APPENDICES

Sound Transit
Central Link Light Rail Final EIS

APPENDIX A
Agency Coordination

Appendix A Agency Coordination

Agency coordination has played an important role throughout the light rail study process. The agencies listed below were contacted during data collection, resource identification, determination of regulatory compliance requirements and/or development of methodology. Agencies also provided additional information and evaluation throughout the analysis process. Consultation regarding compliance with specific regulatory issues with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Service and the Washington State Historic Preservation Office is reflected in letters from these agencies, included at the end of this section.

Agencies	Topics
Federal	
U.S. Army Corps of Engineers	Wetlands, Geology/Soils
Federal Highway Administration	Wetlands, Traffic, Air Quality, Energy, Displacements/Relocations, Highway Improvement Plans, Noise and Vibration, Capital Cost Estimates
Federal Emergency Management Agency	Flooding
U.S. Department of the Interior Geological Survey	Geology/Soils, Visual Impact Assessment
U.S. Environmental Protection Agency	All
U.S. Fish and Wildlife Service	Threatened and Endangered Species
U.S. Coast Guard	Navigation
U.S. Soil Conservation Service	Wetlands, Geology/Soils
Bonneville Power Administration	Energy
National Marine Fisheries Service	Threatened and Endangered Species
Northwest Power Planning Council	Energy
Advisory Council on Historic Preservation	Historic and Archaeological Resources
State	
Interagency Committee for Outdoor Recreation	Parklands
Department of Community, Trade, and Economic Development (formerly State Energy Office)	Energy
Department of Fish and Wildlife	Threatened and Endangered Species, Fish and Wildlife, Wetlands
Department of Ecology	Hazardous Materials, Geology
Department of Transportation	Highway Improvements Plans, Traffic, Wetlands, Hazardous Materials, Energy, Displacements and Relocations, Historic Resources, Capital Cost Estimates, Geology/Soils, Noise and Vibration, Hydrology/Water Quality
Department of Natural Resources	Threatened and Endangered Species, Geology
Office of Archaeology and Historic Preservation	Historic and Archaeological Resources
Washington Energy Strategy Committee	Energy
Local/Regional Agencies	
Cities of Seattle, Tukwila, SeaTac, and Renton and King County	Wetlands, Hydrology/Water Quality, Fish and Wildlife, Land Use and Economic Development, Historic Resources, Displacements/Relocations, Transportation Plans, Traffic, Transit, Noise and Vibration, Visual Resources, Historic and Archaeological Resources, Neighborhoods, Parklands, Geology
Port of Seattle	Energy
Puget Sound Clean Air Agency	Air Quality
Puget Sound Regional Council	Regional Travel, Land Use and Economic Development, Population and Employment
Seattle City Light	Energy
Tribes	Cultural Resources, Fisheries

Source: Sound Transit, Parametrix, Inc., October 1998.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO
ATTENTION OF

Regulatory Branch

NOV -4 1998

James Irish
Central Puget Sound
Regional Transit Authority
1100 Second Avenue, #500
Seattle, Washington 98101

Dear Mr. Irish:

Your letter of October 30, 1998, summed up a conversation we had some two weeks earlier about Department of the Army (DA) permit requirements that might pertain to your agency's light rail project. You asked for my written concurrence with your letter's contents.

I thought you summed up our meeting quite accurately. When rails cross any waters of the United States (e.g., rivers, lakes, wetlands, Puget Sound, etc.) their supporting structure requires a DA permit. When the crossing is accomplished on a fill-based bed or causeway, we normally require a standard individual permit. When the crossing is accomplished with an elevated structure, if we even require a DA permit, it is usually a nationwide permit. Our nationwide permit program is undergoing substantial revision, and I did not review any particular structures or plans during our meeting. But at the present time, we would most likely use Nationwide Permit 25 for an elevated structure utilizing poured concrete piers.

Questions about the adequacy of an alternatives analysis for a Park-and-Ride lot get raised and resolved during the permitting process.

And any bridge across a navigable water-- Portage Bay or the Duwamish River in this case-- would require a permit from the U.S. Coast Guard instead of the Corps of Engineers. A tunnel under Portage Bay would likely need a standard individual permit.

If you have any questions about the Corps' regulatory program or its applicability to Sound Transit projects, please call me at (206) 764-6907.

Sincerely,

Jack Kennedy
Regulatory Project Manager

SOUNDTRANSIT

October 30, 1998

Mr. Jack Kennedy
U.S. Army Corps of Engineers
Regulatory Branch
P.O. Box 3755
4735 East Marginal Way South
Seattle, WA 98134-2385

Dear Mr. Kennedy:

This letter summarizes our September 17, 1998 meeting to discuss potential impacts of Sound Transit's Central Link Light Rail Transit project to wetlands and other waters of the United States. A summary of the project alternatives under consideration and the potential impacts of these alternatives to aquatic resources were discussed. Based on your review of the information presented, we understand that the primary regulatory issues under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act are as discussed below.

1. Most potential impacts to aquatic resources involve linear crossings of wetlands, rivers, streams, or lakes by the proposed light rail either as a bridge or elevated structure. For these types of impacts, the Corps of Engineers could approve the crossings using Nationwide Permit 14 for crossing or placing fill in wetlands, or Nationwide 25 for crossings that require placement of piers in wetlands, lakes, or rivers.

2. Filling of wetlands to develop a park-and-ride lot near the Boeing Access Road could required an individual permit for the project. To fill wetlands for development of the park-and-ride facility, Sound Transit must demonstrate, through an alternatives analysis, that the proposed fill is the least environmentally damaging, practicable alternative available. The alternative analysis in the draft EIS appears to be sufficient to meet this purpose.

3. Tunnel or bridge crossings of Portage Bay and possibly the Duwamish River would be subject to Section 10 jurisdiction and may require an individual permit.

As we discussed, Sound Transit would like a letter to include in our draft EIS identifying your agencies regulatory and environmental issues associated with the project. Thank you for the opportunity to discuss this project, and please contact me at (206) 689-7451 if you have additional questions.

Sincerely,

James Irish
Senior Environmental Analyst

JI:gs

ji-41

c: Valerie Rosenkrantz
Perry Weinberg
Jim Kelley, Parametrix
Kittie Ford, Herrera
Jeff Heilman, LINK EIS Team

Central Puget Sound
Regional Transit Authority
1100 Second Ave., Suite 500
Seattle, WA 98101-3423
Reception 206.684.6776
Facsimile 206.684.1234
www.soundtransit.org

APPENDICES

Sound Transit
Central Link Light Rail Final EIS

APPENDIX A
Agency Coordination

Appendix A Agency Coordination

Agency coordination has played an important role throughout the light rail study process. The agencies listed below were contacted during data collection, resource identification, determination of regulatory compliance requirements and/or development of methodology. Agencies also provided additional information and evaluation throughout the analysis process. Consultation regarding compliance with specific regulatory issues with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Service and the Washington State Historic Preservation Office is reflected in letters from these agencies, included at the end of this section.

Agencies	Topics
Federal	
U.S. Army Corps of Engineers	Wetlands, Geology/Soils
Federal Highway Administration	Wetlands, Traffic, Air Quality, Energy, Displacements/Relocations, Highway Improvement Plans, Noise and Vibration, Capital Cost Estimates
Federal Emergency Management Agency	Flooding
U.S. Department of the Interior Geological Survey	Geology/Soils, Visual Impact Assessment
U.S. Environmental Protection Agency	All
U.S. Fish and Wildlife Service	Threatened and Endangered Species
U.S. Coast Guard	Navigation
U.S. Soil Conservation Service	Wetlands, Geology/Soils
Bonneville Power Administration	Energy
National Marine Fisheries Service	Threatened and Endangered Species
Northwest Power Planning Council	Energy
Advisory Council on Historic Preservation	Historic and Archaeological Resources
State	
Interagency Committee for Outdoor Recreation	Parklands
Department of Community, Trade, and Economic Development (formerly State Energy Office)	Energy
Department of Fish and Wildlife	Threatened and Endangered Species, Fish and Wildlife, Wetlands
Department of Ecology	Hazardous Materials, Geology
Department of Transportation	Highway Improvements Plans, Traffic, Wetlands, Hazardous Materials, Energy, Displacements and Relocations, Historic Resources, Capital Cost Estimates, Geology/Soils, Noise and Vibration, Hydrology/Water Quality
Department of Natural Resources	Threatened and Endangered Species, Geology
Office of Archaeology and Historic Preservation	Historic and Archaeological Resources
Washington Energy Strategy Committee	Energy
Local/Regional Agencies	
Cities of Seattle, Tukwila, SeaTac, and Renton and King County	Wetlands, Hydrology/Water Quality, Fish and Wildlife, Land Use and Economic Development, Historic Resources, Displacements/Relocations, Transportation Plans, Traffic, Transit, Noise and Vibration, Visual Resources, Historic and Archaeological Resources, Neighborhoods, Parklands, Geology
Port of Seattle	Energy
Puget Sound Clean Air Agency	Air Quality
Puget Sound Regional Council	Regional Travel, Land Use and Economic Development, Population and Employment
Seattle City Light	Energy
Tribes	Cultural Resources, Fisheries

Source: Sound Transit, Parametrix, Inc., October 1998.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO
ATTENTION OF

Regulatory Branch

NOV -4 1998

James Irish
Central Puget Sound
Regional Transit Authority
1100 Second Avenue, #500
Seattle, Washington 98101

Dear Mr. Irish:

Your letter of October 30, 1998, summed up a conversation we had some two weeks earlier about Department of the Army (DA) permit requirements that might pertain to your agency's light rail project. You asked for my written concurrence with your letter's contents.

I thought you summed up our meeting quite accurately. When rails cross any waters of the United States (e.g., rivers, lakes, wetlands, Puget Sound, etc.) their supporting structure requires a DA permit. When the crossing is accomplished on a fill-based bed or causeway, we normally require a standard individual permit. When the crossing is accomplished with an elevated structure, if we even require a DA permit, it is usually a nationwide permit. Our nationwide permit program is undergoing substantial revision, and I did not review any particular structures or plans during our meeting. But at the present time, we would most likely use Nationwide Permit 25 for an elevated structure utilizing poured concrete piers.

Questions about the adequacy of an alternatives analysis for a Park-and-Ride lot get raised and resolved during the permitting process.

And any bridge across a navigable water-- Portage Bay or the Duwamish River in this case-- would require a permit from the U.S. Coast Guard instead of the Corps of Engineers. A tunnel under Portage Bay would likely need a standard individual permit.

If you have any questions about the Corps' regulatory program or its applicability to Sound Transit projects, please call me at (206) 764-6907.

Sincerely,

Jack Kennedy
Regulatory Project Manager

SOUNDTRANSIT

October 30, 1998

Mr. Jack Kennedy
U.S. Army Corps of Engineers
Regulatory Branch
P.O. Box 3755
4735 East Marginal Way South
Seattle, WA 98134-2385

Dear Mr. Kennedy:

This letter summarizes our September 17, 1998 meeting to discuss potential impacts of Sound Transit's Central Link Light Rail Transit project to wetlands and other waters of the United States. A summary of the project alternatives under consideration and the potential impacts of these alternatives to aquatic resources were discussed. Based on your review of the information presented, we understand that the primary regulatory issues under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act are as discussed below.

1. Most potential impacts to aquatic resources involve linear crossings of wetlands, rivers, streams, or lakes by the proposed light rail either as a bridge or elevated structure. For these types of impacts, the Corps of Engineers could approve the crossings using Nationwide Permit 14 for crossing or placing fill in wetlands, or Nationwide 25 for crossings that require placement of piers in wetlands, lakes, or rivers.

2. Filling of wetlands to develop a park-and-ride lot near the Boeing Access Road could required an individual permit for the project. To fill wetlands for development of the park-and-ride facility, Sound Transit must demonstrate, through an alternatives analysis, that the proposed fill is the least environmentally damaging, practicable alternative available. The alternative analysis in the draft EIS appears to be sufficient to meet this purpose.

3. Tunnel or bridge crossings of Portage Bay and possibly the Duwamish River would be subject to Section 10 jurisdiction and may require an individual permit.

As we discussed, Sound Transit would like a letter to include in our draft EIS identifying your agencies regulatory and environmental issues associated with the project. Thank you for the opportunity to discuss this project, and please contact me at (206) 689-7451 if you have additional questions.

Sincerely,

James Irish
Senior Environmental Analyst

JI:gs

ji-41

c: Valerie Rosenkrantz
Perry Weinberg
Jim Kelley, Parametrix
Kittie Ford, Herrera
Jeff Heilman, LINK EIS Team

Central Puget Sound
Regional Transit Authority
1100 Second Ave., Suite 500
Seattle, WA 98101-3423
Reception 206.684.6776
Facsimile 206.684.1234
www.soundtransit.org

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER-98/817

RECEIVED
FEB 16 1999
REGIONAL TRANSIT AUTHORITY

FEB 10 1999

Ld0854

Ms. Helen Knoll
Regional Administrator
Federal Transit Administration
Region X
Jackson Federal Building, Suite 3142
915 Second Avenue
Seattle, Washington 98174-1002

Dear Ms. Knoll:

This is in response to the request for the Department of the Interior's comments on the Draft Environmental Impact Statement/Section 4(f) Evaluation for the Central Link Light Rail Transit Project, King County, Washington.

We concur that there is no prudent and feasible alternative to the proposed project, if project objectives are to be met. However, we do not believe that all possible planning has been done to minimize harm to Section 4(f) resources.

Historic and Archeological Resources

The project potentially involves between 7 and 25 historic resources depending on the alternatives chosen. These resources are adequately described and detailed information is provided on the expected impact of each alternative. The document clearly indicates on-going consultation with the Washington State Historic Preservation Office (SHPO) is occurring. It further states that the Federal Transit Administration will enter formal consultation with the SHPO's office and will develop a Memorandum of Agreement (MOA) to minimize adverse impacts on those historic resources affected by the Central Link project as it progresses. A signed copy of the MOA should be included in the Final Section 4(f) Evaluation.

Park and Recreation Resources

The Department of the Interior has the following concerns regarding park and recreational resources. These concerns should be addressed in the Final Section 4(f) Evaluation.

1. The first sentence in Section 4.16.2 Impacts, states that twenty-nine (29) parkland resources were identified in the potentially affected area that are likely to be impacted in some way by the proposed alternatives. A table and accompanying map should be developed identifying these 29 parkland resources. The table should include a column containing information on the expected impact to each.

2. The document does not indicate that consultation has occurred with the Washington State Interagency Committee for Outdoor Recreation (IAC). The IAC manages the federally funded Land and Water Conservation Fund (LWCF) grant program as well as several other state funded grant programs.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER-98/817

RECEIVED
FEB 16 1999
REGIONAL TRANSIT AUTHORITY

FEB 10 1999

Ld0854

Ms. Helen Knoll
Regional Administrator
Federal Transit Administration
Region X
Jackson Federal Building, Suite 3142
915 Second Avenue
Seattle, Washington 98174-1002

Dear Ms. Knoll:

This is in response to the request for the Department of the Interior's comments on the Draft Environmental Impact Statement/Section 4(f) Evaluation for the Central Link Light Rail Transit Project, King County, Washington.

We concur that there is no prudent and feasible alternative to the proposed project, if project objectives are to be met. However, we do not believe that all possible planning has been done to minimize harm to Section 4(f) resources.

Historic and Archeological Resources

The project potentially involves between 7 and 25 historic resources depending on the alternatives chosen. These resources are adequately described and detailed information is provided on the expected impact of each alternative. The document clearly indicates on-going consultation with the Washington State Historic Preservation Office (SHPO) is occurring. It further states that the Federal Transit Administration will enter formal consultation with the SHPO's office and will develop a Memorandum of Agreement (MOA) to minimize adverse impacts on those historic resources affected by the Central Link project as it progresses. A signed copy of the MOA should be included in the Final Section 4(f) Evaluation.

Park and Recreation Resources

The Department of the Interior has the following concerns regarding park and recreational resources. These concerns should be addressed in the Final Section 4(f) Evaluation.

1. The first sentence in Section 4.16.2 Impacts, states that twenty-nine (29) parkland resources were identified in the potentially affected area that are likely to be impacted in some way by the proposed alternatives. A table and accompanying map should be developed identifying these 29 parkland resources. The table should include a column containing information on the expected impact to each.

2. The document does not indicate that consultation has occurred with the Washington State Interagency Committee for Outdoor Recreation (IAC). The IAC manages the federally funded Land and Water Conservation Fund (LWCF) grant program as well as several other state funded grant programs.

Many of the State funded grant programs administered by the IAC contain conversion requirements (similar to the LWCF program) designed to protect the recreation investment. These restrictions may require replacement land of equivalent fair market value and reasonably equivalent usefulness and location for the property to be converted to non-recreation use.

3 Section 4.16.2.1 Relevant Regulations, contains the following sentence regarding Section 6(f) of the LWCF: "If no alternatives are practical, the U.S. Department of the Interior must approve replacement land of reasonably equivalent recreational utility and location in compliance with IAC policies." This sentence should be corrected to read as follows: "If no alternatives are practical, the U.S. Department of the Interior must approve replacement land of reasonably equivalent recreational utility and location, *equal to or greater than the fair market value of the property being converted to non-recreation use*, in compliance with *National Park Service LWCF* policies."

4 Section 4.16.3 Mitigation, Alternative F1, and Section 4.16.4, Significant Unavoidable Adverse Impacts, both reference Angle Lake Park as being subject to the requirements of Section 6(f) of the LWCF. National Park Service records do not indicate that LWCF grant monies have been awarded at Angle Lake Park. Perhaps State grant money has been awarded at Angle Lake Park through the IAC that contain similar requirements for replacement property?

5 Appendix E, page E-2, Description of Section 4(f) Resources, indicates there are 10 parks and other recreational facilities along the alternative light rail routes. This figure is inconsistent with Section 4.16.2 Impacts, that indicates there are 101 parkland resources in the potentially affected area, 29 of which are considered likely to be impacted in some way by the proposed alternatives.

Impacts and mitigation measures to park and recreational resources should be coordinated with and approved by the authorities having jurisdiction over those resources, and evidence to that effect should be documented in the Final Section 4(f) Evaluation. Please note that the National Park Service will consider land conversion requests under Section 6(f) only after Section 4(f) approval of this project by the Department of Transportation.

Summary Comments

The Department of the Interior will provide you with further comments on the Section 4(f) aspects of this project upon circulation of the Final Environmental Impacts Statement/Section 4(f) Evaluation for public review and comments.

We appreciate the opportunity to provide these comments.

Sincerely,

Willie R. Taylor, Director
Office of Environmental
Policy and Compliance

cc:
Mr. James Irish
Environmental Project Manager
Central Link Draft EIS
Sound Transit
1100 2nd Avenue, Suite 500
Seattle, Washington 98101-3423

Ms. Laura Eckert Johnson, Director
Interagency Committee for Outdoor Recreation
Post Office Box 40917
Olympia, Washington 98504-0917

Mr. Ken Bounds, Director
Seattle Department of Parks and Recreation
100 Dexter Ave North
Seattle, Washington 98109

Ms. Leslie Betlach, Director
Renton Department of Parks and Recreation
200 Mill Avenue, South
Renton, Washington 98055

Mr. Craig Larsen, Director
King County Department of Parks and Recreation
2040 84th Avenue, SE
Mercer Island, Washington 98040

Mr. Don Williams, Director
Tukwila Department of Parks and Recreation
6200 South Center Boulevard
Tukwila, Washington 98188

Ms. Kit Ledbetter, Director
SeaTac Department of Parks and Recreation
17900 International Boulevard
Suite 401
SeaTac, Washington 98188

Mr. Jim Webster, Director
Washington Recreation and Park Association
350 South 333rd Street, Suite 103
Federal Way, Washington 98003

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
HABITAT PROGRAM/OLYMPIA FIELD OFFICE
510 Desmond Drive SE/Suite 103
LACEY, WASHINGTON 98503

April 28, 1998

Doug Gresham
Herrera Environmental Consultants
2200 Sixth Avenue, Suite 601
Seattle, WA 98121

Re: Species List Request for the Lake Washington and Green River Drainage Basins and Marine Waters Within Elliot Bay

Dear Mr. Gresham:

The National Marine Fisheries Service (NMFS) has reviewed your April 17, 1998 letter requesting a list of threatened (T) and endangered (E) species for the above referenced area.

We have enclosed a list of those anadromous fish species that are listed as T or E, those that are proposed for listing, and those that are candidates for listing under the Endangered Species Act (ESA). This inventory only includes those anadromous species under NMFS' jurisdiction. The U.S. Fish and Wildlife Service should be consulted regarding the presence of species falling under their jurisdiction.

Presently, Puget Sound chinook salmon *(Oncorhynchus tshawytscha)* are proposed for listing as T. They occur in the Lake Washington and Green River drainages and in marine areas of Elliot Bay. Also, please be aware that coho salmon *(O. kisutch)* and sea-run cutthroat trout *(O. clarki clarki)* can be found in the project areas and are candidate (C) species eligible for listing under the ESA. Although C species are not afforded protection under the ESA, it would be prudent to incorporate project design features that avoid or minimize impacts to anadromous fish resources should they become listed at a later date.

I am also providing you a list of T and E species which are less frequently found in Puget Sound. The Steller sea lion *(Eumetopias jubatus)*, humpback whale *(Megatera novaengliae)* and leatherback sea turtle *(Dermochelys coriacea)* could on occasion be present in Elliot Bay. The Steller sea lion could also be present in the Duwamish Waterway and Lake Washington Ship Canal below the Ballard Locks.

Thank you for your inquiry for information pertaining to federally listed T and E species. Should you require additional information, please contact Mr. Gordon Zillges at (360) 753-9090 or at the letterhead address.

Sincerely,

Matt Longebaugh for

Steven W. Landino
Washington State Habitat Branch Chief

Enclosures

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
HABITAT PROGRAM/OLYMPIA FIELD OFFICE
510 Desmond Drive SE/Suite 103
LACEY, WASHINGTON 98503

July 16, 1998

James Irish
Sound Transit
1100 Second Ave., Suite 500
Seattle, Washington 98101-3423

Dear Mr. Irish:

The National Marine Fisheries Service (NMFS) has reviewed your June 10, 1998 letter indicating postponement of completion of the Biological Assessments for the Link Light Rail Transit project corridor until after the Draft EIS is issued. We concur with this decision.

