to Obstruction	2 ft min. from edge of pavement	WSDOT DM 1020.05 (2)(b) ENG May 2001
Horizontal Alignment - Bikeway Curve Widening	0 - 25 ft R, 4 ft 25 - 50 ft R, 3 ft 50 - 75 ft R, 2 ft 75 - 100 ft R, 1 ft 100 ft +, 0 ft	WSDOT DM Figure 1020-11 ENG May 2001
Vertical Clearance for Pedestrian Bridges	17.5 ft min.	WSDOT DM 1120.04(5)(a)(3) ENG Sept 2002
Vertical Clearance to Obstruction	8 ft min. to overhead obstructions Higher vertical clearance for passage of maintenance and emergency vehicles	WSDOT DM 1020.05 (2)(b) ENG May 2001

Superelevations	2% max. Straight 2% cross slope on tangent sections.	WSDOT DM 1020.05(2)(g) ENG May 2001
Grades	5% max. 2% recommended for 800' and longer Suggested grade length limits 5-6% for up to 800 ft 7% for up to 400 ft 8% for up to 300 ft 9% for up to 200 ft 10% for up to 100 ft 11+% for up to 50 ft	WSDOT DM 1020.05(2)(k)
Lateral Clearance for Signs	3 ft min. 6 ft max.	WSDOT DM Fig 1020-13 Eng May 2001
Vertical Clearance for signs	4 ft min. 5 ft max.	WSDOT DM Fig 1020-13 Eng May 2001
Lighting	Depends on night time usage	WSDOT DM 1020.05(2)(q) ENG May 2001
Design Speed	20 mph 30 mph for long down grade >4%	WSDOT DM Fig 1020-10 ENG May 2001
Lengths of Approach	450 ft	Assume 5 ft deck (including structure depth) and 5% grade.
Stopping Sight Distance	Min.	WSDOT DM 1020-19 ENG May 2001
Crest Vertical Curve Sight Distance		WSDOT DM 1020-20 ENG Sept 2002
Lateral Clearance on Horizontal Curves		WSDOT DM 1020-21 ENG Sept 2002
Bridge Rails		WSDOT DM Fig 1020-16 Eng May 2001
Pavement Surface Quality	Dense graded asphalt concrete surfaces preferred	WSDOT DM 1020.04(4)(m) Eng May 2001
Bollards		WSDOT DM 1020-05(2)(o)
Signing and pavement Marking		WSDOT DM 1020.05(2)(p) ENG May 2001