If you have additional questions please contact Gordon Zillges at (360) 753-9090 or at the letterhead address.

Sincerely,

Matt Longenbaugh for

Steven W. Landino
Washington State Habitat Branch Chief

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

1 October 1999

Mr. James Irish
Central Puget Sound Regional Transit Authority
1100 Second Avenue, Suite 500
Seattle WA 98101-3423

REF: Seattle Historic Properties
Construction of Sound Transit Light Rail Project

Dear Mr. Irish:

In response to a request from the Federal Transit Administration that you provide FTA with written documentation as to the Council's position regarding the inclusion of a signed Memorandum of Agreement or Programmatic Agreement in the Final Environmental Impact Statement for the referenced project, we offer the following comments.

In carrying out their responsibilities pursuant to Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470f), the Council encourages Federal agencies to coordinate compliance with Section 106 and the procedures in the Council's regulations with any steps taken to meet the requirements of the National Environmental Policy Act. The Council's regulations state that "[a]gencies should consider their Section 106 responsibilities as early as possible in the NEPA process, and plan their public participation, analysis, and review in such a way that they can meet the purposes and requirements of both statutes in a timely and efficient manner." [36 CFR §800.8(a)(1)].

Given the status of consultation on a number of issues in this case, we believe that it would be premature to include a fully executed MOA or PA in the FEIS. We believe that the purposes of Section 106 would be better served if a "final draft" of the agreement was included in the FEIS so that the public will have an additional opportunity to provide comments to the consulting parties on its terms. In our view, the document that you recently provided to us is ready for publication.

Please contact me at (202) 606-8528, or via eMail at rcox@achp.gov if I can provide you or FTA with any additional information or clarification.

Sincerely,

Ralston Cox
Office of Planning and Review

STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT
Office of Archaeology and Historic Preservation
420 Golf Club Road SE, Suite 201, Lacey • PO Box 48343 • Olympia, Washington 98504-8343 • (360) 407-0752
Fax Number (360) 407-6217

November 2, 1998

Mr. James Irish
Sound Transit
1100 Second Avenue, Suite 500
Seattle, Washington 98101-3423

In future correspondence please refer to:
Log: 050598-09-FTA
Re: Central Link Light Rail Transit
Project Determinations of Eligibility

Dear Mr. Irish:

On behalf of the Washington State Office of Archaeology and Historic Preservation (OAHP) I have completed my review of the historic properties identified as within the area potentially affected by the Central Link Light Rail Transit Project. By my count, this review includes 78 Historic Property Inventory Forms which in turn has included several historic districts and one multiple property resource, the Olmsted Park system. These properties represent a diverse range of property types and a substantial collection of some of the region's most historically significant and architecturally distinguished structures.

As a result of this review, I concur that all the properties submitted to OAHP to date are eligible for listing in the National Register of Historic Places. This concurrence includes the Olmsted Park System; the Roanoke Park, Federal Avenue, and Fraternity/Sorority Row historic district; and the Columbia City Historic District expansion. I note that the Seattle-First National Bank Building at 566 Denny Way (B85) is less than 50 years of age. At this point, it does not meet the test for exceptional significance for properties which have yet to reach the 50 year age threshold for National Register consideration. However, it is my opinion that the building will be eligible by the year 2000 when it will reach the 50 year age threshold. Therefore, it would be prudent for Sound Transit to incorporate this property into its project planning process.

Thank you for the opportunity to review and comment. Also, thanks go to your consultant Courtois and Associates for notable efforts in completing this evaluation process. On behalf of OAHP, I look forward to continue working with Sound Transit as we begin to identify project effects and mitigation measures. Please feel free to contact me at (360) 407-0766 should you have any questions..

Sincerely,

Gregory Griffith
Comprehensive Planning Specialist

GAG

Cc: Shirley Courtois
Karen Gordon

STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT
Office of Archaeology and Historic Preservation
420 Golf Club Road SE, Suite 201, Lacey • PO Box 48343 • Olympia, Washington 98504-8343 • (360) 407-0752
Fax Number (360) 407-6217

November 3, 1998

Mr. James Irish
Sound Transit
1100 Second Avenue, Suite 500
Seattle, Washington 98101-3423

In future correspondence please refer to:
Log: 050598-09-FTA
Re: Central Link Light Rail Transit
Project Preliminary Impact Analysis

Dear Mr. Irish:

Thank you for sending a copy of the preliminary draft of the Historic and Archaeology EIS chapter to the Washington State Office of Archaeology and Historic Preservation (OAHP). On behalf of OAHP, State Archaeologist Rob Whitlam and myself have reviewed the preliminary draft to assess how impacts to archaeological and historic properties are addressed.

As a result of our review, both Rob and I are comfortable with the conclusions and recommendations contained in the document. However, both of us acknowledge that the project is in very early stages of planning and much remains to be decided.

It is apparent that the project will have an affect, including adverse effects, on properties listed in or eligible for listing in, the National Register of Historic Places. For archaeological properties, issues will arise as excavation work occurs. Therefore, a process for rapid evaluation and mitigation planning will need to be in place. Apparently a traditional cultural place (TCP) may be affected by the project. If so, consultation will need to be initiated with interested tribes and mitigation measures identified. For historic properties, avoidance and mitigation measures will need to be considered on a case by case basis once actual alignments are decided upon and designs are formulated. We recommend that a programmatic agreement (PA) be drafted specifying processes and procedures for consultation on all these questions as the project unfolds.

Again, thank you for the opportunity to review and comment on this document. Should you have any questions, please feel free to contact me at (360) 407-0766.

Sincerely,

Gregory Griffith
Comprehensive Planning Specialist

GAG

Cc: James Bard
Shirley Courtois
Karen Gordon

STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT
Office of Archaeology and Historic Preservation
420 Golf Club Road SE, Suite 201, Lacey • PO Box 48343 • Olympia, Washington 98504-8343 • (360) 407-0752
Fax Number (360) 407-6217

September 27, 1999

Helen M. Knoll
Regional Administrator
Federal Transit Administrator
915 Second Avenue
Federal Bldg. Suite 3142
Seattle, WA 98174-1002

RE: 0505989-09-FTA
Central Link Rail Transit Project

Dear Ms. Knoll:

As the State Historic Preservation Officer I have reviewed your determinations of eligibility for the Bayview Brewery/Seattle Brewing & Malting Co./Rainer Brewery and the Great Western Smelting and Refining Company. I am concurring that the Bayview Brewery/Seattle Brewing & Malting Co is not eligible for the National Register of Historic Places. We do not concur that the Great Western Smelting & Refining Company is eligible for the National Register of Historic Places. In conjunction with Karen Gordon, the Seattle Historic Preservation Officer, I have concluded that the Great Western Smelting and Refining Company is *not eligible* for the National Register of Historic Places.

If you have any questions or concerns please do not hesitate to contact me at (360) 407-0826. You can also reach me by e-mail at allysonb@cted.wa.gov. Your concern for protecting the heritage of our state is appreciated.

Sincerely,

Allyson Brooks Ph.D.
State Historic Preservation Officer

cc: Steve Wells, CTED State of Washington
Karen Gordon, City of Seattle HPO
James Irish, Soundtransit

STATE OF WASHINGTON
INTERAGENCY COMMITTEE FOR OUTDOOR RECREATION
P.O. Box 40917 • Olympia, Washington 98504-0917 • (360) 902-3000 • FAX (360) 902-3026

July 2, 1999

Mr. James Irish, Environmental Project Manager
Sound Transit
1100 2nd Avenue, Suite 500
Seattle, Washington 98101-3423

RE: Central Link Light Rail Transit Project Draft Environmental Impact Statement and Parklands Technical Back-up

Dear Mr. Irish:

Thank you for submitting a copy of the above referenced document for my review.

Since 1964, the Washington State Interagency Committee for Outdoor Recreation (IAC) has provided state and federal grant funds to outdoor recreation and conservation projects throughout the state of Washington. I have attached a list of all projects for the five entities (Seattle, Tukwila, SeaTac, Renton, and King County) that have received IAC administered state or federal funding for parks, recreation, open space, or conservation purposes. I have highlighted the projects that appear linked to project titles identified within the DEIS for the Central Link Light Rail Transit Project.

IAC has contractual agreements with each entity restricting use of the project properties to outdoor recreation and/or conservation. If at any time these recreation or conservation lands are used for a purpose other than for which the project agreement provides, there *may* be a "Conversion of Use" requiring replacement land and facilities.

IAC staff will be in contact with the five project sponsors (Seattle, Tukwila, SeaTac, Renton, and King County) to identify possible impacts to projects along or adjacent to the proposed Central Link Light Rail Transit Project corridor.

Sincerely,

Eric Johnson, Manager
Project Services Division

CC: Charles Ng, City of Seattle

Don Williams, City of Tukwila
Kit Ledbetter, City of SeaTac
Leslie Betlach, City of Renton
Barbara Wright, King County
IAC Project Managers

Interagency Committee for OUTDOOR RECREATION

City Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
City: Seattle									
6-006 A	Armeni Boat Ramp #2	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	93,750.00	31,250.00	125,000.00
6-024 A	Magnolia Tidelands Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	41,508.75	13,836.25	55,345.00
6-036 A	Armeni Boat Ramp #1	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	74,325.00	24,775.00	99,100.00
6-037 D	Arboretum Trail	University of Washington	LWCF	Darrell	Closed Comp	King	45,000.00	62,957.84	107,957.84
8-084 A	Peppi's Playground	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	97,500.00	32,500.00	130,000.00
8-085 A	Armeni Boat Launching Ramp Extension	Seattle Parks & Rec Dept	+ BONDS	Marguerite	Closed Comp	King	348,750.00	116,250.00	465,000.00
8-086 A	Elliott Bay Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	567,562.50	189,187.50	756,750.00
8-088 A	Wallingford Playfield	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	231,000.00	77,000.00	308,000.00
8-089 A	Miller Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	77,625.00	25,875.00	103,500.00
8-121 A	Flo Ware Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	29,250.00	9,750.00	39,000.00
8-122 A	West Queen Anne Playfield	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	225,281.25	75,093.75	300,375.00
9-018 A	Chittenden Locks Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	210,000.00	70,000.00	280,000.00
9-019 A	Matthews Beach Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	292,500.00	97,500.00	390,000.00
9-020 A	Seattle Small Urban Parks	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	224,550.00	74,850.00	299,400.00
9-021 A	Sandell Playground	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	270,000.00	90,000.00	360,000.00
9-075 A	Beacon Hill Playfield	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	187,500.00	62,500.00	250,000.00
9-076 D	Lake Washington Boulevard Bicycle Path	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	122,974.01	40,991.34	163,965.35
9-080 A	Seattle Mini Parks	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	51,750.00	17,250.00	69,000.00
9-150 A	Red Barn Ranch	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	168,750.00	56,250.00	225,000.00
9-152 A	Schmitz Waterfront Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	300,000.00	100,000.00	400,000.00
9-183 A	Bhy Kracke Park	Seattle Parks & Rec Dept	+ Fed - Other	Marguerite	Closed Comp	King	127,500.00	42,500.00	170,000.00
9-186 A	Freeway Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	242,670.00	80,890.00	323,560.00
9-188 A	Plum Tree Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	8,625.00	2,875.00	11,500.00
9-204 D	Powell Barnett	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	118,935.00	118,935.00	237,870.00
0-017 A	Thornton Creek #1 & #2	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	189,737.25	63,245.75	252,983.00
0-045 A	Fauntleroy Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	174,669.00	58,223.00	232,892.00
0-068 A	North Beach Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	82,835.25	27,611.75	110,447.00
0-069 D	Sandell Playground	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	216,789.34	72,263.12	289,052.46
2-012 D	Atlantic City Park	Seattle Parks & Rec Dept	+ BFP - LOCAL	Marguerite	Closed Comp	King	101,235.00	33,745.00	134,980.00
2-014 D	Rainier Beach	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	244,395.61	81,465.20	325,860.81
2-031 D	Beacon Hill Playfield	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	310,258.68	103,419.56	413,678.24
2-070 D	Waterfront Park	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	366,552.75	,099,658.25	1,466,211.00
3-001 D	Central Freeway Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	1,134,422.47	378,143.53	1,512,566.00
3-041 A	Brighton Neighborhood Park	Seattle Parks & Rec Dept	+ HUD	Marguerite	Closed Comp	King	211,205.04	70,401.68	281,606.72
4-029 D	Bhy Kracke Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	99,071.73	33,023.92	132,095.65
4-042 D	Gas Works Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	294,148.50	98,049.50	392,198.00
5-006 D	Discovery Park #2	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	422,512.00	140,838.00	563,350.00
5-007 D	Licton Springs Park	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	184,558.00	61,519.00	246,077.00
6-009 D	Discovery Park #1	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	319,350.00	106,450.00	425,800.00
7-021 D	Sand Point Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	913,129.00	439,226.00	1,352,355.00

OTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project To[redacted] May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Am[redacted] within another program.)
+ means a[redacted]onal programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Committee on OUTDOOR RECREATION

City Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
78-030 D	Central West Seattle Playfield	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	450,000.00	421,656.73	871,656.73
78-031 D	Genesee Park & Playfield	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	583,000.00	517,000.00	1,100,000.00
79-019 D	Green Lake Park Improvement	Seattle Parks & Rec Dept	LWCF	Marguerite	Closed Comp	King	308,376.00	308,376.00	616,752.00
80-030 D	International Children's Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	150,000.00	50,000.00	200,000.00
80-031 D	Ravenna/Cowen Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	300,000.00	100,000.00	400,000.00
81-9018 D	Armeni Boat Ramp	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	468,750.00	156,250.00	625,000.00
83-023 D	New Neighborhood Park	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	150,000.00	150,000.00	300,000.00
84-046 D	Mt. Baker Rowing & Sailing Facility	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	150,000.00	450,000.00	600,000.00
85-069 A	South Lake Union Park	Seattle Parks & Rec Dept	+ LWCF	Marguerite	Closed Comp	King	150,000.00	245,000.00	395,000.00
86-027 D	South Lake Union Park	Seattle Parks & Rec Dept	BONDS	Marguerite	Closed Comp	King	132,891.00	287,109.00	420,000.00
87-036 D	Golden Gardens Boat Ramp	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	466,446.92	618,313.37	1,084,760.29
88-029 D	Seacrest Park	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	150,000.00	,500,000.00	1,650,000.00
89-014 D	Magnuson Park	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	150,000.00	232,055.00	382,055.00
91-054 A	Kubota Gardens	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Closed Comp	King	320,000.00	320,000.00	640,000.00
91-055 A	Thornton Creek	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	632,000.00	632,000.00	1,264,000.00
91-056 A	Pipers Creek	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	300,000.00	300,000.00	600,000.00
91-057 A	Longfellow Creek Natural Area	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	1,300,000.00	,300,000.00	2,600,000.00
91-058 A	South Lake Union/Kurtzer	Seattle Parks & Rec Dept	WWRP - WA	Marguerite	Closed Comp	King	650,000.00	650,000.00	1,300,000.00
91-059 A	Olmsted/Fairview Park	Seattle Parks & Rec Dept	WWRP - WA	Marguerite	Closed Comp	King	480,000.00	480,000.00	960,000.00
91-246 A	Cheasty Grnblt & Mt View Nat. Areas 199	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	1,000,000.00	,000,000.00	2,000,000.00
91-247 A	Duwamish Head Greenbelt, Ph. 1	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Active	King	1,252,590.00	,252,590.00	2,505,180.00
91-249 A	Ship Canal Trail & Park	Seattle Parks & Rec Dept	WWRP - TR	Marguerite	Closed Comp	King	319,500.00	390,500.00	710,000.00
92-088 A	Cheasty Grnblt & Mt.View Nat. Areas 199	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	500,000.00	803,850.94	1,303,850.94
92-089 A	Duwamish Head Greenbelt Ph. 2	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Active	King	477,985.00	642,015.00	1,120,000.00
92-199 D	Central Waterfront Project	Seattle Port of	+ BFP - STATE	Marguerite	Closed Comp	King	2,799,034.00	,561,205.00	8,360,239.00
92-290 D	14th NW Shilshole Bay Boat Ramp	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	76,964.00	76,965.00	153,929.00
92-291 D	Sunnyside Boat Ramp Improvements	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	40,062.00	40,062.00	80,124.00
92-292 A	West Duwamish Greenbelt	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Active	King	1,050,000.00	,050,000.00	2,100,000.00
92-293 A	East Duwamish Greenbelt	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Closed Comp	King	706,850.00	706,850.00	1,413,700.00
92-348 A	Kiwanis Ravine	Seattle Parks & Rec Dept	WWRP - UW	Marguerite	Active	King	231,040.00	231,040.00	462,080.00
93-132 D	Martin Luther King Jr. Outdoor Improv.	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Closed Comp	King	202,230.00	202,230.00	404,460.00
94-020 D	Security Fencing	Seattle Rifle and Pistol Club	FARR	Scott	Closed Comp	King	25,185.00	31,500.00	56,685.00
96-1191 D	Last Open Space in Lake City	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Active	King	177,203.00	177,203.00	354,406.00
96-1214 A	Smith Cove Park	Seattle Parks & Rec Dept	WWRP - WA	Marguerite	Active	King	1,000,000.00	,000,000.00	2,000,000.00
96-1248 D	Fairview Olmsted Park	Seattle Parks & Rec Dept	WWRP - WA	Marguerite	Active	King	300,000.00	351,685.00	651,685.00
96-1252 D	"Scrap" Containment Log Boom	Seattle Police Department	BFP - LOCAL	Marguerite	Closed Comp	King	4,000.00	4,000.00	8,000.00
96-198 D	I-90/Judkins Park Improvements	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Active	King	300,000.00	402,622.00	702,622.00
96-200 D	Bobby Morris Playfield Park Renovation	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Active	King	300,000.00	558,841.00	858,841.00
96-201 D	Webster Playground	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Closed Comp	King	189,278.00	189,278.00	378,556.00
96-349 D	Golden Gardens Boat Ramp	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Closed Comp	King	62,134.00	62,134.00	124,268.00
97-080 D	Green Lake Park Improvements - Ph. 1	Seattle Parks & Rec Dept	WWRP - LP	Marguerite	Active	King	300,000.00	512,684.00	812,684.00
97-1302 C	Issaquah Creek/Lake Sammamish Water	King Co Water & Land Resourc	WWRP - RHP	Lynn	Active	King	87,225.00	29,075.00	116,300.00
98-1105 N	Don Armeni Boat Ramp Feasibiltiy Study	Seattle Parks & Rec Dept	BFP - LOCAL	Marguerite	Active	King	100,000.00	50,000.00	150,000.00

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Committee for OUTDOOR RECREATION

City Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
						Total:	8,214,920.05	28,424,389.98	56,639,310.03

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project [redacted] May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC A[redacted]nt within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Interagency Committee for OUTDOOR RECREATION

City Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
City: Tukwila									
78-050 D	Christensen Greenbelt #1	Tukwila Parks & Rec Dept	+ LWCF	Darrell	Closed Comp	King	20,292.00	13,528.00	33,820.00
80-047 D	Christensen Greenbelt Park #2 & #3	Tukwila Parks & Rec Dept	LWCF	Darrell	Closed Comp	King	40,000.00	40,000.00	80,000.00
83-008 D	Crystal Springs McMicken Park	Tukwila Parks & Rec Dept	BONDS	Darrell	Closed Comp	King	51,380.00	51,380.00	102,760.00
84-012 D	Christensen Greenbelt Park #3	Tukwila Parks & Rec Dept	LWCF	Darrell	Closed Comp	King	82,000.00	82,000.00	164,000.00
92-318 D	Duwamish/Green River Trail	Tukwila Parks & Rec Dept	WWRP - TR	Darrell	Closed Comp	King	226,161.00	226,161.00	452,322.00
						Total:	419,833.00	413,069.00	832,902.00

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Interagency Committee for OUTDOOR RECREATION

City Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
City: SeaTac									
92-317 D	North SeaTac Park Baseball Quad. Ph. 1	SeaTac Parks & Rec Dept	WWRP - LP	Darrell	Active	King	300,000.00	,416,684.00	1,716,684.00
93-129 D	North SeaTac Park Soccer Fields Ph.2	SeaTac Parks & Rec Dept	WWRP - LP	Darrell	Active	King	300,000.00	,087,654.00	1,387,654.00
96-1150 D	Angle Lake Park, Phase I	SeaTac Parks & Rec Dept	WWRP - LP	Darrell	Closed Comp	King	300,000.00	321,684.20	621,684.20
						Total:	900,000.00	2,826,022.20	3,726,022.20

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Interagency Committee for OUTDOOR RECREATION

City Location Report

Project Number		Project Name	Sponsor	Program	Proj Mgr	Status	County	IAC Amount	Sponsor Amount	Project Total
City: Renton										
66-018	D	Gene Coulon Beach Park	Renton Parks Department	+ LWCF	Darrell	Closed Comp	King	335,928.53	187,146.00	523,074.53
69-073	A	Lake Washington Beach Park Add. 1	Renton Parks Department	+ BFP - LOCAL	Darrell	Closed Comp	King	325,500.00	108,500.00	434,000.00
70-016	A	Lake Washington Beach Park Add. #3	Renton Parks Department	+ HUD	Darrell	Closed Comp	King	393,750.00	131,250.00	525,000.00
75-026	A	Cedar River Stage 1	Renton Parks Department	LWCF	Darrell	Closed Comp	King	308,726.50	308,726.50	617,453.00
79-038	A	Cedar River Trail System	Renton Parks Department	BONDS	Darrell	Closed Comp	King	192,119.00	192,119.00	384,238.00
80-024	D	Coulon Beach Park 1	Renton Parks Department	LWCF	Darrell	Closed Comp	King	256,400.00	256,400.00	512,800.00
81-008	D	Coulon Beach 2A	Renton Parks Department	+ LWCF	Darrell	Closed Comp	King	450,000.00	150,000.00	600,000.00
82-068	A	Cedar River Trail System	Renton Parks Department	BONDS	Darrell	Closed Comp	King	74,750.00	74,750.00	149,500.00
84-021	D	Cedar River Trail Extension	Renton Parks Department	+ BONDS	Darrell	Closed Comp	King	124,315.00	147,811.00	272,126.00
91-211	A	May Creek Trail Addition	Newcastle City of	WWRP - TR	Darrell	Closed Comp	King	267,914.80	267,914.80	535,829.60
91-259	A	May Creek Trail, 1991	Renton Parks Department	WWRP - LP	Darrell	Closed Comp	King	169,200.00	169,200.00	338,400.00
92-296	A	Black River Riparian Forest	Renton Parks Department	WWRP - UW	Darrell	Closed Comp	King	228,350.00	486,650.00	2,715,000.00
92-297	D	Cedar River Trail & Pedestrian Bridge	Renton Parks Department	WWRP - TR	Darrell	Active	King	651,183.00	651,183.00	1,302,366.00
92-298	A	May Creek Trail, 1994	Renton Parks Department	WWRP - LP	Darrell	Closed Comp	King	90,573.96	90,573.96	181,147.92
92-303	A	Cedar River Trail	King County Parks & Recreation	WWRP - TR	Darrell	Closed Comp	King	380,821.00	380,821.00	761,642.00
93-124	A	Cedar River Recreation Park	Renton Parks Department	WWRP - LP	Darrell	Closed Comp	King	500,000.00	687,550.00	3,187,550.00
96-195	A	Springbrook Creek	Renton Parks Department	WWRP - LP	Darrell	Closed Comp	King	126,720.00	851,093.59	977,813.59
96-324	D	Safety Upgrade Phase 1	Renton Fish & Game Club Inc	FARR	Darrell	Closed Comp	King	49,999.11	64,605.44	114,604.55
97-1172	D	Renton Safety Upgrade - Phase 2	Renton Fish & Game Club Inc	FARR	Darrell	Active	King	37,239.00	38,760.11	75,999.11
							Total:	4,963,489.90	9,245,054.40	14,208,544.30

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Interagency Committee for OUTDOOR RECREATION

County Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	IAC Amount	Sponsor Amount	Project Total
	County: King							
66-025 A	Sammamish River Park	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	750,000.00	250,000.00	1,000,000.00
66-026 A	Lake Wilderness Park	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	285,000.00	95,000.00	380,000.00
68-130 A	S. Central Shoreline Park - Twin Ponds A	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	163,800.00	54,600.00	218,400.00
69-006 A	East Green River	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	167,250.00	55,750.00	223,000.00
69-123 A	Big Finn Hill	King County Parks & Recreation	BONDS	Darrell	Closed Comp	73,315.71	219,947.15	293,262.86
69-126 A	Kenmore Community Park (Swamp Creek)	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	79,275.00	26,425.00	105,700.00
69-127 A	North Central Lake Sammamish	King County Parks & Recreation	BONDS	Darrell	Closed Comp	420,000.00	140,000.00	560,000.00
69-132 A	North Green River	King County Parks & Recreation	+ BONDS	Darrell	Closed Comp	465,413.25	155,137.75	620,551.00
70-007 A	Highline Park #6	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	23,437.50	7,812.50	31,250.00
70-008 A	Sammamish River Stage 4	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	428,554.50	142,851.50	571,406.00
70-041 A	Maplewood Heights	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	60,000.00	20,000.00	80,000.00
70-057 A	NE Lake Washington Beach Park	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	178,500.00	59,500.00	238,000.00
70-072 A	East Green River #2	King County Parks & Recreation	BONDS	Darrell	Closed Comp	72,281.25	24,093.75	96,375.00
70-077 A	East Green River #3	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	84,750.00	28,250.00	113,000.00
71-044 D	Seahurst Park	King County Parks & Recreation	BONDS	Darrell	Closed Comp	888,450.00	296,150.00	1,184,600.00
71-045 A	Highline Park #4	King County Parks & Recreation	+ HUD	Darrell	Closed Comp	29,736.25	27,208.75	56,945.00
72-011 A	East Green River #4	King County Parks & Recreation	BONDS	Darrell	Closed Comp	187,500.00	62,500.00	250,000.00
72-043 A	Highline Park #10	King County Parks & Recreation	BONDS	Darrell	Closed Comp	113,625.00	37,875.00	151,500.00
72-044 D	Marymoore Park Ph. 1	King County Parks & Recreation	BONDS	Darrell	Closed Comp	365,850.00	121,950.00	487,800.00
72-062 D	Luther Burbank	King County Parks & Recreation	BONDS	Darrell	Closed Comp	353,913.00	117,971.00	471,884.00
72-063 A	Highline Park #1	King County Parks & Recreation	BONDS	Darrell	Closed Comp	36,832.50	12,277.50	49,110.00
73-056 D	Marymoore Park Ph. 2A	King County Parks & Recreation	BONDS	Darrell	Closed Comp	75,000.00	25,000.00	100,000.00
73-057 D	Marymoore Park Ph.#3	King County Parks & Recreation	BONDS	Darrell	Closed Comp	223,646.93	74,548.98	298,195.91
74-017 A	Highland Community Park (Shoreview Par	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	244,125.00	81,375.00	325,500.00
77-004 D	N.E. Washington Beach Park	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	389,775.00	129,925.00	519,700.00
78-003 D	Russell Road #2	+ King County Parks & Recreati	+ LWCF	Darrell	Closed Comp	375,000.00	250,000.00	625,000.00
78-060 A	Highlands Addition	King County Parks & Recreation	BONDS	Darrell	Closed Comp	475,000.00	475,000.00	950,000.00
78-079 D	S. Central Shoreline Park - Twin Ponds D	King County Parks & Recreation	LWCF	Darrell	Closed Comp	125,000.00	125,000.00	250,000.00
80-034 D	Redondo Boat Access	King County Parks & Recreation	BFP - LOCAL	Darrell	Closed Comp	404,987.50	312,993.71	717,981.21
80-052 A	Lake Wilderness Trail	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	82,912.50	27,637.50	110,550.00
80-053 A	Lake Geneva, Broome's Resort Acq.	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	235,657.50	78,552.50	314,210.00
81-032 D	Shoreview Athletic Complex	King County Parks & Recreation	+ LWCF	Darrell	Closed Comp	297,727.76	99,242.58	396,970.34

NOTES: IAC Amount: Includes funding amount for program(s) selected.

Sponsor Amount: Total sponsor match.

Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)

+ means additional programs (/ sponsors) for this project are not shown on report.

* means project is also listed under additional programs (/ sponsors) on report.

Committee for OUTDOOR RECREATION

County Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	IAC Amount	Sponsor Amount	Project Total
83-011 D	Dockton Moorage and Boat Launch	King County Parks & Recreation	BFP - LOCAL	Darrell	Closed Comp	243,700.00	243,700.00	487,400.00
83-052 A	Bear Creek Athletic Field	King County Parks & Recreation	BONDS	Darrell	Closed Comp	92,810.83	92,810.84	185,621.67
86-059 A	Final Link Burke Gilman - Sammamish Rvr	King County Parks & Recreation	BONDS	Darrell	Closed Comp	77,500.00	77,500.00	155,000.00
87-080 A	Lisabuela Acquisition	King County Parks & Recreation	BFP - LOCAL	Darrell	Closed Comp	247,138.47	247,138.47	494,276.94
91-037 A	Salmon Creek Acquisition	King County Parks & Recreation	WWRP - UW	Darrell	Closed Comp	1,098,100.00	1,098,100.00	2,196,200.00
91-210 A	Beaver Lake Wetlands	King County Parks & Recreation	WWRP - UW	Darrell	Closed Comp	1,000,000.00	1,433,063.00	2,433,063.00
91-232 A	Lake Desire/Spring Lake	King County Parks & Recreation	WWRP - LP	Darrell	Closed Comp	1,200,000.00	1,200,000.00	2,400,000.00
91-233 A	Moss Lake Acquisition	King County Parks & Recreation	WWRP - LP	Darrell	Closed Comp	1,250,000.00	1,250,000.00	2,500,000.00
91-234 A	Swamp Creek	King County Parks & Recreation	WWRP - UW	Darrell	Closed Comp	645,333.00	1,682,165.82	2,327,498.82
91-235 A	Three Forks Park	King County Parks & Recreation	WWRP - UW	Darrell	Closed Comp	1,150,360.00	1,300,721.00	2,451,081.00
91-236 A	Horseshoe Bend Trail	King County Parks & Recreation	WWRP - TR	Darrell	Closed Comp	75,733.68	75,733.67	151,467.35
91-262 D	Lake Meridian Boat Launch	King County Parks & Recreation	BFP - LOCAL	Darrell	Closed Comp	103,094.00	103,094.00	206,188.00
92-082 D	Missing Link Underpass	King County Parks & Recreation	WWRP - TR	Darrell	Closed Comp	300,000.00	443,299.00	743,299.00
92-083 D	Green River Trail Dev., Ph. 1	King County Parks & Recreation	WWRP - TR	Darrell	Active	1,000,000.00	1,423,922.80	2,423,922.80
92-086 A	Cottage Lake Acquisition	King County Parks & Recreation	LWCF	Darrell	Closed Comp	500,000.00	1,175,000.00	1,675,000.00
92-303 A	Cedar River Trail	King County Parks & Recreation	WWRP - TR	Darrell	Closed Comp	380,821.00	380,821.00	761,642.00
93-041 D	Cottage Lake Park, Ph. 1	King County Parks & Recreation	WWRP - LP	Darrell	Closed Comp	300,000.00	722,430.00	1,022,430.00
96-008 D	Big Finn Hill	King County Parks & Recreation	WWRP - LP	Darrell	Closed Comp	89,250.00	159,778.00	249,028.00
97-1036 D	Cottage Lake	King County Parks & Recreation	WWRP - LP	Darrell	Active	300,000.00	443,767.00	743,767.00
97-1042 A	Lake Sawyer Regional Park	King County Parks & Recreation	WWRP - LP	Darrell	Active	500,000.00	7,341,000.00	7,841,000.00
97-1259 D	Lake Desire Trail Repair	King County Parks & Recreation	NRTP - GENERAL	Scott	Active	2,500.00	2,500.00	5,000.00
					Total:	18,712,657.13	24,531,119.77	43,243,776.90

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

Interagency Committee for OUTDOOR RECREATION

County Location Report

Project Number	Project Name	Sponsor	Program	Proj Mgr	Status	IAC Amount	Sponsor Amount	Project Total
	County: King							
92-085 A	Green River/Cedar River Trail	King County Open Space	WWRP - TR	Darrell	Active	376,075.00	376,075.00	752,150.00
					Total:	376,075.00	376,075.00	752,150.00

NOTES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within another program.)
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

17900 International Blvd., Suite 401 • SeaTac, Washington 98188-4236
City Hall: (206) 241-9100 • Fax: (206) 241-3999 • TDD: (206) 241-0091

November 16, 1998

Sound Transit
Attn: James Irish, Senior Environmental Analyst
1100 Second Avenue, Suite 500
Seattle, WA 98101

RE: Angle Lake Park 4(f) Evaluation

Dear Mr. Irish:

The proposed Sound Transit Light Rail Link use of a strip of land 25 feet wide within the Angle Lake Park frontage would have significant negative impact. Impact would include visual obstruction of the park from SR99 (International Blvd.), and untimely removal of recently renovated areas of the park which include new signage, landscaping, irrigation, sidewalk, curb & gutter, fencing and parking entry/exit. The Angle Lake Park site is confined and the loss of land would have a significant impact that could not be replaced. Angle Lake Park Phase I construction was carefully designed to consider parking needs, landscape improvements, street park views and took almost two years of planning. Staff conducted several public meetings with input from adjacent residents, commissions, committees an the City Council to complete the design.

Angle Lake Park is one of the most used parks in the City of SeaTac park system. We estimate over 60,000 users per year. The park is significant as the only fresh water lake with a boat launch and public access in a very large geographic area. The City of SeaTac completed Phase I of the parks Master Plan with three quarters of a million dollar in renovations in 1998. The City received a grant from the Interagency Committee for Outdoor Recreation (IAC) for the recently completed renovations for Phase I of the park improvements.

The City of SeaTac wishes to cooperate with Sound Transit but we are very concerned with the loss of any land at Angle Lake Park. If you have any further questions in regards to Angle Lake Park, feel free to contact Kit Ledbetter, Parks and Recreation Director at (206)248-6138.

Sincerely,

Calvin P. Hoggard

Calvin P. Hoggard
City Manager

cc: Kit Ledbetter, Parks and Recreation Director
Julie Rodwell, Programs Manager

City of Seattle

~~Norman B. Rice, Mayor~~ **Paul Schell, Mayor**

Seattle Department of Parks and Recreation
Kenneth R. Bounds, Superintendent

November 25, 1998

James Irish
Senior Environmental Analyst
Central Puget Sound Regional Transit Authority
1100 Second Avenue, Suite 500
Seattle, WA 98101-3423

Subject: **Comments on Section 4 (f) Evaluation, Link Central Light Rail Draft EIS**

Dear Mr. Irish:

As you requested, we have reviewed the Section 4(f) Evaluation section you sent us in September of this year. This letter will address the more recent October 8th version of the E and 4(f) analysis, with the understanding that our comments on that October draft may still affect the public document to be released next month. I will focus here on the primary uses and values of the affected park and recreation facilities within Seattle.

Rainbow Point Park

The 4 (f) section in the October 8th EIS draft accurately describes this small viewpoint park. The 0.6 acre minipark supplies part of the immediate neighborhood's usable open space. It provides the neighboring residential areas with a little visual relief and separation from the massive freeway area beyond. Its unique value is the opportunity it provides for westward views to Green Lake 1/3-mile westward across Interstate 5, and to the Olympic Mountains in the distance. As with most small parks featuring a few benches and a little turf area, it is not heavily used at any one time.

The complicated freeway overpass and interchanges nearby probably tend to discourage use by people from outside the neighborhood, unless they happen upon it by chance. People living nearby or otherwise familiar with the site tend to visit it especially during sunsets when the lake and mountain views are at their best. While the adjacent busy transportation corridor interferes with the viewpoint's serenity, the uniquely spectacular westward view offsets that influence to some degree.

2911 Second Avenue, 4th Floor, Seattle, Washington 98121-1079
TEL: (206) 684-4075, TDD: (206) 233-7061

Ravenna Boulevard

As described in the Section 4 (f) Evaluation, Ravenna Boulevard links two of northeast Seattle's most beautiful and significant parks, Green Lake and Ravenna Park. The 8.4 acre Cowen Park, also a part of the Olmsted Plan for Seattle parks and boulevards, has frontage on Ravenna Boulevard. The boulevard's value should also be considered in a larger context. The attached Figure 1 illustrates the its key role in the Olmsted Plan for continuous open space extending further south to the University of Washington campus and beyond. This system is linked via the approximately 13-mile Burke-Gilman Trail to northwest Seattle and to King County's further 14-mile extension of the trail.

The landscaped Ravenna Boulevard itself is of enduring value to people living in neighborhoods all along its approximately 1.3 mile length. It features a designated bike lane that runs past the location being considered for construction of an elevated light rail transit structure. Just as Green Lake Park at one end of the boulevard and the Burke-Gilman Trail at the other are intensively used year-round for bicycling, running and walking, so is the boulevard connecting these features. The median itself is a very significant route for recreational joggers and walkers going to and from Green Lake, because of its continuity and scenic quality. Bike riders using the dedicated lane adjacent to the median enjoy these same amenities. All of these recreational uses occur year-round.

Even though the previous serenity of this location was definitely diminished in the mid-1960's by construction of a 200-foot wide Interstate 5 overpass and a northbound off-ramp, Ravenna Boulevard's landscaped median strip and planting strips on both sides have greatly ameliorated their impacts. The Seattle Parks and Recreation Department maintains the grass and trees in the 60-foot wide median. The large trees in the median and adjacent grass strip east of the freeway overpass have helped to soften its visual intrusion, both for recreational users and vehicle occupants on the boulevard, and for residents of nearby neighborhoods.

North and South Passage Point Parks

These two small parks are on opposite sides of the narrow waterway joining Portage Bay and Lake Union. Their ownership characteristics, location under the Interstate 5 bridge structure, and public usage are very similar. Their relationship to the Alternative B.2.1 light rail bridge and its support structures would also be quite similar.

As in the case of the Rainbow Point site described above, the parks' proximity to a noisy freeway is offset by the unique opportunity they provide for public access and spectacular views. Both park sites are in or adjacent to some of Seattle's highest-density residential areas, along with miscellaneous industrial and heavy commercial uses along the water's edge. Neither of these areas has enough open space to meet the City's standard for existing or anticipated populations. Seattle's 1993 Parks and Recreation COMPLAN identified the Lake Union Neighborhood District (where the parks are located) as having only 0.38 acres of

usable open space per 100 population, the third lowest open space/population ratio for 13 su districts in the city. Owing to the prevalence of private ownerships along this waterway, there are very few places where the public can actually get close to the shoreline. That is why the City is committed to maintaining these two parks under such an intensively used transportation facility as the Interstate 5 bridge.

North Passage Point Park's recreational utility is enlarged by its location just one block south of the City's 13-mile Burke-Gilman Trail system. The park is a natural stopping and resting place as well as viewpoint for many thousands of bicyclists, walkers and runners who pass this point every year. The views east and west, and southward to the downtown skyline, are very compelling attractions for passers-by to stop there for awhile, sometimes to use the picnic tables for a food break.

South Passage Point Park is intimately connected with the adjoining Pocock Rowing Center property so that together they provide both open space and public access for small boats. By mutual agreement, the Pocock Rowing Foundation has expanded its main dock by attaching a float that extends westward into the adjacent Parks and Recreation Department's space (See attached photos in Figure 2). The properties are connected by an extension of the shoreline pathway system from the park. The main float and the extension are used at peak times for launching and retrieving the Foundation's rowing shells. At other times the general public has access to these facilities to launch and retrieve small cartop boats such as kayaks and canoes. As mentioned earlier, because of the predominantly private ownership and built-up nature of Portage Bay and Lake Union shorelines, this is extremely valuable access for thos kinds of boats.

Future Sister City Park/I-90 Trail

The attached Figure 3 illustrating the I-90 Corridor shows Future Sister City Park (and the I-90 Trail within it) as one of a series of park spaces along almost 1.5 miles of the freeway's length. The nine consecutive parks (see attached maps) comprise a 57-acre complex across the breadth of the Rainier Valley. The I-90 Trail continues under Mount Baker Ridge to the Lake Washington Boulevard and other linear parks illustrated on the attached Olmsted Plan diagram, and also extends eastward across Lake Washington.

All of this linear open space was recently developed and opened for use alongside the Interstate-90 freeway corridor. Its importance resides in the way it is helping to reconnect fragmented communities that for many decades were divided and disrupted by regional traffic facilities and freeway construction. The parks and the I-90 Trail running through them are establishing visual and functional continuity with a type of open space amenity not previously available. The trail allows walkers, runners and bike riders to travel across the mile-wide valley with only two at-grade road crossings to interrupt the experience. The linear park spaces, including the 4.6-acre Future Sister City Park, are also important as visual buffer spaces to offset the concrete acoustical walls that line the freeway route.

"Future Sister City" Park will eventually be renamed for a specific sister city relationship i the future, comparable to the adjacent Taejon Park already named for that Korean city. The

level of park use is not very intensive, probably because not many people are yet familiar with the access points to it and connections with other points of interest. It is still quite new. As public familiarity with the area grows, more trail users will discover and use it. Adjacent neighborhoods will also use these spaces as they become more established. There is a substantial quantity of new and rehabilitated housing on the east slope of Beacon Hill near the park. This development has happened over the past few years after completion of the I-90 freeway and installation of the adjacent landscaped park spaces.

Again, as with the other parks and trails described above, the proximity to a heavily traveled freeway creates a fragile environment for recreation. In the I-90 Trail situation, the noise and visual disturbance of the adjacent freeway is greatly mitigated by the green open space on both sides of the trail, and by the quieter residential streets south of the Future Sister City Park. The park itself is quite narrow, in most places less than 75 feet in width. Any additional non-park activity or facilities in that narrow linear space would diminish the new park's positive influences.

Cheasty Boulevard

This facility was not included in the Parks and Recreation Facilities portion of the latest Section 4 (f) Evaluation we have seen, although it is covered in the Historic Properties evaluation. We expressed our concerns about this in our October 23, 1998 comments on the Preliminary Draft EIS, but for purposes of this letter will focus on the boulevard's uses and value.

The Cheasty Boulevard connection to Mount Baker Boulevard was included in the Olmsted Plan for Seattle Parks and Boulevards (see attached Olmsted Plan map). A continuous linear open space from Jefferson Park on Beacon Hill via Cheasty and Mount Baker Boulevards to Lake Washington Boulevard has continued to appear in subsequent maps and plans, even though implementation has not yet been achieved. The lower part of the boulevard route is characterized by abutting commercial development and probably some encroachments on City-owned property intended for eventual boulevard improvements. The complicated intersection of the Cheasty Boulevard route across two major arterial streets is presently accomplished only on a pedestrian overpass connecting to the Mount Baker Boulevard side of Rainier Avenue South. Seattle's 1993 *Parks and Recreation COMPLAN* recommended preparation of a restoration plan and consideration of a soft-surface pedestrian trail on the west side of Cheasty Boulevard.

For most of its long descent diagonally down the eastern slope of Beacon Hill from Jefferson Park, the existing boulevard roadway traverses a scenic, tree-lined route. The City of Seattle owns much of the steeply sloping property adjacent to the roadway. The boulevard corridor provides a strikingly scenic backdrop when viewed from the intensively developed Rainier Valley at the bottom of the hill. The boulevard's principal recreational value lies in its continuity, providing the potential for a fine walking/jogging/bike route from Jefferson Park to Mount Baker Boulevard and beyond. It presently serves those functions, aided by the pedestrian overcrossing at Rainier Avenue South. It is one of the City's designated bike routes. When eventually improved with a soft pedestrian path and with additional right-of-

way consolidated in the northernmost 500 feet of the route, Cheasty Boulevard's potential will be further realized.

East Duwamish Greenbelt

The Section 4(f) Evaluation identified a transit alignment along the southeast part of this greenbelt, approximately where Beacon Avenue South crosses Martin Luther King Jr. Way South, south of South Henderson Street. The parcels affected by the light rail transit alignment are large, including both flat property closest to MLK, Jr. Way and the steeply sloping uplands east of that. This department acquired property there recently to consolidate more public ownership of the slopes. The upper slopes of these parcels are generally quite steep, some in excess of 40 %, and are considered slide-prone. The wooded slopes are also part of a designated wildlife habitat area extending almost a mile south. For these reasons they are classified as Environmentally Critical Areas and their development is regulated by a City ordinance of that name. The City's public ownership of these greenbelt properties helps to assure conservation of the scenic and habitat qualities they provide. The greenbelt properties, especially the steep wooded slopes, also provide an important buffer between commercial and industrial development along MLK, Jr. Way and the residential area to the east, at the top of the slope.

Thank you for the opportunity to provide these comments. If you have further questions, please contact Pete Marshall of our planning section at (206) 684-7048.

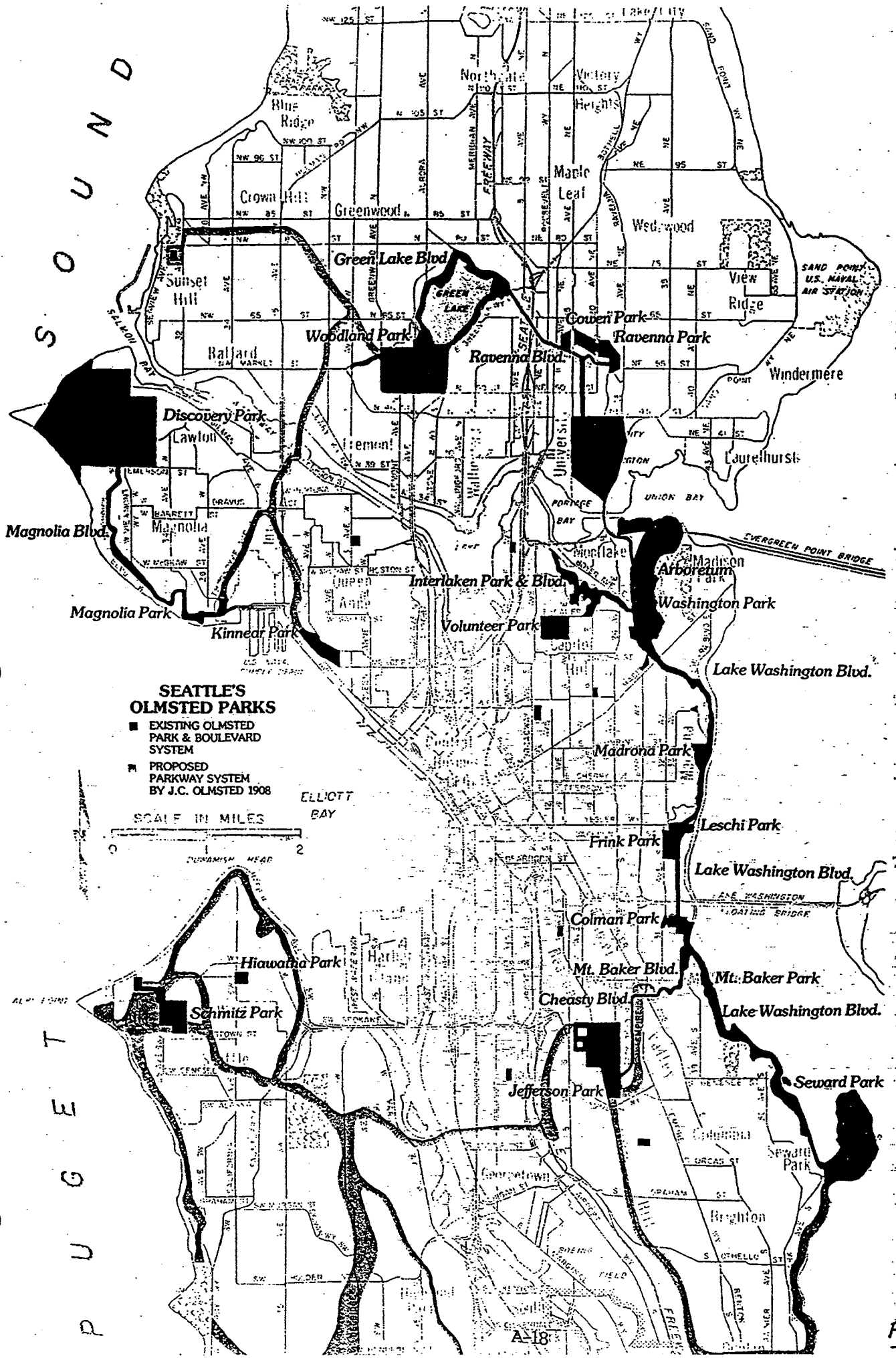
Sincerely,

for KB

Kenneth R. Bounds

Attachments: Figures 1 to 3

cc: Woody Wilkinson
Margaret Anthony
Herbye White
Lou Clark
Terry Dunning
Cliff Marks, SPO


SOUND
PUGET
SEATTLE'S
OLMSTED PARKS
EXISTING OLMSTED PARK & BOULEVARD SYSTEM
PROPOSED PARKWAY SYSTEM BY J.C. OLMSTED 1908
SCALE IN MILES
0
1
2
ELLIOTT BAY
Green Lake Blvd
Woodland Park
Ravenna Blvd.
Cowen Park
Ravenna Park
Discovery Park
Magnolia Blvd.
Magnolia Park
Kinnear Park
Interlaken Park & Blvd.
Volunteer Park
Arboretum
Washington Park
Lake Washington Blvd.
Madrona Park
Leschi Park
Frink Park
Lake Washington Blvd.
Colman Park
Hiawatha Park
Mt. Baker Blvd.
Mt. Baker Park
Cheasty Blvd.
Lake Washington Blvd.
Schmitz Park
Jefferson Park
Seward Park
Blue Ridge
Crown Hill
Greenwood
Maple Leaf
Wedgwood
Sunset Hill
Ballard
View Ridge
Windermere
Laurelhurst
Lawton
Fremont
Magnolia
Montlake
Capitol Hill
Georgetown
Beacon Hill
Rainier Beach
Seattle Park
Brighton
SAND POINT U.S. NAVAL AIR STATION
EVERGREEN POINT BRIDGE
LAKE WASHINGTON FLOATING BRIDGE
UNION BAY
PORTAGE BAY
GREEN LAKE
MERIDIAN AVE FREEWAY
SEATTLE
UNIVERSITY
DUWAMISH HEAD

FIGURE

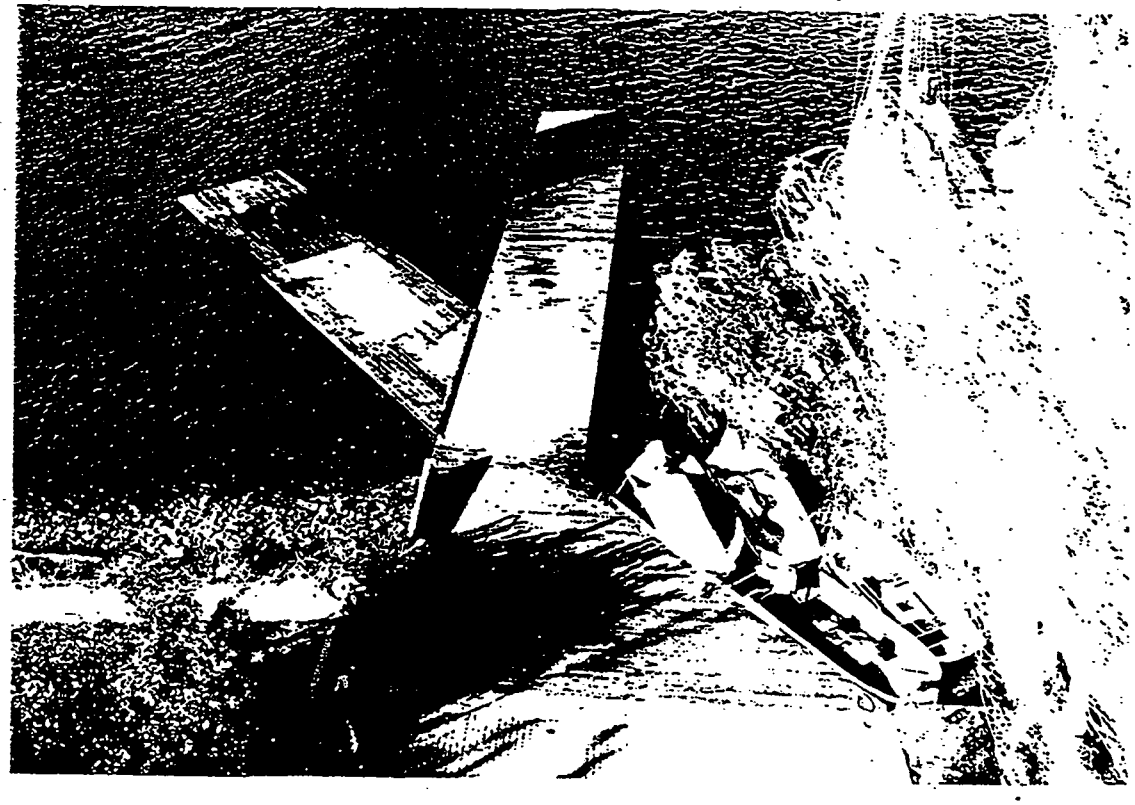


FIGURE :

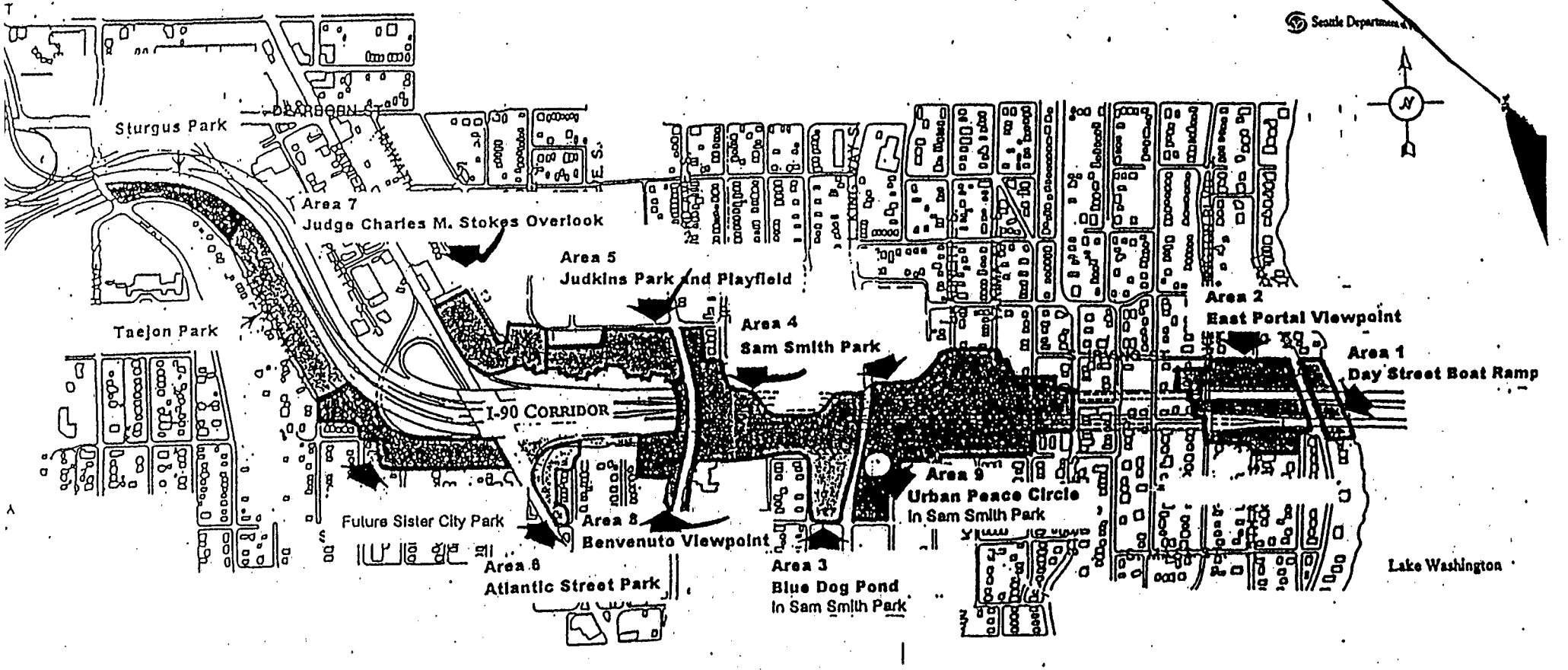

Sturgus Park
Area 7
Judge Charles M. Stokes Overlook
Area 5
Judkins Park and Playfield
Area 4
Sam Smith Park
Area 2
East Portal Viewpoint
Area 1
Day Street Boat Ramp
Taejon Park
I-90 CORRIDOR
Area 9
Urban Peace Circle
in Sam Smith Park
Future Sister City Park
Area 8
Benvenuto Viewpoint
Area 6
Atlantic Street Park
Area 3
Blue Dog Pond
in Sam Smith Park
Lake Washington

FIGURE 3

SOUNDTRANSIT

September 3, 1998

RECEIVED
SEP - 3 1998
SEATTLE PARKS & RECREATION
SUPERINTENDENT

Ken Bounds
Superintendent of Parks
Seattle Department of Parks and Recreation
100 Dexter Avenue N.
Seattle, WA 98109

Dear Mr. Bounds:

As part of the Link Central Light Rail Draft EIS process, an evaluation of the potential impacts to significant public parks and recreational facilities was conducted. Facilities determined to be impacted by the proposed project were included in a Section 4(f) Evaluation. The Section 4(f) Evaluation is a requirement of the U.S. Department of Transportation Act of 1966. The Act requires that if federally-funded transportation projects (such as the Link Central Light Rail project) impact park lands, an evaluation of feasible and prudent avoidance alternatives and measures to minimize harm must be completed. As part of that Section 4(f) process, "public officials with jurisdiction" over impacted facilities are requested to provide formal comment on the significance of those facilities. That input typically includes information on the primary use of the facility and its value to the population it serves.

The Link Central Light Rail Section 4(f) Evaluation identified the following significant facilities within your jurisdiction that would experience direct and/or proximity impacts:

- Rainbow Pont Park ?
- Ravenna Boulevard
- North Passage Point Park
- South Passage Point Park
- Future Sister City Park/I-90 Trail
- Duwamish/Green River Trail

In accordance with Section 4(f) requirements, you are requested to provide your formal comments on the significance of the facilities included in the list above. Your input will become part of the official record of the Link Central Light Rail EIS process and included in the Section 4 (f) Evaluation.

Sincerely,

James Irish
Senior Environmental Analyst

JI:bsm
Enclosures

Central Puget Sound
Regional Transit Authority
1100 Second Ave., Suite 500
Seattle, WA 98101-3423
Reception 206.684.6776
Facsimile 206.684.1234
www.soundtransit.org

City of Tukwila

6200 Southcenter Boulevard • Tukwila, Washington 98188 John W. Rants, Ma

September 28, 1998

Mr. James Irish
Senior Environmental Analyst
Central Puget Sound
Regional Transit Authority
1100 Second Avenue, Suite 500
Seattle WA 98101-3423

Subject: Comments related to Section 4 (f) review for Tukwila's Lookout Park and Foster Golf Course

Dear Mr. Irish:

As Tukwila's Director of Parks and Recreation and the city official directly responsible for the two above-mentioned park facilities, I am responding to your September 3, 1998 letter concerning the significance of these two public facilities.

Put bluntly, the difference in their significance is like night and day. Lookout Park was built as an added amenity to a new vehicle bridge over the Duwamish River. The park area divided by the bridge has on the north side a wooden viewing platform on the bank of the river and on the south a bench and historical plaque about boats that used to travel the river. Both improvements receive very little visitation yearly and could easily be relocated up or downstream from the current location, moved to the other side of the river, or be reduced in size. Complete elimination is possible as the improvements are not an integral part of our city park system.

Foster Golf Course is a 51 year old golf course located on the western shores of the Duwamish River. A 1977 voter approved bond issue provided funds for the city to purchase the course in 1978 and it mandates the area be operated as a golf course. The course has operated successfully in this heavily developed commercial area and has about 70,000 players each year. There is no doubt this is a significant park area. But the real question is can the Light Rail Line be developed on the golf course's western flanks? The answer is yes, with some conditions.

Although noise and views may cause some distraction to golfers, they currently endure Boeing Air Field airplane noise and traffic noise from I-5 and Interurban Avenue. Planes fly overhead every few minutes. The Light Rail Line will cause little impact to the golfers on the course. Only fairway #18 will be next to the rail lines. The improvements (sound walls, landscaping, etc.) will assist to eliminate the impact of the train traffic.

The most obvious impact to the course, as stated in the Draft EIS, is to the golf course's parking area. Because golf is a seasonal activity with a large percentage of the yearly revenues occurring

from April through September, it is imperative to have at least the 200 parking stalls that exist today.

Presently the city is planning to relocate the golf course maintenance building to a location south and away from Interurban Avenue. This section will "free up" some space near the existing club house for parking. We also have plans in about three years to build a new golf club house near the existing building. Because no site plan has yet to be developed for this "club house area," it is difficult to say what impacts the Light Rail Line would have given the yet to be established golf course plans in the area of the existing club house. It is a fact that a minimum of 200 parking stalls will need to be provided.

There are several options that should be considered to continue to provide the plus 200 parking stalls:

- Parking under the rail support bridge
- Parking garage
- Parking under the top floor of the new club house (current plans call for a two story club house with golf power cart storage and pro shop on the bottom floor and restaurant/lounge on the top floor).

Additional options should be considered as well. One not acceptable is parking across the street (Interurban Avenue).

My opinion is the Lookout Park area is not a significant park. However, Foster Golf Course is, but with parking improvements (to recover lost stalls) the impacts can be mitigated.

Sincerely,

Don Williams

Don Williams, Director
Parks and Recreation Department

cc: Mayor John W. Rants
John McFarland, City Administrator
Alice Strand, Land Use Planner
Lynn Miranda, Land Use Planner

Sound Transit
Central Link Light Rail Final EIS

APPENDIX B
Public Involvement

Appendix B Public Involvement

Active public involvement has been integral to the light rail project. This appendix summarizes the major public involvement activities that have helped shape the light rail line.

PUBLIC INVOLVEMENT GOALS

Sound Transit is committed to working with local public transportation agencies, local jurisdictions, and agencies to create an open public involvement process with ample opportunities to inform and involve the community. Citizens and groups have extensive opportunities to interact with, and receive a response from, appointed and elected officials on issues of interest or concern. Sound Transit makes every effort to ensure that:

- citizens have access to the planning process
- citizens' input is actively sought at all stages of planning and development
- a representative cross section of interests is engaged
- all programs and activities are publicized, and the proceedings and records made available for public review
- citizens have opportunities to influence decisions before they are finalized
- citizens' inquiries, suggestions, and ideas are answered or accounted for in the decision-making process.

ON-GOING PUBLIC INVOLVEMENT ACTIVITIES

Agency Hotline

Sound Transit maintains a toll-free telephone line that offers regularly updated recorded information on the agency and its programs. Callers may also leave a message or question for Sound Transit staff. The agency standard is to respond within a week's time, if not sooner. This service has also been made available in the following languages: Vietnamese, Cambodian, Chinese, Korean, Laotian, Spanish, Russian, Amharic, and Tigrinya.

Community/Neighborhood meetings and events

Over the 10-year life of this project, agency staff attended, presented material, and listened to concerns at over 2,350 meetings of neighborhood, community, and interest groups. Sound Transit staff members are available at any time to meet with these groups or their representatives. Sound Transit also regularly sponsors displays at events such as fairs, community meetings, employee transportation fairs, etc.

Regular Newsletters and updates

- Sound Transit Wave (previously Choices), a quarterly newsletter, provides recipients with information on agency progress and project status. It is distributed to about 14,000 people.
- On-Board, a bi-weekly summary of the actions taken and issues discussed by the Sound Transit Board. It is distributed to about 2,500 community and business leaders.

Fact Sheets

Sound Transit regularly produces geographic, project, or issue specific fact sheets. These are made available out of the Sound Transit offices, mailed upon request or interest, and distributed at community events.

Database

Sound Transit maintains a database listing of 12,000 people interested in receiving regular mailings on the agency's progress and is having opportunities for public input. Recently that database was upgraded to track individual comments received through the community outreach process, allowing decision makers and design staff better access to suggestions and concerns raised during outreach.

MARCH 1995 BALLOT (REGIONAL TRANSIT PLAN)

Input from thousands of citizens was used to evaluate three study options before determining what elements would be included in the regional transit system plan placed before the voters in March of 1995.

- Option A emphasized improvements to the bus network.
- Option B emphasized surface light rail and commuter rail.
- Option C emphasized an extensive grade-separated rail system.

"Directline" questionnaire

The June 1994 issue of Choices included a brief questionnaire asking readers for feedback on which features of the study options they would like to see included in the regional transit system. In all, 541 people responded to the questionnaire.

Voter opinion survey

In August 1994, Sound Transit conducted a phone survey of 1,200 households within the transit district to evaluate public support for the proposed transit system. Results of the survey indicated widespread recognition of the region's traffic problem, nearly 2 to 1 support for the tax increase to build a regional transit system, and strong preference for a system that emphasized rail.

Opinion Leader Roundtables

Between September and October of 1994, Sound Transit sponsored seven roundtable events involving business, civic, and community leaders in each of the five geographic subareas; environmental leaders; and local planning commissions. Collectively, 300 participants discussed the trade-offs of each of the three study options and worked toward consensus on a preferred option.

Satellite Summit on Regional Transit

On October 8, 1994, Sound Transit sponsored simultaneous public meetings in each of the five geographic subareas, linked by simultaneous cable broadcast. Participants were given an overview of the regional transit proposal and asked to discuss separately what should be included in the plan, and how much the region should spend on transit improvements. Participants at each site then summarized their discussion for the larger audience. Portions of the event were broadcast live on local cable, and aired at various times over the following week.

Public Hearings on Regional Transit System Plan

Four public hearings were held to give the public an opportunity to comment on the adoption of a proposal for a regional transit system plan to be placed before the voters. The hearing dates and locations were as follows:

- October 12, 1994 (King County)
- October 13, 1994 (Pierce County)
- October 13, 1994 (Snohomish County)
- October 19, 1994 (Regional hearing held in King County)

Voter information brochure

Prior to the election, in accordance with state law, Sound Transit mailed an informational brochure, describing the project and financing methods to every voter household within the district (approximately one million households).

November 1996 ballot (*Sound Move*)

Sound Move represents a significant departure from the 1995 transit proposal. Recognizing that the 1995 plan failed in part because "one size does not fit all", the new plan relied less on rail for all areas, and proposed a mix of modes best suited to improve mobility in the various areas of the region. Input from local elected officials, community leadership, and the public played a key role in creating that new approach. Outreach activities designed to ask the question "what transit improvements should we spend our limited resources on?" helped define the right mix of transit modes.

Planning Kit

In June 1995, Sound Transit released a planning kit to help public and elected officials evaluate what elements should go into a new proposal. It listed cost estimates for the various components, and estimated farebox, tax, and bond revenues available, thereby allowing the reader to design his or her own system and explore tradeoffs associated with different system configurations. The kit was distributed widely among elected officials; city, county and agency staff; and community leaders.

Citizen Forum

On September 21, 1995, Sound Transit sponsored a forum for citizens, organizations, and consensus groups to share ideas about what should be included in a new ballot proposal for a regional transit system. A total of 26 organizations and 31 individuals presented their comments before the Sound Transit Board.

Regional Outreach Committee

In October 1995, the Sound Transit Board created a Regional Outreach Committee to provide oversight and comment on any new rail proposal. The 15-member committee included representatives from each of the five geographic subareas, business, labor, civic and environmental interests, as well as supporters and opponents of the 1995 proposal. The committee met regularly throughout 1996.

Guiding Principles

In November 1995, as a direct response to public input received after the March 1995 election, the Sound Transit Board adopted nine guiding principles for the design of the new regional transit system. These principles helped in reduce the length and cost of the light rail component of *Sound Move*. Some of those principles included:

- Conservative funding assumptions – the primary funding sources would be modest voter-approved local tax increases, federal grants, and long-term bonding.
- Equitable distribution of revenues – local tax revenues would be used to benefit the five subareas of the RTA District (Snohomish County, north King County, south King County, east King County and Pierce County) based on the share of revenues each subarea generates. This distribution formula would apply to all future phases.
- System completion within ten years – different parts and segments of the plan would be implemented in stages and be operational as soon as possible; the entire system would be completed and operational within ten years.

Voter information brochure

As provided by state law, Sound Transit mailed an informational brochure, describing the project and financing methods to every voter household within the district (approximately one million households).

POST-ELECTION ACTIVITIES

After voters approved local funding for *Sound Move*, staff sought to involve the public in the environmental analysis, engineering, and design work on the light rail line.

North corridor alternative task force

One of the most controversial elements of *Sound Move* was the proposed light rail tunnel under Capitol Hill. One of the first activities of Sound Transit following the election was to organize a citizen task force to consider and help identify an alternative northern route that could be evaluated against the preferred alternative during environmental review and preliminary engineering stages. The 18-member task force consisted of volunteers from neighborhoods, the environmental community, business interests, and the Seattle Planning Commission. The task force held five meetings between May and July 1997, at the end of which they adopted the I-5 High-level Bridge/South Lake Union route analyzed in this document as an alternative to the Capitol Hill Tunnel route.

Scoping

The formal scoping process for the light rail project occurred from November 1997 to February 1998. The goal was to inform the public and solicit input on what routes and what impacts Sound Transit should analyze in the EIS. Activities included:

- A scoping information report mailed to approximately 4,500 households
- Local newspaper advertisements announcing the comment period and open houses
- Seven informational open houses offering the public an opportunity to learn about the project and submit comments
- Over 400 written comments on the scope of the environmental study.
- A summary of all comments published and released March 10, 1998, marking the end of the scoping period.

Although the formal scoping period has ended, public comments continue to be accepted on the project and scope of the analysis in the Environmental Impact Statement (EIS).

Community Office

In the summer of 1998, Sound Transit opened a community office in the Rainier Valley neighborhood. The community office offers neighborhood residents a place to get information on the project, look at graphic displays, and meet with staff to discuss particular interests or concerns.

Identifying the Most Promising Alternatives

Between February and June of 1998, Sound Transit held "From Here to Alternatives" – an extensive public outreach effort designed to solicit input on which specific route alternatives would be studied in the EIS. Activities for this effort included:

- Material describing the possible routes was distributed to approximately 8,000 households along the corridor.
- Eleven public workshops were held to discuss possible impacts of the route options.
- Ten field trips to Portland, Oregon and Vancouver, British Columbia gave participants an opportunity to see an operating light rail system.
- Two walking tours of the possible routes.
- Two formal public hearings served as the final events in the alternatives analysis.

Findings from these outreach efforts were summarized and presented to the board on May 8, 1998.

On May 14, having heard the community's input, the Sound Transit Board formally adopted the alignment alternatives described in this document.

Environmental Impact Statement

Between June and December of 1998, Sound Transit invited the public to a series of events designed to raise awareness of the impacts of the various route and station locations being considered for analysis in the EIS. The goal was to encourage the community to make effective, informed comments both on the EIS and to the Sound Transit Board as they prepare to identify the preferred alternative in February. Activities included the following:

- Preparing two brochures (one describing the route and station option, and one announcing the Draft EIS and opportunities for comment) for mailing to 122,000 households along the proposed routes
- Creating newspaper advertisements announcing upcoming forums and opportunities to comment on the Draft EIS
- Hosting three informational open houses held in the Rainier Valley
- Holding six community forums to educate the community on the Draft EIS process, describing major findings of the EIS, and noting how to comment on the document.
- Preparing video segments highlighting field trips, and the Draft EIS process to show on local cable access channels.
- Preparing the Draft EIS, an Executive Summary, and workbook describing route/station options and making it available to the public.
- Holding five public hearings to provide an opportunity for the community to comment on the Draft EIS.

Because language, cultural and disability issues can sometimes create barriers to participation in public involvement activities, Sound Transit held special activities targeted for non-English-speaking and other special communities. These included:

- Two roundtables with community leaders and media representatives from non-English-speaking communities.
- Translating project information into 10 languages.
- Phone lines featuring recorded project information and voice mailboxes for questions (created in 9 languages).
- Advertisements published in non-English community newspapers.
- Sound Transit staff participating in advertisements and radio shows broadcast in eight different languages.
- Five volunteers from the deaf/blind community passed on information about Link light rail to other deaf/blind individuals. The group met regularly with staff to share information.
- Representatives from groups dealing with mobility issues were invited to a roundtable to give feedback on route and station locations and the public involvement program.

On February 25, 1999, after considering the input and comments from the above activities, the Sound Transit Board identified the preferred alternative. Since then, Sound Transit has been working in conjunction with the neighborhoods and communities along the preferred route to develop the project design to a preliminary engineering level of detail. The on-going public involvement activities described earlier have continued through the Final EIS and will continue through preliminary engineering, final design and beyond.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX C
Distribution List

Appendix C Distribution List

FEDERAL

Advisory Council on Historic Preservation
Federal Aviation Administration
Federal Emergency Management Division
Federal Highway Administration
National Marine Fisheries Service
National Parks Service
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Department of Commerce
U.S. Department of Fish and Wildlife
U.S. Department of the Interior
U.S. Department of Transportation
U.S. Environmental Protection Agency

TRIBES

Duwamish Tribal Council
Muckleshoot Tribal Council
Suquamish Tribal Council
U.S. Bureau of Indian Affairs

STATE

WA State Department of Community Trade and Economic Development
WA State Department of Ecology
WA State Department of Fish and Wildlife
WA State Department of Health
WA State Department of Natural Resources
Interagency Committee for Outdoor Recreation
WA State Department of Social and Health Services
WA State Department of Transportation
WA State Office of Archaeology and Historic Preservation
WA State Office of the Attorney General
WA State Office of Urban Mobility
WA State Parks and Recreation Commission
WA State Patrol
WA State Utilities and Transportation Commission
University of Washington

REGIONAL

Economic Development Council of Seattle and King County
Elevated Transportation Company
Puget Sound Air Pollution Control Agency
Puget Sound Regional Council

COUNTIES

King County
- Development of Environmental Services
- Development of Natural Resources
- Executive Office
- Regional Transit Manager
- Roads Division

Pierce County
Snohomish County

PORTS

Port of Seattle

TRANSIT AGENCIES

Community Transit
Everett Transit
King County Transit Division
Pierce Transit
Sound Transit Board

LOCAL

City of Bellevue
City of Redmond
City of Renton
- Fire Department

City of Seattle
- City Light
- Department of Construction and Land Use
- Department of Neighborhoods
- Department of Parks and Recreation
- Executive Services Department
- Fire Department
- Landmarks Preservation Board
- Law Department
- Light Rail Review Panel
- Office of Economic Development

Office of Housing
Planning Commission
Police Department
Seattle Center
Public Utilities
Seattle Transportation (SEATRAN)
Strategic Planning Office

City of SeaTac
Fire Department
Planning and Community Development
Public Works Department

City of Tukwila
Building Department
City Clerks Office
Community Development
Finance Department
Fire Department
Parks and Recreation
Planning Commission
Police Department
Public Works
Transit Advisory Commission

LIBRARIES

Auburn Public Library
Bates Technical College Library
Edmonds Community College Library
Enumclaw Public Library
Everett Community College Library
Everett Public Library
Evergreen State College Library
Green River Community College Library
Highline Community College Library
Institute of Transportation Economics - Japan
King County Library System
King County Transportation and Natural Resources Library
Lake Washington Technical College
Milton Memorial Library
North Seattle Community College Library
Northwest University Transportation Library
Pierce College Library
Pierce County Law Library
Pierce County Library System
Puget Sound Christian College Library
Renton Public Library
Renton Technical College Library
Seattle Central Community College Library

Seattle Pacific University Library
Seattle Public Library
Seattle Times Library
Seattle University Library
Seattle University School of Law Library
Seattle Vocational Institute Library
Shoreline Community College Library
Sno-Isle Regional Library System
South Seattle Community College Library
Tacoma Public Library
University of California
University of Puget Sound Library
University of Washington Libraries
Washington State Department of Transportation Library
Washington State Library

RAILROADS AND RAIL SERVICE

Amtrak
Burlington Northern Santa Fe Railroad
Union Pacific Railroad

SCHOOLS AND COMMUNITY CENTERS

City of Seattle Community Centers
- Greenlake
- Jefferson
- Miller
- Queen Anne
- Rainier Beach
- Rainier
- Ravenna Eckstein
- VanAsselt

City of Seattle Neighborhood Service Centers
- Capitol Hill
- Central
- Greater Duwamish
- Lake-City – North Seattle
- Greenwood – Northwest
- Lake Union – Freemont
- Queen Anne/Magnolia
- Southeast
- Southwest/Delridge
- University District & Northeast Seattle

Highline Community Hospital Specialty Center
Harborview Medical Center
Seattle School District
Swedish Medical Center

Tukwila Senior Center

UTILITIES

AT&T
GTE Northwest
GTE Wireless
Highline Water District
King County Water District #20
King County Water District #125
Midway Sewer District
MCI
Olympic Pipeline
Pacific Fiberlink
Puget Sound Energy
Summit Cablevision
TCI
U.S. West Communications
Val-Vue Sewer District

ELECTED OFFICIALS

The Honorable Gary Locke
Governor of Washington
First District Congressman Jay Inslee
King County Executive Ron Sims
King County Council
Seattle City Council
Seattle Mayor's Office
Tukwila City Council
Tukwila Mayor's Office
SeaTac City Council
SeaTac Mayor's Office

BUSINESS AND COMMUNITY ORGANIZATIONS

1000 Friends of Washington
African American Jewish Coalition For Justice
Asia First, Inc.
Asian Pacific American Coalition For Equality
Aurora-Lincoln Neighborhood Planning
Ballard Chamber of Commerce
Ballard Neighborhood Service Center
Beacon Hill Chamber of Commerce
Beacon Hill Urban Village Community Planning Committee
Bicycle Alliance of Washington
Black Dollar Days Task Force
Brighton Neighborhood Council

Brighton/Dunlap Community Council
Broadway Business Improvement Association
Capitol Hill Chamber of Commerce
Capitol Hill Community Council
Cascade Bicycle Club
Central Neighborhood Planning
Central Area Development Association
Columbia City Neighborhood Association
Columbia Place Community Council
Community Coalition for Environmental Justice
Community Development Association
Downtown Seattle Association
Downtown Urban Center Planning Group
Duwamish Improvement Club
Duwamish Valley Neighborhood
Eastlake Community Council
El Centro De La Raza
Elevated Transportation Company
Feet First
First Hill Improvement Association
Foster Community Club
Freemont Chamber of Commerce
Freemont Neighborhood Council
Friends of Othello Park
Genessee Merchants Association
Greater Duwamish District Council
Greater Seattle Chamber of Commerce
Greater University Chamber of Commerce
Greenlake Community Council
Greenlake 2020
Groundswell Off Broadway
Hawthorne Hills Community Club
Highway 99 Action Committee
Holly Park Community Council
Jackson Place Community Council
Judkins Park Community Council
Lakewood/Seward Park Community Council
League of Women Voters
Light Rail Task Force
Maple Leaf Community Council
McMicken Heights Community Club
Minority Executive Directors Coalition
Mt. Baker Community Club
Mt. Zion Transit Task Force
NOISE
North Beacon Hill Council
North Beacon Hill Neighborhood Planning
North Rainier Neighborhood

Pedestrian Advisory Board
Pike/Pine Neighborhood Planning Group
Pike/Pine Urban Neighborhood Coalition
Pioneer Square Community Council
Pioneer Square Business Improvement Association
Pioneer Square Neighborhood Planning
Portage Bay/Roanoke Park Community Council
Puget Sound Light Rail Transit Society
Queen Anne Neighborhood Plan
Rainier Audubon Society
Rainier Beach Community Council
Rainier Beach Neighborhood 2014
Rainier Beach Visionary Board
Rainer Chamber of Commerce
Rainier Lions Club
Rainier Valley Transit Advisory Council
Rainier Vista Community Council
Rainking Community Council
Roosevelt District Chamber of Commerce
Roosevelt Neighbors Alliance
Roosevelt Neighborhood Association
Save Our Valley (SOV)
Seattle Bicycle Advisory Board
Seattle Center
Seattle Chinatown Chamber of Commerce
Seattle Chinatown International District Business Improvement Association
Seattle Chinatown International District Public Development Authority
Seattle Community Council Federation
Seattle Industry for Responsible Transit (SIRT)
Seattle Marine Business Coalition
Seattle Neighborhood Group
Sierra Club
Sound Decisions
Southeast Economic Development (SEED) Board of Directors
South Atlantic Community Council
South Of the Dome Business Association (SODO)
South Lake Union District Council
South Ryan Way Hill Association
South Shore Community Council
SR 509 Steering Committee
Southwest King County (SWKC) Chamber
S.P.E.E.A.
The Ave. Group
The Bullitt Foundation
The Duwamish Committee
Thorton Creek Alliance
Tomorrow's Roosevelt
Tukwila Chamber of Commerce

Tukwila Tomorrow
Tukwila Transit Advisory Committee
Tukwila Transit Partnership
University Christian Church
University Presbyterian Church
University District Business Improvement Association
University District Community Council
University Park Community Club
Uptown Alliance
Valley Area Transportation Alliance
Vision Seattle
Weed and Seed Citizens Advisory Council

BUSINESSES

Ajax Airport Parking
Arai/Jackson Architects and Planners
Atomic Video
Boysen & Boysen, LLC
Budget Car/Truck Rental
C.A. Newell Company
Centerplex
Cottingham Transportation Engineering
Dave Sabey
Desimone Shell
Dollar Rent A Car
Fred Hart
Free Ride Zone
General Automotive Service
Graham & James LLP/Riddell Williams, P.S.
HE Goldberg & Company
Holly Park Business Owners
Jack's Auto Parts
Jeffrey Ek
Kathy Dang
Kemper Development Company
King Plaza
Lander Street Properties
Lindal Cedar Homes
LPL Financial
MacDonald Meat Company
MacMillan – Piper
Multi-Care
National Pride Car Wash
Pape Properties
Perfect Copy & Print
Perkins Coie LLP
Phelps Tire

Praxair Distribution, Inc.
Riverton McDonalds
Sud City Car Wash
Tammy's Bakery
Thrifty Car Rental
TRF Pacific, Inc.
Twice Sold Tales
Vagrant Records Studio
Williams, Kastner, and Gibbs
Young Investments
Zan's Plumbing

INDIVIDUALS

Aites, Ed
Akers, Keri
Akers, Ray
Allmendinger, Tom
Anderson, Jeff
Anderson, Eleana
Apsitis, James
Archer, Dixie
Ashby, Travis
Austin, Tiffany
Avondo, Ade & Roseanne
Avriett, Pamela
Bader, Jorgen
Badolato, Robert
Baker, Susan
Baldeschwiler, Gordon
Ballard, Don
Bambrick, Doug
Banks, Lavada
Banyard, John
Barnes, Doug
Barnes, Bob
Beleford, Donita & Rozell
Bernhard, Anna
Bjustrom, Mary
Boss, Bobby & Ella
Boyar, Mark
Bresee, Carol
Brighton, Ed
Brown, Richard
Brown, Janette
Browne, Colleen
Bryant, William And Kelly
Brydolf, Gunnec
Bullock, Eunice M.
Burke, Kay
Burkhart, Dick
Caldwell, Betty
Caldwell, Nancy
Cameron, Ron
Cameron, Roderick
Camp, Janice
Capestany, Mark
Carberry, Peter
Cargill, Doug
Carleton, Penny
Carlson, Ben
Carpenter, David O.
Cary, Tom
Chambliss, Dorothy
Chemnick, Pat
Chen, Hui-sung
Chu, Deborah
Chudgar, Samir
Clark, Steven
Clark, Anne Xuan
Clarke, Owen L.L.
Clinton, David
Cohen, Sandra
Colby, Donn
Coluccio, Nick
Coluccio, Frank
Cook, Kim
Coonrod, Forrest
Cory, Paul
Cox, David
Crew, Ruth
Cunnington, Analiese
Cupp, Sharon
Curtis, George
Dalby, Craig
Dan McKilttop, Colleen Brown
Dang, Heida
David, Joseph
David Ralph, Susan Ott
Davies, Diane
Davis, Oscar
De Gooyer, Elise
De Groot, Janke
De Guzman, Michael & Marilyn
Deal, James
Dean
Demery, Leroy W. Jr.
Deright, Alan
Des Jardin, Cathie
Detson, Rose M.
Devine, Anne
Dewhirst, John & Kathleen
Dexter, John
Ding, Jim
Dixon, Joe
Dixon, David & Zelda

Dobson, William
Dominick
Donaldson, Martin
Donnelly, Sheila
Downs, Pat
Dubin, Gail
Dubman, Jonathan
Duckworth, Bobbye
Duncan, Jack
Dunston, Marshall
Dutcher, Katie
Edmond-Quinn, Patricia
Edwards, Richard
Fahr, Laura
Fernald, Greta
Fichtenberg, David H.
Finley, Michael
Fleck, Martin
Fletcher, Sarah
Fletcher, Catherine
Flowers, John
Fogdall, Larry
Ford, Angela
Forrey, W.
Fradet, Jane
Frank, Alan & Teresa
Frodet, James
Gaines, Kitty
Galbreath, E. H.
Gallis, Bryon
Galloway, Yvonne C.
Gengler, Tom
Gentis, Kandi
Gibbons, Laura E.
Glover, James H.
Goodall, Scott
Goodman, Howard
Gorney, Alexandra
Gorshkow, Kenneth M.
Graham, Corey
Graham-Squire, Mike
Grahm, Joanna
Grega, Philip
Griswold, Erik
Gully, Betty J.
Gunby, Virginia
Hall, Lyman
Halliburton, Kathy
Hansmire, Audrey
Hanson, Alice
Harris, Marlow
Hashiguchi, Hachiro
Haskell, Forrest
Hasson, Denise
Haynes, Grover
Hayward, Colleen
Hazen, Hazel
Heller, Tom
Hendrix, Shirley
Herberich, Catherine
Higley, Spencer
Hill, Irma
Hitchcock, Maureen
Hobbs, Kathryn L.
Hogan, John & Faith
Hom, Wayne
Hougham, Ron
Howell, Steve
Hsu, Robert
Huseby, Michael
Iki, John
Irish, Jim
Jackson, Mamie
James, David N.
Jenkins, Shirley
Jennifer Doherty, James Benton
Jennings, Ernest
John, Esther
Johnson, John
Jordan, Seanna M.
Kaplan, Sara
Karen
Kaufman, Albert
Keller, Ralph
Kellor, Rolfe
Kelly, L. Roy H.
Kennedy, Mary
Kerr, Georgina
Kinney, Susanne & David
Kirkham, Anne
Kleen, Josh
Klein, Heather
Kleui, Helen & George
Korkowski, Ruth
Korkowski, David
Kostka, Donna

Kriebel, John F.
Kujundzic, Jasminka
Kutzman, Andrea
La, Huy Q.
Laferla, Jeannie
Lamb, Ron & Nancy
Lamothe, Roy
Lane, Theodore (Ted)
Lang, Rich
Larrimore, E.
Larson, Sonja
Larson, Dave
Leask, Jan
Lemberg, Ivy
Lessley, Keith
Lewellan, Art
Lewis, Gwen
Lietwiler, Charles
Lindemann, Bev
Linder, Phil
Little, Maria
Lium, Mark
Livingston, Brian
Locke, Hubert G.
Loesell, Lorene
Love, S. Reily
Lufkin, Frank
Lynch, William G.
Lyons, Bonnie
Mac Rae, Pam
Maduell, Charles E.
Mallow, W. P.
Malone, Woodrow
Manassa, Dorothy
Manderscheid, Mike
Mark, Allan
Markholt, Bob
Mathis, Carol
Matthies, Melissa
McCullough, Jim
McLean, Dwight
McLean, Vivian
McManus, Joanne
Meharg, Jerry
Mercer, Eden
Merner, Sarah
Merrell, Frederica
Meryhew, Joan
Miller-Engelsberg, Constance
Misut, Hafo
Morgan, Bob
Morgna, Wendy
Morishita, M.
Moss, Brian
Mouser, Mark
Mulkey, William W.
Mullen, Madeline
Murphy, Edward M.
Murphy, Lance & Cindy
Murphy, Harold And Marilyn
Mycon, Steve & Debbie
Nashif, Ken
Neill, Craig
Nelson, Donna
Nelson, Laura
Newell, Peachie
Newman, Gretchen
Newton, Dot
Niggemeyer, Tim
Nix, Martin E.
Noble, Alteen
Noble, Eddie
Nyborg, Julie & Ronald
Oaksen, Greg
Oaksen, Heather Drew
O'Brien, John
O'Brien, Michael
O'Connor, Erin
Oebler, Candace
O'Hara, Molly & Norv Sytsma
Oliver, Julie
Olson, Christina
Orr, Mike
Overbeck Md, John R.
Owens, John
Pappas, Sandra
Parameswaran, G.
Parnell, Jim
Paschal, Patricia
Paul, Deborah
Peel, Grant
Peoples, John
Peterson, Don
Petitt, Gilbert
Petricek, Margaret
Pharr, Tarra

Pharr, Wanda
Pharr, Claudia
Phipps, Jennifer
Pichereau, Susan M.
Pierce, Annie
Plevin, Arlene
Porter, Jonathan
Porter, Harvey
Powell, Gary
Prime, Mike
Puglisi, Anthony
Quarnstrom, Fred & Mariana
Quevedo, Tavo
Ragsdale, Mike
Ramey, Brian
Ranlet, John
Ray, Frank
Renaud, Rick
Renner, Peter J. & Sandra
Responte, Allen
Richardson, Carol
Richardson, Randy
Riebs, Frederic
Rinehart, Chuck
Roberts, Lisa
Robertson, Dennis L.
Robinson, Thomas
Rockwood, Mark
Roger, J.
Ronning, Shraron
Rosengreen, Bev
Rossotto, Michael
Rudine, Robert C.
Ryden, Debra
Salava, Gary
Salihovic, Mevlida
Sawyer, Al
Schaefer, C. Thomas
Schilling, Tim
Schmidt, Saskia
Schmitt, Michael
Schneider, John D.
Schuh, Mike
Schumacher, Richard
Scott, Jesse
Segalla, Susan
Seidman, Carolyn D.
Sepic, Jim
Settler, Emery
Shuster, Steve
Simmons, Frederich
Simpson, Richard
Sinde, Yolanda
Sinnott, Larry
Skehan, Mike
Slepko, Nick
Slettebak, Arn & Kathy
Smith, Jim
Smithburg, Paul
Smith-Casem, Veronica
Socommodau, Suzanne
Spain, David & Jannie
Stack, Rob
Stakestedt, Sharon
Stallcup, Hazel
Stallcup, Samuel G.
Stannard, Richard
Stanwell, Helen
Stearn, Bill
Stedman, Marcia
Steve Nordeen, Anita Glasford
Stock, Myles
Stockmeyer, Cleveland
Stranderg, Karen
Stromme, Sandy
Sundborg, Jean
Swan, Charles E.
Tappero, Paul
Tarver, Geraldine
Tate, Juanita & Jerry
Telschow, Maryane E.
Theophilus, Adrienne
Thiel, Phillip
Thurmond, Harris
Thwing, Jim
Tilbury, R. P.
Timken, Mark
Tooley, Douglas
Trohimovich, Tim
Ultican, Timothy
Usner, Adam
Van Derschelden D.D.S, R.L.
Vance, Mary Anne
Vandermeerssche, Marc-Albert
Vasser, Karen
Vaughn, Daniel C.

Voorhees, Peter
Wagner, Walther
Waller, Judith
Walsh, David
Warsi, Salaha
Washington, Michael B. & Carol
Weaver, Walter S.
Wehde, Sharon
Weidler, Michael
Weiss, Stuart
Welch, John
Wendland, Jeff
Werran, Cordilia
Weston, James
Whipple, Steve & Sally
Whisler, Kristine
Whisner, Jack
Whitaker, Stephen
White, A. J.
White, Marie
White, Ryal
Whitney, Blanche
Wilhoit, Nick
Willhoite, Zack
Williamson, Sharon
Wilson, Kenneth
Winter, Pauline
Wirth, Judith & Harry
Witters, Joan
Wittmann, Thomas
Wong, Sam
Woo, Michael
Woodford, Susanne L.
Woodhouse, Philip
Woods, Vickie
Woodurd, Robert C.
Wright, Karen
Wurgler, Chris
Yee, Warren
Young, Christine
Young, Jessica
Zapeda, Barbara

OTHER

Baseball Stadium Public Facilities District
Municipal League
Washington Association of Rail Passengers
Washington Environmental Council
South County Area Transportation Board

Sound Transit
Central Link Light Rail Final EIS

APPENDIX D.1
Glossary

Appendix D.1 Glossary

Accessibility: The ease by which an individual can reach desired activities in any location by use of the transportation system.

Access Time: The time required to walk, bike, or drive from the origin of the trip (for example, from home) to a (boarding) transit stop, plus the waiting time based on the frequency of transit service, and/or the transfer time and the walking or driving time from the transit (de-boarding) stop to the destination. For auto trips, it is the time required to walk to and from parking places, and delays within parking facilities, if any.

Air Pollutant (also, Air Contaminant): Smoke, dust, fumes, or odors in the ambient air that have potential for harmful effects.

Air Quality Maintenance Area (AQMA): An area having the potential to violate a federal or state ambient air quality standard, based on expected growth and development in the area.

Alignment: Horizontal and vertical geometric elements, which define the location of the light rail alignment or roadway.

Alluvium: An unconsolidated, terrestrial sediment composed of sorted or unsorted sand, gravel and clay that have been deposited by water.

Ambient Air: Surrounding air.

Annualized Capital Cost: A one-time capital cost converted into an annual value which incorporates both the depreciation on the capital item and the foregone interest on the money invested in the project.

Area Source: A general classification of the origin of an air pollutant (e.g., park-and-ride lots are area sources of CO emissions).

Arterial Street: A street with partial control of access, with some intersections at-grade and intended to move high volumes of traffic over long distances at high speed.

Artifacts: Any portable object used and/or modified by civilization (particularly during prehistoric times).

At-grade Crossing: Any intersection of two or more flows of traffic at the same elevation (possibly involving more than one mode of transportation), such as light rail /road crossing.

Atmospheric Stability: A measure of the capacity of the ambient air to disperse air pollutants; unstable to increasingly stable air.)

Average Daily Traffic (ADT): The total volume of traffic during a given time period divided by the number of days in that time period, representative of average traffic in a one-day time period.

Average Time (also, Exposure Time): The duration of exposure to a given concentration of an air contaminant, specified in ambient air quality standards, (e.g., the two national standards of 9 parts per million (ppm) and 35 ppm specify averaging times of eight hours and one hour).

Average Wait Time (AWT): Average time spent by passengers at a station or bus stop waiting for transit service.

Average Weekday (AWD): A measurement of average conditions during one weekday, i.e., Monday through Friday.

A-weighted sound level (dBA): To approximate the way humans interpret sound, a filter circuit with frequency characteristics similar to the human hearing system is built into sound measurement equipment. Measurements with this filter enacted are referred to as A-weighted sound levels, expressed in dBA.

Background Concentration: The pollutant level that would exist at a site in the absence of air pollution sources in the neighborhood of the site. (Different from Modeled Concentration).

Baseline Energy Consumption: Energy consumption, usually for a No-Build alternative, that is used as a reference against which energy consumption for a Build alternative is compared.

Boarding Trips: A trip on a transit line or group of lines where each boarding of a transit vehicle is considered the start of a new trip. Number of trips boarding (entering) transit vehicles, regardless of whether the trip involved a transfer from another transit vehicle. Equivalent to unlinked trips. A fare may or may not be collected for each boarding trip, depending on whether a transfer is used.

British Thermal Unit (Btu): An energy unit equal to the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit. One therm equals 1,000,000 Btu.

Capital Costs: Nonrecurring costs required to construct transit systems, including costs of right-of-way, facilities, rolling stock, power distribution and the associated administrative and design costs, and financing charges during construction.

Car Pool: A group of passengers and drivers organized to utilize one automobile on a regular basis, riding together, for the same trip purpose (generally the work trip).

Carbon Monoxide (CO): A colorless, odorless, tasteless gas, and one of the criteria air pollutants released from automobile exhaust.

Catenary: The system of overhead wires suspended over the track to provide power for the electric light rail vehicles.

Commuter Rail: A passenger-rail, diesel-powered system which will offer service for commuters from Lakewood to Seattle and Everett to Seattle. The locomotives will use the existing Burlington Northern/Santa Fe railroad network.

Concentration (also, level): A measure of the air pollutant in the ambient air, having the units of mass per volume.

Construction Energy: In transportation analysis, the energy used to build stations, terminals, roadbeds, trackbeds, tunnels, vehicles and other equipment and facilities. Construction energy includes the energy content of materials and the energy used to haul and place them.

Construction Staging Area: During construction, a site temporarily used for materials or equipment storage, assembly, or other temporary, construction-related activities.

Corridor: See Central Link Corridor.

Criteria Air Pollutants: Those air pollutants which have been recognized by the EPA as potentially harmful and for which standards have been set to protect the public health and welfare. The criteria air pollutants are carbon monoxide, sulfur dioxide, particulates, nitrogen dioxide, ozone, hydrocarbons and lead.

Day Night Sound Level (Ldn): L_{dn}, also abbreviated DNL, is a 24-hour Leq, but with a 10 dB penalty assessed to noise event occurring at night. Nighttime is defined as 10pm to 7am. This strongly weights Ldn toward nighttime noise to reflect most people being more easily annoyed by noise during the nighttime hours when both background noise is lower and most people are sleeping.

dBA: The sound level obtained through the use of A-weighting characteristics specified by the American National Standards Institute (ANSI) Standard S1.4-1971. The unit of measure is the decibel (dB), commonly referred to as dBA when A-weighting is used. The "A" weighting scale closely resembles human response to noise.

Decibel: The unit used to measure the loudness of noise (see dBA).

Displacement: A property encroachment, which would require full acquisition of the parcel & structure if any in order to build and operate the light rail system.

Disturbed Habitat: A habitat in which naturally occurring ecological processes and species interactions have been significantly disrupted by the direct or indirect results of human presence and activity.

Drop-off zone: A station that provides temporary loading and unloading facilities for autos and/or buses. The station may be combined with feeder bus stations.

Ecologically Sensitive Area: An area, valued locally for its rare or sensitive habitat, existing in a relatively undisturbed, natural state and supporting indigenous species.

Efficiency: In energy systems, the quotient of energy outputs to energy inputs, being in the range from zero to one (e.g., the energy efficiency of U.S. electric power generation plants is approximately 0.3). In transportation systems, the degree of goal attainment measured relative to cost, indicative of the productivity of a given level of investment.

Elasticity: In economic analysis, the sensitivity of the demand or supply of a commodity to changes in another variable, (e.g., the price elasticity of gasoline is the ratio of the percent change in consumption to percent change in price).

Elevated Guideway: A guideway which is positioned above the normal activity level (e.g., elevated structure for light rail to cross over a street).

Emission: Particulate, gaseous, noise or electromagnetic by-products of the transit system or vehicle.

Emission Control: Method by which emissions are governed in an effort to minimize the pollutants and/or noise emitted.

Emission Inventory: A listing by emission source of the amounts of air pollutants released into the atmosphere (generally, in tons or kilograms per day).

Emission Source: The origin of an air pollutant, (e.g., automobiles and trucks are sources of carbon monoxide, hydrocarbons and nitrogen oxides).

Emission Standards: A limitation on the release of an air contaminant into the ambient air (e.g., the federal government limits CO, HC and NOx emissions per mile of travel in new automobiles).

Endangered Species: According to the Federal Endangered Species Act of 1973, an endangered species is any species in danger of extinction throughout all or a significant portion of its range, other than an insect determined by the Secretary of the Interior to constitute a pest whose protection under the provisions of this act would present an overwhelming and overriding risk to man.

Energy Content of Materials: A total energy value equal to the sum of the latent energy of a material and the energy used in its manufacture.

Energy Factor: A number which when multiplied by the appropriate usage units (e.g., vehicle miles, tons, dollars) yields a measure of energy consumption (e.g., 0.5 gallons per vehicle mile x 10 miles = 5.0 gallons consumed for propulsion).

Energy System: The network of major and minor routes, vehicles, facilities and other energy consuming entities that are considered in energy analysis.

Equity: The incidence of fairness and the distribution of benefits, costs and impacts among population subgroups except as defined for subareas per allocations set out in *Sound Move.*

Equivalent Level (Leq): Leq is a measure of sound energy over a period of time. It is referred to as the equivalent sound level because it is equivalent to the level of a steady sound which, over a referenced duration and location, has the same A-weighted sound energy as the fluctuating sound.

Express Service: Transit service where a very limited number of stops is made.

Executive Order 11991 (1977): Directed the CEQ Guidelines to be rewritten as regulations binding on all Federal actions, and to reduce paperwork.

Facilities Energy (also, station energy): A portion of the operational energy that includes the energy to operate parking lots, administration buildings and other facilities. It does not include propulsion or maintenance energy.

Fare Box: A device that accepts and, in some cases, registers coins and tokens used by passengers as payment for rides.

Fare Structure: The methodology of determining the fare which a passenger pays for service.

Fare: The authorized amount (cash or token) paid or valid transfer, pass, etc., presented for a transit ride.

Feeder bus station: A station that provides lateral bus transportation service for riders to transfer to a light rail mode.

Feeder service: Local transit service which feeds trunkline (usually faster and at higher capacity) transit service.

Forest or Woodland Habitat: A habitat type generally dominated by Douglas fir, western red cedar and western hemlock, frequently with a hardwood understory. The ground cover is generally lush. Birds and small mammals abound and larger mammals are common in large stands.

Frequency, Vehicle: Time rate of vehicle arrivals at a station stop or along a transit line.

Full displacement: A type of property encroachment which would require the acquisition of the full parcel and displace the current use in order to build and operate the light rail system.

Full Funding Grant Agreement (FFGA): This is the principal means FTA uses to manage New Starts projects. The FFGA is a contract between FTA and the local agency, and defines the project, including cost, schedule, maximum level of federal financial assistance (subject to appropriation), and terms and conditions of federal participation.

Grade-Separated: Parallel or crossing lines of traffic that are vertically or horizontally physically separated from each other and do not share a common intersection.

Ground-borne noise: Noise which is transmitted through the ground, typically reported in decibels (dBA)

Ground-borne vibration: A small but rapidly fluctuating motion transmitted through the ground, typically reported as velocity or acceleration.

Guideway: Specifically designed way traversed by transit vehicles constrained to the way.

Headway: The time between transit vehicles at any particular point along the route.

High Occupancy Vehicle (HOV): Typically includes carpools with two or more people, vanpools and buses.

Hydrocarbons (HC): Specifically, non-methane hydrocarbons that contribute to the formation of photochemical oxidants (commonly known as smog), primarily ozone.

Impedance Value: A factor used to weight the time spent waiting for transit. Often computed as 2.1 times the in-vehicle time.

Indirect Energy: A term used to denote all energy inputs for the construction, operation and maintenance of a system, exclusive of propulsion energy and parasitic loads within vehicles.

Indirect Source: An entity that does not directly emit pollutants but attracts emission sources such as automobiles and trucks. Shopping centers, stadiums and highways are examples of indirect sources.

Induced Trips: Trips generated because of the construction of a new (transportation) facility. (Different from Shifted Trips).

Intactness: The visual integrity of a landscape's natural and built features.

Integration with Other Modes: Method by which a transit system interfaces with other modes of transportation.

Interchange: The system of interconnecting ramps between two or more intersecting roadways or guideways which are grade-separated.

Joint Development: Opportunities for the development or redevelopment of adjacent parcels (in station areas) in a manner which would support both the transit investment and the community objectives through the use of both public and private funds.

Kilowatt (KW): A unit of electrical energy.

Kilowatt-hour (KWH): One Kilowatt of energy (measured over one hour).

L_{10}: The sound level that is exceeded ten percent of the time (the 90^{th} percentile) for the period under consideration. This value is an indicator of both the magnitude and frequency of occurrence of the loudest noise events.

L_{10}(h): The hourly value of L_{10}.

Lacustrine soils: A soil which has been formed in a lake bed.

Land Development Pattern: The use, types and intensity of development. Land development patterns affect trip demand, average trip length and, therefore, energy consumption.

Landscaped Habitat: A habitat in urban areas having limited native species. Vegetation generally consists of mowed lawns and exotic trees and bushes.

L_{dn}: The day/night average noise level.

Lead (Pb): A component of total suspended particulates released in the combustion of gasoline containing lead.

L_{eq}: The equivalent steady-state sound level which, in a specified time period, would contain the same acoustic energy as the varying sound level during the same period, considers volume capacity, travel speeds and delay.

L_{eq}(h): The hourly value of L_{eq}.

Level of Service (LOS): A qualitative measure that represents the collective factors of travel under a particular volume condition. A measure of traffic congestion.

Light Rail Transit: A mode of mass transportation comprised of light rail vehicles, which travel on steel tracks and are powered by electricity from overhead wires. This mode is characterized by its ability to operate in both at-grade and/or grade-separated environments.

Line haul: A transit system which offers service along a line or corridor.

Line Source: A general classification of the origin of an air pollutant, (e.g., highways and other roads are line sources of CO emissions).

Link: Sound Transit's proposed light rail system.

Load Factor: The average ratio of passengers to seats, during some specified period of operation of a public transit route.

Local service: A type of transit operation involving frequent stops and consequent low speeds, the purpose of which is to deliver and pick up transit passengers as close to their destinations or origins as possible.

Locally Preferred Alternative (LPA): Following the publication of the Draft EIS, the Sound Transit Board identified a preferred alternative, consisting of routes in Segments B through F and some station preferences. This is known as a "locally" preferred alternative because FTA has not yet selected a preferred alternative.

Maintenance Energy: A portion of operational energy that is applied to repair and maintenance of vehicles and buildings in the system. It does not include propulsion or facilities energy.

Microgram Per Cubic Meter (abbreviated g/m3 or mcg/m3): A unit of concentration equal to one thousandth of a gram per cubic meter.

Minimum Operable Segment (MOS): A shorter segment of the N.E. 45th to SeaTac route that could be successfully operated on an interim or long-term basis if necessary, and could be extended at a later time. Three MOSs are discussed in the Final EIS (MOS A, B and C).

Minimum Turn Radius: Generally assumed to be the minimum horizontal turn radius (tightest curve).

Minority residents: Those persons who, in responding to the 1990 US Census, indicated their race to be something other than "White" or reported entries that the Bureau of the Census categorized as something other than "White".

Mobility: The ease of continuous movement along the transportation system.

Mobility limited: As defined for 1990 US Census data, persons who had a health condition (physical and/or mental) that had lasted for 6 or more months and which made it difficult to go outside the home alone.

Mode: A particular form or method of travel, such as pedestrian, bicycle, automobile, bus or light rail.

Mode split: Forecast of proportion of total person-trips that would use each of the various modes of transportation that include transit and cars.

Modeled Concentration: An air pollutant level, excluding the background level, predicted by a model (see Background Concentrations).

National Ambient Air Quality Standards (NAAQS): Federal limits on levels of atmospheric contamination necessary to protect the public from adverse effects on health (primary standards) and welfare (secondary standards).

National Historic Preservation Act of 1966: The Act which established the National Register of Historic Places and State Historic Preservation program and set forth guidelines and regulations for environmental review of projects involving federal funding.

National Register of Historic Places: The official list of the nation's cultural resources determined to be worthy of preservation.

Network: A system of real or hypothetical interconnecting links that forms the configuration of transit routes and stops which constitute the total system.

New Starts - Refers to a federal funding program administered by the Federal Transit Administration. Section 5309 New Starts funds are discretionary federal funds available for new fixed guideway systems and extensions to existing systems. Sound Transit is pursuing New Starts funding for Link. A New Starts project can receive federal funding by having an earmark in an authorization act or by having a non-earmarked authorization committed by the FTA in a Full Funding Grant Agreement.

Non-attainment Area: An area designated by the EPA as presently violating the National Ambient Air Quality Standards, based on archival air quality data.

NOx: Oxides of nitrogen (nitrogen oxide and nitrogen dioxide). The pollutants released during high temperature combustion of fossil fuels such as diesel.

Off-peak: Those periods of the day where demand for transit service is not at a maximum.

Open Field Habitat: A habitat characterized by various species of perennial and annual grasses, forbs, small and large birds, small mammals and snakes. This habitat is especially important in providing nesting sites and food for various song and predatory birds.

Operating Costs: Recurring costs incurred in operating transit systems, including wages and salaries, maintenance of facilities and equipment, fuel, supplies, employee benefits, insurance, taxes and other administrative costs. Amortization of facilities and equipment is not included.

Operating Revenue: The gross income from operation of the transit system including fares, charter income, concessions, advertising, etc. Does not include interest from securities, non-recurring income from sale of capital assets, etc.

Operational Energy: The energy used for vehicle propulsion, facilities and maintenance for a specified period, usually one year.

Originating Ride (or Trip): A one-way trip taken on a transit line or group of lines, where a transfer from one line to another is not considered to be the start of a new trip.

Overhead Catenary System (OCS): Electrical transmission poles and lines which supply power to the light rail system.

Ozone: A gas consisting of three oxygen atoms formed in reactions of non-methane hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is one of the Criteria Air Pollutants.

Palustrine Wetland: Freshwater wetlands dominated by trees, shrubs, and emergent vegetation.

Park-and-Ride (P&R) Lot: A lot that provides all-day parking for cars at or near a transit facility.

Partial Encroachment: A property which would be partially acquired in order to build and operate the light rail. A partial encroachment would not dislocate the existing use.

Pasquill Stability Class: A category of atmospheric stability ranging from Class A (extremely unstable conditions) to Class F (moderately stable conditions).

Passenger Mile: A measure of travel equivalent to one passenger traveling one mile.

Patronage: The number of person-trips carried by a transit system over a specified time period.

Payback Period (also, Break-even Period): The period over which the initial energy cost of a project is recuperated. The period is calculated by dividing the construction energy consumption of a project by the forecast annual operational energy savings attributable to the project. Savings are measured against baseline energy consumption, and are the net of savings (losses) in propulsion, savings (losses) in maintenance and savings (losses) in facilities.

Peak Hour: The hour of the day in which the maximum demand for service is experienced, accommodating the largest number of automobile or transit patrons.

Peak Particle Velocity (ppv): Specifications for allowable levels of vibration from blasting, pile driving and other construction processes with the potential of causing building damage are almost always expressed in terms of peak particle velocity since this is thought to be well correlated with maximum stresses in buildings. Peak particle velocity is the instantaneous positive or negative peak in the vibration signal.

Peak Period: A specified time period for which the volume of traffic is greater than that during other similar periods.

Person-trip: A trip from a point of origin to a destination made by a person by any travel mode. Within transit, transfers are not counted. That is, a person traveling from home to work on a bus with one transfer creates only one person trip.

Photochemical Oxidants (Smog): Gaseous pollutants formed from reactions of non-methane hydrocarbons (HC) and nitrogen oxides (NOx) in the presence of sunlight, (e.g., ozone).

Place Miles: A unit of transportation carrying capacity that equals the capacity of a vehicle (including seats and standees for transit vehicles) multiplied by the miles the vehicle travels.

Platform Hours: Elapsed time from when a transit bus or train pulls out of the garage into service to when it returns to the garage after completing its service.

Point Source: A general classification of the origin of an air or water pollutant, usually characterized as smokestacks or outfalls.

Polychlorinated Biphenyl (PCBs): Hazardous environmental pollutants upon which the federal government has placed additional controls regulating disposal.

Potentially Affected Area: This is defined differently by each technical discipline. It includes the area that could be affected by the Alternatives.

Poverty-level household: As used for 1990 US Census data, the average poverty threshold for a family of four persons was $12,674 in 1989. The defined family poverty level threshold varied by total number of family members, number of children under 18 years and number of persons over age 65. For a detailed discussion of the poverty definition, see U.S. Bureau of the Census, Current Population Reports, Series P-60, No. 171, Poverty in the United States: 1988 and 1989.

Power: The time rate of energy use.

Preferred Alternative: Following publication of the Draft EIS, the Sound Transit Board will identify the preferred alternative as the preferred action. The Final EIS will further evaluate the preferred alternative as well as other alternatives.

Propulsion Energy (also, direct energy): In transportation analysis, a portion of operational energy that includes fuels and electricity to propel vehicles and provide lighting, heating and air conditioning within them.

Pulsing: The coordinated arrival and departure of buses on a number of different bus lines at a transit center to facilitate transferring of passengers among those bus lines. Usually, local feeder bus lines are scheduled to arrive at the transit center just ahead of the trunkline bus or train and then depart just after the trunkline bus or train.

Radial System: A network of transit lines which meet in the downtown area.

Region: The four county, PSRC region including King, Pierce, Snohomish and Kitsap Counties.

Right-of-Way: The corridor (horizontal and vertical space) owned by the transit agency for the transportation way.

Riparian Habitat: A habitat type associated with stream and lake margins and characterized by dense vegetation consisting primarily of willow, alder and cottonwood species, supporting a wide variety of waterfowl, songbirds, amphibians and small mammals.

Route Miles: The length of a route measured in miles between its end points.

Route: The course followed by a transit vehicle as a part of the transit system.

Runoff: The rainwater, which directly leaves an area in surface drainage, as opposed to the amount that seeps out as groundwater.

Seat Mile: A measure of transit capacity that is an amount of potential travel equivalent to one transit seat traveling one mile. A bus with forty seats traveling one mile would produce forty seat miles.

Section 4(f): Section 4(f) of the Department of Transportation Act restricts the use of USDOT funds for projects affecting the following properties: publicly owned land from a public park, recreation area or wildlife and waterfowl refuge, or any land from a significant historic site.

Section 6(f): Section 6(f) of the Land and Water Conservation Act of 1965 established restrictions on, and replacement requirements for, the use of land acquired with funds authorized under the Land and Water Conservation Fund Act.

Section 9: Section 9 of the Rivers and Harbors Act of 1899, which established authority to issue permits for bridges and causeways across any navigable waters of the United States - Permit program administered by the U.S. Coast Guard.

Section 10: Section 10 of the Rivers and Harbors Act of 1899 established authority to issue permits for obstructions or alterations of any navigable waters of the United States. This Permit program is administered by the Corps of Engineers.

Section 106: Section 106 of the National Historic Preservation Act of 1966 establishes a procedure to review the potential effects on cultural resources by projects receiving federal funds.

Section 404: Section 404 of the Clean Water Act is a permit program administered by the Corps of Engineers under guidelines by EPA to protect the nation's waters from dredged and fill sources.

Segment: This refers to the six sections of the Central Link Corridor, as defined in Chapter 2 of the Draft EIS.

Sensitive Receptor: A local area or site which supports activities easily disrupted by audio or visual intrusions or distractions, such as a park, school, historic landmark or residential neighborhood.

Signal Progression: A series of traffic signals timed and coordinated to optimize the flow of selected traffic movements.

Signal Preemption: Traffic signal options, which may modify normal traffic signal phasing for preferential treatment of transit vehicles.

Smog: See Photochemical Oxidants.

Social Interaction: Intra-neighborhood communication and circulation, utilizing street, sidewalk and bikeway connections between residential areas and community facilities, retail businesses, and employment centers. Also includes verbal interaction and telecommunications facilities.

Sounder: Sound Transit's commuter rail system, which will travel from Everett to Lakewood, through Seattle.

Staging Area: A holding area where transit vehicles wait until they can depart the location in a specific scheduled sequence (not to be confused with "Construction Staging Area").

State Implementation Plan (SIP): A plan required of each state by the Clean Air Act that describes how the state will attain and maintain the National Ambient Air Quality Standards.

Subarea: A unique portion of the Regional Transit Authority taxing district, one of five as defined in Sound Move (Snohomish County, North King County, East King County, South King County, and Pierce County).

Subduction Zone: An area where one crustal plate is descending below another. The Puget Sound area is in close proximity to a subduction zone, which is formed by the Juan de Fuca plate descending below the North American plate. This action can cause significant seismic activity.

Terminal: The terminating point of transportation routes with transfer facilities and, often, amenities for passenger convenience.

Terminus: A transit station located at the end of a transit (including light rail) line.

Title 23, Code of Federal Regulations, Part 771 (23 CFR Part 771) (Revised 1987): Federal Highway Administration regulations governing the preparation of environmental impact statements and relate documents.

Title 23, Code of Federal Regulations, Part 777 (23 CFR Part 777) (Revised 1980): Federal Highway Administration regulations providing policy and procedures for evaluation and mitigation for impacted, privately owned wetlands.

Threatened Species: According to the Federal Endangered Species Act of 1973, any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Through-route: Interconnected transit lines in the downtown area, or a transit center, which allows buses (or trains) entering downtown or the transit center on one line to pass through and exit on another line. This eliminates the need to turn transit vehicles around downtown or at the transit center and allows some passengers to continue without transferring.

Total Suspended Particulates (TSP): Air pollutants which consist of solid particles (dust, lead, salts, etc.) suspended in the atmosphere. TSP is a criteria air pollutant.

Total Travel Time: The total elapsed time between trip beginning and end, including travel, terminal and waiting time.

Transfer: The portion of a trip between two connecting transit lines, both of which are used for completion of the trip.

Transfer Ratio: The number of boarding trips divided by originating trips.

Transfer Time: The elapsed trip time required to change between modes (e.g., bus to light rail) or to transfer between routes of the same mode (e.g., bus to bus).

Transit: A transportation system principally for moving people in an urban area and made available to the public usually through paying a fare.

Transit Center: A station with shelters where a large number of transit vehicles and passengers can be brought together with safety and convenience.

Transit Street Classification System: The City of Seattle's system for designating certain streets as being important for transit. This is part of the City's overall street classification system.

Transportation Corridor (also, Corridor): The group of travel movements (or travel flows) between two or more locations. A corridor may have components, or sub corridors. A corridor includes all facilities, transit and highway, that may be used to accommodate the specified travel movement.

Transportation Systems Management (TSM): Incorporates relatively low cost approaches to improving mobility without constructing major new transportation facilities. TSM generally emphasizes smaller physical improvements and operational changes such as intersection improvements, minor widenings, traffic engineering actions, operational changes such as queue jumps or queue bypass lanes for buses, expanded bus service, transit centers and improved transit access.

Travel Time (In vehicle): The time required to travel between two points, not including terminal or waiting time.

Trip: The one-way movement of one person between his origin and his destination, including transfers and the walk to and from the means of transportation.

Trip Demand: The number and type (public or private origin and destination) of trips measured, calculated or forecast in a specified area having a given land development pattern. Trip demand also depends on prevailing economic, behavioral and attitudinal conditions.

Trip Length: The number of miles per trip. This is usually an average number for a specified trip type, area and analysis year.

Trunkline: A relatively high-frequency, high-capacity transit line, which connects outlying activity centers and/or transit centers to the downtown area (also line haul route).

Unity: In visual analysis, the visual coherence and compositional harmony of the landscape.

Use of Section 4(f) Land: According to regulations of the U.S. Department of Transportation, use of Section 4(f) land is defined as: (1) acquisition of title or easement to land, or (2) in unusual circumstances, serious indirect impacts, such as increase in noise, visual intrusion or access obstruction.

Vehicle Mile: An amount of travel equivalent to one vehicle traveling one mile.

Vehicle Occupancy: The number of persons per vehicle. Usually an average number for a specified trip type, area and analysis year.

Vibration Propagation: The transfer of vibration through soil or other media.

Vibration Propagation Test: A test which provides an estimate of vibration levels as a function of distance from a vibration source, in this case the right rail vehicle. Tests are done on the surface to evaluate propagation at-grade, or at the bottom of a bore hole for tunnel routes.

Vibration Velocity: Vibration velocity is the basic measure of ground-borne vibration. It is a measure of the rate at which particles in the ground are oscillating relative to the equilibrium point.

Vibration Velocity Level: It is generally accepted that, over the frequency range important for ground-borne vibration from transit systems, human response to vibration is best correlated to the root-mean square (rms) vibration velocity. In this report rms vibration velocity is always expressed as decibels relative to 1 micro-inch per second. A one second rms time constant is assumed. The units are abbreviated as VdB to avoid any confusion with noise decibels.

Viewer Employed Photography (VEP): A process by which 'stakeholders' - community members, business owners, etc. - are enlisted to contribute to a planning process through the use of photographic documentation. The stakeholders photograph areas or points of interest and/or concern. The resultant photographs are used to help establish values and objectives for the planning process.

Visual Amenity: An object or element (such as buildings or vegetation) which enhance the visual character of a view or area.

Visual Encroachment: The imposition of an object, or objects, on a view such that the view is disrupted, obstructed or otherwise modified from its original state.

Visual Resource Management: An inventory, analysis, and planning process which, through the identification of values and establishment of associated objectives, is employed to establish future management practices.

Walk-on-Station: A station where the primary mode of arrival is by walking. This type of station will be targeted at high-density residential areas and employment concentrations.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX D.2
List of Acronyms

Appendix D.2 List of Acronyms and Abbreviations

AC Alternating Current

ACGIH American Conference of Governmental Industrial Hygienists

ACHP Advisory Council on Historic Preservation

ADA Americans with Disabilities Act

ADT Average Daily Traffic

AVO Average Vehicle Occupancy

APC Automatic Passenger Counter

APE Area of Potential Effect

AV Assessed Valuation

BA Biological Assessment

BMP Best Management Practice

BNSF Burlington Northern Santa Fe Railroad

Btu British Thermal Unit

CAA Clean Air Act

CAWA Clean Air Washington Act

CBD Central Business District

CERCLA Comprehensive Environmental Response Compensation and Liability Act

CFR Code of Federal Regulations

CO Carbon Monoxide

CPI Consumer Price Index

CPP County-wide Planning Policies

CPS Convention Place Station

CPS RTA Central Puget Sound Regional Transit Authority

CPTED Crime Prevention through Environmental Design

CSO Combined Sewer Overflows

CT Community Transit

dB Decibel

dBA A-weighted decibel

DC Direct current

deNR Determined eligible for National Register

DO Dissolved Oxygen

DOR Department of Revenue

DSTT Downtown Seattle Transit Tunnel

Ecology Washington State Department of Ecology

EIS Environmental Impact Statement

EMF Electromagnetic Fields

eNR eligible for National Register

EPA U. S. Environmental Protection Agency

ESA Endangered Species Act

eSL Eligible Seattle Landmark

FEMA Federal Emergency Management Agency

FFGA Full Funding Grant Agreement

FGTS Freight and Goods Transportation System

FHWA Federal Highway Administration

ft feet/foot

FTA Federal: Transit Administration

G gauss

GMA Growth Management Act

GTC Ground Transportation Center

GVW Gross Vehicle Weight

HAL High Accident Location

HC Hydrocarbons

HCM Highway Capacity Manual

HCT High Capacity Transit

HOV High-Occupancy Vehicle

HPO Historic preservation officer

Hz Hertz

IAC Interagency for Outdoor Recreation

ICNIRP International Commission on Non-ionizing Radiation Protection

IDS International District Station

IMC Intermodal Center

ISTEA Intermodal Surface Transportation Efficiency Act

JRPC Joint Regional Policy Committee

KCM King County Metro

kV Kilovolt

kWH Kilowatt Hour

L_{dn} 24-hour, Time Averaged, A-weighted Sound Levels

L_{eq} Equivalent Continuous sound Levels

L_{max} Maximum Noise Levels

LOS Level of Service

LPA Locally Preferred Alternative

LPB Landmarks Preservation Board

LRT Light Rail Transit

LRV Light Rail Vehicle

mG milligauss

mgd million gallons per day

mi mile

min minute

MIS Major Investment Study

MOA Memorandum of Agreement

METRO Municipality of Metropolitan Seattle

MOS Minimum Operable Segment

mph miles per hour

MPO Metropolitan Planning Organization

MTCA Model Toxics Control Act

MTP Metropolitan Transportation Plan

MVET Motor Vehicle Excise Tax

MW megawatt

NAAQS National Ambient Air Quality Standards

NCAA North Corridor Alternatives Analysis

NEAT North End Airport Terminal

NEPA National Environmental Policy Act

NMFS National Marine Fisheries Service

NOAA National Oceanic and Atmospheric Administration

NO_x Oxides of Nitrogen

NRHP National Register of Historic Places

O&M Operations and Maintenance

OCS Overhead Catenary System

OP Olmsted Parks

PA Programmatic Agreement

PCBs Polychlorinated Biphenyls

$PM_{2.5}$ Particulate matter (2.5 microns or less in size)

PM_{10} Particulate matter (10 microns or less in size)

PPM Parts per million

PRT Personal Rapid Transit

PSAPCA Puget Sound Air Pollution Control Agency

PSRC Puget Sound Regional Council

RCRA Resource Conservation and Recovery Act

RCW Revised Code of Washington

RMS Root Mean Square

ROD Record of Decision

RPZ Residential Parking Zone

RSIP Residential Sound Insulation Program

RTA Regional Transit Authority

RTP Regional Transportation Plan

SCS Soil Conservation Service

SEPA State Environmental Policy Act

SHPO State Historic Preservation Officer

SIP State Implementation Plan

SL Seattle Landmark

SOV Single Occupancy Vehicle

SPD Seattle Police Department

SRD Special Review District

STS Satellite Transit System

T Tesla

TAZ Transportation Analysis Zone

TBM Tunnel Boring Machine

TCP Traditional Cultural Properties

TDM Transportation Demand Management

TEA-21 Transportation Equity Act for the 21st Century

TIP Transportation Improvement Program

TOD Transit Oriented Development

TPSS Traction-Powered Substation

TSCA Toxic Substances Control Act

TSM Transportation Systems Management

UGA Urban Growth Area

UGB Urban Growth Boundary

UMTA Urban Mass Transportation Administration

UP Union Pacific

UPSP Union Pacific-Southern Pacific

U.S. DOT United States Department of Transportation

U.S. EPA United States Environmental Protection Agency

U.S. FWS United State Fish and Wildlife Service

UST Underground Storage Tank

UWUniversity of Washington

V Volts

V/CVolume to Capacity Ratio

VdB Vibration decibels

VEP Viewer Employed Photography

VHT Vehicle Hours Traveled

VMT Vehicle Miles Traveled

VOC Volatile Organic Compounds

VRM Visual Resources Management

WAC Washington Administrative Code

WDFW Washington Department of Fish and Wildlife

WDNR Washington Department of Natural Resources

WHR Washington Heritage Register

WSDOT Washington Department of Transportation

WSF Washington State Ferries

yd^3 cubic yard

YOE Year of Expenditure

Sound Transit
Central Link Light Rail Final EIS

APPENDIX D.3
References

Appendix D.3 References

_____. American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada. Policy Studies Journal 16(4):751-767. 1988

_____. Archaeological Monitoring of the SW 43rd Street (South 180th Street) Construction Project. Letter report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1983.

_____. Commercial Waterway District No. 1. Map E-12-2-102, on file, U.S. Army Corps of Engineers, Seattle. Microfiche. 1911.

_____. Cultural Resource Assessment, Rabanco Transfer Station, Black River Quarry, King County. National Archaeological Database Document No. 1334006 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. April 2, 1991.

_____. Cultural Resource Monitoring Alki Transfer/CSO Project, Allentown Truck. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. October 13, 1995.

_____. Cultural Resources Field Assessment of the Fred Meyer Corporation Building Project Area, Renton, King County, Washington. National Archaeological Database Document No. 1334401 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. December 21, 1994.

_____. Duwamish-Puyallup Surveys, Sheet 3-5: South Park, Race Track, and Riverton. Map E-12-4-0, on file, U.S. Army Corps of Engineers, Seattle. Microfiche. 1907.

_____. Mythology of Puget Sound. Journal of American Folklore 37:371-438. Protat Brothers, Macon, France. 1924.

_____. Puget Sound Geography. Unpublished manuscript on file, Pacific Northwest Collection, Allen Library, University of Washington, Seattle. Ca. 1920.

_____. The Archaeology of West Point, Seattle, Washington: 4,000 Years of Hunter-Fisher-Gatherer Landuse in Southern Puget Sound. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1995.

_____. Tualdad Altu (45-KI-59): A 4th Century Village on the Black River, King County, Washington. Report on file, Office of Archaeological and Historic Preservation, Lacey, Washington. 1988.

36 CFR 800: Protection of Historic Properties. Regulations of the Advisory Council on Historic Preservation Governing the Section 106 Review Process. U.S. Government Printing Office, Washington, D.C. 1986 (reprinted 1992).

ACHP. Draft Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review. Advisory Council on Historic Preservation, Washington, D.C. N.D.

Adolfson Associates, Inc. Tacoma-to-Seattle Commuter Rail Environmental Assessment. Prepared for the Central Puget Sound Regional Transit Authority – Sound Transit. June 1998.

Advisory Council on Historic Preservation. 36 CFR 800. Protection of Historic Properties: Recommended Approach for Consultation on Recovery of Significant Information From Archaeological Sites; Final Rule and Notice. Federal Register 64(95):27071-27086. U.S. Government Printing Office, Washington, D.C. May 18, 1999.

Advisory Council on Historic Preservation. A compendium of policy statements: Native American Concerns, Consultation with Native Americans Concerning Properties of Traditional Religious and Cultural Importance. Advisory Council on Historic Preservation, Washington, D.C. June 11, 1993.

Alexander, V. November 4, 1998. Personal communication (telephone conversation between Venus Alexander and Peter Sparhawk, Herrera Environmental Consultants). King County Fire District No. 20, Seattle, WA.

Anderson, B. May 27, 1998. Personal communication (telephone conversation with Kathleen Adams, Herrera Environmental Consultants). The Falcon Research Group.

Anderson, D. July 2, 1998. Personal communication (meeting between David Anderson, Manager for Transportation, and Sound Transit representatives). Seattle School District, Seattle, WA.

Anyon, R. 1991. Protecting the Past, Protecting the Present: Cultural Resources and American Indians. In, G.S. Smith and J.E. Ehrenhard (eds.) Protecting the Past, pp: 215-222.

Atwater. 1987. "Evidence of Great Holocene Earthquakes Along the Outer Coast of Washington State," SCIENCE Vol. 236; pp. 942 – 944.

Bagby, J. June 12, 1998. Personal communication (telephone conversation with Peter Sparhawk, Herrera Environmental Consultants). Seattle Public Utilities, Solid Waste Utility.

Bagley, C. 1929. History of King County, Washington. S.J. Clarke Publishing Company, Chicago. 1929.

Bass, S.F. Pigtail Days in Old Seattle. Lawmen & Hanford Co., Seattle. 1937.

Bauman, K. May 14, 1999. Personal communication. (telephone conversation with Kittie Ford, Herrera Environmental Consultants). Acting Senior Ecologist. King County Department of Natural Resources. Ecological Services Unit. King County, Washington.

Berk & Associates, Inc., "Dearborn-Hiawatha Redevelopment Study D Commercial Space Market Analysis," Seattle, Washington, September 1996.

Berk & Associates, Inc. "Market Review and Assessment of Transit Oriented Development Opportunities". City of SeaTac and Sound Transit Review Draft. August, 1998.

Birnbaum, C.A. and R.R. Page. Revealing the Value of Cultural Landscapes. CRM 17(7):3-4, 47-48. National Park Service, Washington, D.C. 1994.

Blair, William G.E., "Visual Impact Assessment in Urban Environments," in Fundamentals for Visual Project Analysis (Smardon, Palmer, and Felleman, editors), John Wiley and Sons, Inc., New York, 1986.

Blukis Onat Applied Sciences (BOAS). Renton Effluent Transfer System Construction Contract Report ETS-3C/3D. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1985.

Bortleson, G.C., M.J. Chrzastowski and A.K. Helgerson. Historical Changes of Shoreline and Wetland at Eleven Major Deltas in the Puget Sound Region (Sheet 7). U.S. Geological Survey, Reston, Virginia. 1980.

Brown, H. A., R. B. Bury, D. M. Darda, L. V. Diller, C. P. Peterson, and R. M. Storm. 1995. Reptiles of Washington and Oregon. Seattle Audubon Society, Seattle, Washington.

BST Associates. Economic Impacts of Maintenance Base and Light Rail Alignment Alternatives in the South Downtown. June 10, 1999.

BST Associates. Duwamish Industrial Area Economic Assessment. March 10, 1999.

Burney, M.S. Traditional Use Areas and Cultural Properties on the Aboriginal Landscape of the Umatilla, Cayuse, and Walla Walla of Northeastern Oregon and Southeastern Washington. Paper presented at the 45th Annual Northwest Anthropological Conference, Simon Fraser University, Burnaby, British Columbia. 1992.

Burney, M.S., J. Van Pelt, and P. Minthorn. Palineewas: A Traditional Cultural Property of the Umatilla, Cayuse, Walla Walla and Nez Perce of the Southern Plateau of the Pacific Northwest. Paper Prepared for the 46th Annual Northwest Anthropological Conference, Western Washington University, Bellingham, Washington. 1993.

Burney, M.S., M.J. Farrow, R. George, H. Hester, C. Scheeler, P. Minthorn, J.Van Pelt, and J.R. Winkinson. Response Comments to the Hanford Reach of the Columbia River Draft Comprehensive River Conservation Study and Environmental Impact Statement. Submitted to the Department of Energy, Richland, Washington by the Confederated Tribes of the Umatilla Indian Reservation. 1992.

California Department of Transportation. 1983. Energy and Transportation Systems. California Department of Transportation, Division of Engineering Services, Office of Transportation Laboratory. Sacramento California.

California Department of Transportation. 1996. California Highway Construction Cost Index. California Department of Transportation, Office of Office Engineer. Sacramento California.

Campbell, S.K. The Duwamish No.1 Site: A Lower Puget Sound Shell Midden. Office of Public Archaeology, University of Washington, Seattle, Research Report 1. 1981.

Carr, M. June 18, 1998. Personal communication (meeting between Mary Carr, Director of Transportation, and Sound Transit representatives). Highline School District, SeaTac, WA.

Carter, J.A. Historical Maps Relative to Archaeologically Sensitive Areas for the City of Tukwila Manufacturing/Industrial Center. Letter to Vernon Umetsu (City of Tukwila) on file, Historical Research Associates, Inc., Seattle, Washington. December 26, 1997.

Central Puget Sound Regional Transit Authority (RTA), Central Project Justification Report, November 1993.

Central Puget Sound Regional Transit Authority. September 1995. Title VI Submission to the Federal Transit Administration – Region X of the U.S. Department of Transportation. Seattle, Washington.

Cervero, Robert, "Transit-Supportive Development in the United States: Experiences and Prospects", DOT-T_94-08, University of California, Berkley, December 1993.

Chatters, J.C. Archaeology of the Sbabadid Site, 45-KI-51, King County, Washington. Office of Public Archaeology, University of Washington, Seattle. 1981.

Chatters, J.C., D.E. Rhode, and K.A. Hoover. Tualdad Altu (45-KI-59): A Prehistoric Riverine Village in Southern Puget Sound. Archaeology in Washington, Volume II. 1990.

Chen, Hong, Rufolo, Anthony, and Drucker, Kenneth. "Measuring the Impact of Light Rail Systems on Single-Family Home Values: A Hedonic Approach with Geographic Information System Application." Transportation Research Record 1617, Paper No. 98-1250. 1998.

Coleman, Patrick J., Euritt, Mark A., Walton, C. Michael, "Dallas Area Rapid Transit Impact Study: A Framework for Assessing Land Use and Development Impacts," Research Report SWUTC/92/60024-1, The University of Texas at Austin, 1993.

Converse. 1983. Renton Effluent Transfer System.

Council on Environmental Quality. December 10, 1997 [released July 1998]. Environmental Justice; Guidance Under the National Environmental Policy Act. Executive Office of the President, Washington, D.C.

Crandall Aramula PC and Leland Consulting Group. "Link Light Rail, Tukwila Segment, Phase One Market Analysis". Prepared for the City of Tukwila. July,1998.

Creasy, W. and R. Goldberg. 1993. Safety of High Speed Guided Ground Transportation Systems; Potential Health Effects of Low Frequency Electromagnetic Fields due to Maglev and Other Electric Rail Systems. Prepared for the Federal Railroad Administration, Washington, D.C. by Information Ventures, Inc., Philadelphia, Pennsylvania.

Crisp, W. 1996. Practical Application of Low-Income Guidelines in Environmental Justice Analyses. Unpublished report, CH2M HILL, Seattle, Washington.

Dalan, R., S. Hunt and S. Wilke. Cultural Resource Overview and Reconnaissance: Green River Flood Damage Reduction Study. Geo-Recon International, Seattle. Report on file, US Army Corps of Engineers, Seattle. 1981.

Dames and Moore. 1960a. Consolidated Dairy Products.

Dames and Moore. 1960b. Tradewell.

Dames and Moore. 1966. University of Washington, Proposed Student Services Building.

Dames and Moore. 1967. Proposed Terminal Building Expansion and Multistory Parking Facility.

Dames and Moore. 1969. Proposed South Access Road – Terminal Area Drive.

Dames and Moore. 1992. South Aviation Support Area DEIS.

Denny, E.I. Blazing the Way: True Stories, Songs and Sketches of Puget Sound and other Pioneers. Rainier Printing Company, Seattle. 1909.

Dorpat, P. 294 Glimpses of Historic Seattle, Its Neighborhoods and Neighborhood Businesses. Third Edition. Paul Dorpat, 603 Westlake N., Seattle, Washington. 1981.

Downs, J. July 13, 1998. Personal communication (letter from Jim Downs, Fire Chief, to Cal Hoggard, SeaTac City Manager, and Jay Holman, SeaTac Assistant City Manager). City of SeaTac Fire Department, SeaTac, WA.

Downtown Seattle Association. 1998. Information and Resource Guide.

Dragovich, J.D., P.T. Pringle, and T.J. Walsh. Extent and Geometry of the Mid-Holocene Osceola Mudflow in the Puget Lowland: Implications for Holocene Sedimentation and Paleogeography. Washington Geology 22(3):3-26. 1994.

Dvornich, K. M., K. R. McAllister, and K. B. Aubry. 1997. Amphibians and Reptiles of Washington State: Location Data and Predicted Distributions. Volume 2 in Washington State Gap Analysis Project Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.). University of Washington, Washington Cooperative Fish and Wildlife Research Unit, Seattle, Washington.

Eacker, R. April 6, 1999. Personal communication (letter to Mike Merrick, Sound Transit, regarding results of Corrpro Companies' rail insulation testing on Portland Tri-Met's MAX Hillsboro extension line). Sound Transit/LTK Engineering, Seattle, Washington.

Ecology, 1998. Washington State Department of Ecology Proposed 1998 303 (d) List of Threatened and Impaired Water Bodies.

ECONorthwest et al. "Seattle Station Area Planning, Market Analysis, and Development Strategies." Prepared for the City of Seattle. September, 1998.

Eggert, S., K. Hentschel, I. Ruppe, and S. Goltz. 1997. Electric and Magnetic Fields Emitted by Electrified Transport Systems—A Comparison between Conventional Railroad Systems and the Transrapid Maglev System (meeting abstract). in: Abstracts from the Second World Congress for Electricity and Magnetism in Biology and Medicine, 8–13 June 1997, Bologna, Italy.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The Birders Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster, New York, New York.

Elmore, S.H. Archaeological Test Coring at the Proposed Tukwila Development Site. Letter report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. April 21, 1980.

EMF-Link. 1996. EMF Health Report Reanalysis Shows Increased Cancer Incidence for Electric Rail Workers. In EMF-Link, an on-line service provided by Information Ventures, Inc. Internet address: http://infoventures.com.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1. U.S. Army Corps of Engineers, Waterway Experiment Station, Vickburg, Mississippi.

Eschmeyer, W. N., O. W. Herald, and H. Hammann. 1983. A Field Guide to Pacific Coast Fishes of North America. Houghton Mifflin Company, Boston, Massachusetts.

Forsman, L.A. Assessing Traditional Cultural Properties in Urban Settings: An Example from the Duwamish River Valley in Southern Puget Sound: Alki Transfer/CSO (Combined Sewage Outfall) Transfer Project, Traditional Cultural Properties Assessment. Paper presented at the 47th Annual Northwest Anthropological Conference, Spokane, Washington. March 31, 1994.

Forsman, L.A. and B. Peterson. Perspectives on Tribal Consultation and the West Point Project. Paper presented at the 46th Northwest Anthropological Conference, Bellingham, Washington. March 26, 1993.

Forsman, L.A., D.E. Lewarch, and L.L. Larson. Denny Way/Lake Union Combined Sewer Overflow Control Project, Seattle, King County, Cultural Resources Assessment. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. February 28, 1997.

Forsman, L.A., J. Robbins, and L.L. Larson. Proposed RTA South Corridor Longacres Station Alternative Cultural Resource Assessment. Letter to Lloyd Skinner (Adolfson Associates) on file, Office of Archaeology and Historic Preservation, Lacey, Washington. March 23, 1998.

Forsman, L.A., P.S. Solimano, and L.L. Larson. FINAL REPORT: Seattle-Tacoma Commuter Rail Project, Cultural Resource Overview. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1994.

Gannett-DeLeuw. 1990. Rail Transit Technology and Design Guidelines. Seattle, Washington.

Goellner, D., B. Wilson, R. Reiter, A. Pilla, N. Hankin, L. Gillette, and B. Hostage. 1993. Safety of High Speed Guided Transportation Systems: Review of Existing EMF Guidelines, Standards and Regulations. John A. Volpe National Transportation Systems Center, Cambridge, Massachusetts. August 1993.

Grant, D. and L.L. Larson. Cultural Resource Monitoring of the Proposed Waterworks Project, Metro's East Division Water Reclamation Plant, Renton, King County, Washington. National Archaeological Database Document No. 1333995 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. June 7, 1994.

Grant, W.P., W.J. Perkins, and T.L. Youd. Liquefaction Potential Map, Seattle. U.S. Geological Survey, Open File Report 91-441-T. 1992.

Gray, D. June 16 and 24, 1998. Personal communication (internal Seattle City Light memo from Dennis Gray to Michelle Dewey, and comments made at meeting between Sound Transit and Seattle Utility providers). Seattle City Light.

Green River Basin Program. 1984. Green River Management Agreement. Sponsored by King County, City of Auburn, City of Kent, City of Renton, and City of Tukwila.

Green River Basin Program. 1984. Green River Management Agreement.

Haeberlin, H.K. SbeTeTDA'Q, a Shamanistic Performance of the Coast Salish. American Anthropologist 20(3):248-257. 1918.

Hanley, J.R. Archaeological Site Record Form for site 45-KI-51, the Earlington Woods Site. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. July 12, 1979.

Hansen, C. An Open Letter to the Members of the Society for American Archaeology 63 Annual Meeting in Seattle, Washington, from the Duwamish Tribe. Letter on file, CH2M HILL, Inc. March 24, 1998.

Hart Crowser, Inc. Football/Soccer Stadium and Exhibition Center Project: Appendix K, Cultural and Archaeological Resources Technical Report. Report on file, Historical Research Associates, Inc., Seattle, Washington. January 15, 1998.

Hart, J. L. 1973. Pacific Fishes of Canada. Bulletin 189. Fisheries Research Board of Canada. Canadian Government Publishing Centre Supply and Services, Ottawa, Canada.

Haynes, D. July 29, 1998. Personal communication (meeting between Lt. Dave Haynes and Sound Transit representatives). Tukwila Police Department, Tukwila, WA.

Heffron Transportation, Draft Access Duwamish Truck Mobility Report, May 1,1998.

Hinshaw, Mark, Phase II Draft Community Image Development, City of Tukwila, 1993.

Holmes, B.G. and G.L. Possehl. Archaeological Site Record Form for site 45-KI-6. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. August 9, 1963.

Interagency Working Group on Environmental Justice (IWG). August 8, 1995. Draft Guidance for Federal Agencies on Key Terms in Executive Order 12898. EPA Office of Environmental Justice, Washington, DC [Note: This was also included as Appendix A in Council on Environmental Quality, December 10, 1997, Environmental Justice; Guidance Under the National Environmental Policy Act.].

"Interlocal Agreement between Port of Seattle and City of SeaTac" September 1997.

Jainga, J. July 16, 1998. Personal communication (letter to Peter Sparhawk, Herrera Environmental Consultants). Municipal land planner, Puget Sound Energy, Seattle, Washington.

Jermann, J. SW 43rd Street/S 180th Street Project Archaeological Survey. Letter report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. November 25, 1974.

Johnson, Hanson, Padrick, Collins, Tukwila Hillsides: Design and Development Standards, City Of Tukwila, 1990.

Johnson, R. E. and K. M. Cassidy. 1997. Terrestrial Mammals of Washington State: Location Data and Predicted Distributions. Volume 3 in Washington State Gap Analysis Project Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.). University of Washington, Washington Cooperative Fish and Wildlife Research Unit, Seattle, Washington.

Joint Center for Urban Mobility Research Rice Center, "Assessment of Changes in Property Values in Transit Areas". 1987.

Jones, Gregory, "A Program of Joint Development for Denver's Crossmall Transitway Final Report, "Stimulating Development along the Transitway Crossmall in Denver, Colorado,"FTA-CO-08-7001-94-1, National Technical Information Service, Springfield Virginia, 1994.

Jones and Stokes Associates, Inc. Draft Technical Report: Cultural Resources, The Boeing Company, Longacres Office Park, Renton, Washington. Prepared by Northwest Archaeological Associates, Inc., Seattle. Report on file, Office of Archaeology and Historic Preservation, Lacey. 1992.

Kennedy, H. Archaeological Site Record Form for site 45-KI-267. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. July 24, 1985.

King County Geographic Information System. "CD#2, Assessor's Extracts, DBF IV Format". February, 1998.

King County. Shoreline Master Program.

King County. 1987. Parks, Planning, and Resource Department. Wildlife Habitat Profile. King County Open Space Program.

King County. 1994. Comprehensive plan. Text and technical appendices. King County Parks, Planning and Resources Department, King County, WA.

King County. 1994. Department of Development and Environmental Services, West Hill Community Plan and Area Zoning.

King County 1994. Natural Resources and Parks Division. Green River Trail- Phase 1. May.

King County. 1995. Department of Metropolitan Services. Combined Sewer Overflow Control Plan, 1995 Update: An Amendment to Metro's Comprehensive Water Pollution Control Abatement Plan.

King County. 1995. Department of Natural Resources, Water Quality Assessment. Regional Wastewater Services.

King County. 1997. Des Moines Creek Basin Plan. Des Moines Creek Basin Committee: City of SeaTac, City of Des Moines, Port of Seattle, King County. Washington.

King County 1998. Department of Transportation. Bicycling Guidemap.

King County. 1998. King County Police Department. 1997 SeaTac Police Services Annual Report. Seattle, Washington.

King County. 1998a. Information obtained from King County Sheriff's Office Internet page. Internet address: http://www.metrokc.gov/sheriff/. Date of visit: November 4, 1998.

KJS Associates, Inc. 1995. Guidebook for Conformity—Air Quality Analysis Assistance for Nonattainment Areas. May.

Korve Engineering. 1999a. Sound Transit LRT – Auto 2020 Intersection and Crossing Collision Analysis. Memorandum from Korve Engineering to Sound Transit. June 25, 1999.

Korve Engineering. 1999b. Sound Transit pedestrian safety analysis – Task 1. Memorandum from Brent Ogden, Korve Engineering, to Bill Whitbred, Sound Transit. July 16, 1999.

Lamison-White, L. September 1997. Personal Communication (telephone). Poverty Analyst, Bureau of Census, Washington D.C.

Landis John, Guhathakurta, Subhrajit, Huang, William, Zhang, Ming, et al., "TURD Rail Investments, Real Estate Values, and Land Use change:" A Comparative Analysis of Five California Rail Transit Systems, University of California at Berkeley, July 1995.

Lane, B. The Duwamish Indians and the Muckleshoot and Port Madison Indian Reservations. Report on file, Office of Archaeology and Historic Preservation, Lacey. 1983.

Larkin Group. Survey of grade-separation criteria of various North American transit operators. Memos to Sound Transit. August 5, 1999.

Larson, L.L. and D.E. Lewarch. Metro Regional Treatment Plant Enlargement, Cultural Resource Assessment. National Archaeological Database Document No. 1333986 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. March 19, 1991.

Leonard, W. P., H. A. Brown, L.L.C. Jones, K. R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Seattle, Washington.

Lewarch, D.E. Archaeological Site Record Form for site 45-KI-439, the Renton Sears-Fred Meyer Store Site. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. December 15, 1994.

Lewarch, D.E., E.W. Bangs, and L.L. Larson. Cultural Resources Assessment of the Schneider Homes Renton Apartments Project, Renton, King County, Washington. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. July 17, 1996.

Lewarch, D.E., L.L. Larson, J. Robbins, and P.S. Solimano. Metro Alki Transfer/CSO Project, Allentown Site (45-KI-431), Survey and Evaluation. National Archaeological Database Document No. 1334014 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. May 14, 1993.

Lewarch, D.E., L.L. Larson, L.A. Forsman, G.F. Moura, E.W. Bangs, and P.M. Johnson. King County Department of Natural Resources Water Pollution Control Division Alki Transfer/CSO Facilities Project, Allentown Site (45-KI-431) and White Lake Site (45-KI-438 and 45-KI-438A) Data Recovery. National Archaeological Database Document No. 1334688 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. June 7, 1996.

Lewis-Workman, Steven and Brod, Daniel. "Measuring the Neighborhood Benefits of Rail Transit Accessibility." Transportation Research Record 1576. 1997.

Litman, Todd, 1995. "Transportation Cost Analysis for Sustainability", Victoria Transport Policy Institute, Victoria, British Columbia, Canada.

Matelich, T. June 18, 1998. Personal communication (conversation with Nona Diediker, Herrera Environmental Consultants). Val-Vue Sewer District, Tukwila, Washington.

Meninick, J. and R. Winthrop. Talking with Anglos: Cultural Barriers to Communicating an Indian Perspective on Environmental Impacts. MS on file, Cultural Resources Program, Yakama Indian Nation, Toppenish, Washington. 1995.

METRO. 1986. Gilliam Creek Drainage Basin Study. Prepared for the City of Tukwila by Kramer, Chin & Mayo, Seattle, Washington.

METRO. 1993. City of Tukwila Surface Water Management Comprehensive Plan, Final Report. Prepared for city of Tukwila by Kramer, Chin & Mayo, Inc. Seattle, Washington.

METRO. 1996. Personal communication of May 6, 1996 with Randy Parker, Associate Transportation Planner, METRO, Portland Oregon (information supplied to Mr. Parker by Tri-Met, Portland, Oregon).

Metro's Comprehensive Water Pollution Control Abatement Plan.

Micheau, D. June 17, 1998. Personal communication (conversation with Peter Sparhawk, Herrera Environmental Consultants). City of Tukwila Public Works.

Minnesota IMPLAN Group, Inc. "1995 IMPLAN Multiplier Reports". 1998.

Minor and Associates. 1998. Portland Westside Light Rail Tunnel Construction Noise and Vibration Mitigation Technical Report and Measured Construction Noise Levels Data Base. On file in offices of Michael Minor and Associates. Portland, Oregon. May 1998.

Mochizuki, R. June 18, 1998. Personal communication (letter from Ron Mochizuki, Captain, Special Operations Section, to Peter Sparhawk, Herrera Environmental Consultants). Seattle Police Department, Seattle, WA.

Montieth, M. June 18, 1998. Personal communication (conversation with Nona Diediker, Herrera Environmental Consultants). Midway Sewer District, SeaTac, Washington.

Muckleshoot. 1995. The Distribution and Growth of Green River Chinook Salmon (Oncorhynchus tshawytscha) and Chum Salmon (Oncorhynchus keta) Outmigrants in the Duwamish Estuary as a Function of Water Quality and Substrate. Muckleshoot Indian Tribe, Fisheries Department, Water Resources Division.

Municipality of Metropolitan Seattle (Metro), Regional Transit Project Central Corridor Project Justification Report, November 1993.

Municipality of Metropolitan Seattle (Metro), Regional Transit System Plan Draft Environmental Impact Statement, October 12, 1992.

Municipality of Metropolitan Seattle (Metro), Regional Transit System Plan Final Environmental Impact Statement, March 1993.

Murakami E., and J. Young. October 26, 1997. Daily Travel by Persons with Low Income. Paper for the 1995 Nationwide Personal Transportation Survey Symposium, Bethesda, Maryland.

Nagorsen, D. W. and R. M. Bringham. 1993. Bats of British Columbia. UBC Press, Vancouver, British Columbia.

National Marine Fisheries Service. 1998. Environmental and Technical Services Division. Agency correspondence on the presence of endangered or threatened anadromous fish species in the study area.

National Park Service (NPS). National Park Service. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15, , Washington, D.C. 1991.

National Transportation Library. 1993. California Motor Vehicle Stock, Travel and Fuel Forecast. California Department of Transportation, Office of Traffic Improvement. Sacramento, California.

Negri, Steve. May 13, 1998. Personal communication (telephone conversation with Kathleen Adams, Herrera Environmental Consultants). Wildlife biologist, Washington Department of Fish and Wildlife, Region IV, Mill Creek..

Nesbitt, E.A. Marine Fauna of the Middle Eocene Tukwila Formation, King County. Washington Geology 26(1):13-19. Washington State Department of Natural Resources, Olympia. April 1998.

NMFS. 1998. Agency correspondence on the presence of endangered or threatened anadromous fish species in the study area. National Marine Fisheries Service, Environmental and Technical Services Division.

Northwest Power Planning Council. 1996. Northwest Power in Transition: Opportunities and Risks. Northwest Power Planning Council. Portland, Oregon.

NPS. 1994. NPS-28: Cultural Resource Management Guidelines. National Park Service, Washington, D.C. 1994.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho.

Oak Ridge National Laboratory. 1997. Transportation Energy Data Book: Edition 17. Prepared for the U.S. Department of Energy, Office of Transportation Technologies.

Ojima, Frederick Y. July 14, 1998. Personal communication (letter to Nona Diediker of Herrera Environmental Consultants regarding analysis of power frequency magnetic fields along various light rail routes). Seattle City Light.

Ombudsman for Fairness for all in British Columbia, "Skytrain Report", Public Report No. 8, November, 1987.

Palmer, S.P., H.W. Schasse, and D.K. Norman. Liquefaction Susceptibility for the Des Moines and Renton 7.5-minute Quadrangles, Washington. State of Washington Division of Geology and Earth Resources, Geologic Map GM-41. 1994.

Parametrix. 1992. Des Moines Creek Water Quality Study.

Parametrix. 1992. Des Moines Creek Water Quality Study. Unpublished report for FAA Port of Seattle, Seattle, Washington. 10pp + Appendices.

Parker, P.L. (ed.). Traditional Cultural Properties: What You Do and How We Think. CRM Volume 16, Special Issue. National Park Service, Washington, D.C. 1993.

Parker, P.L. and T.F. King. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38, National Park Service, Washington, D.C. 1990.

Parson Brinckerhoff/Kaiser Engineers Team (Parsons/Kaiser). 1991j. Rail Technologies and Design Guidelines Update Report. Seattle, Washington.

Parson Brinckerhoff/Kaiser Engineers Team (Parsons/Kaiser). 1991k. Rail Technology Perspective Technical Memorandum. Seattle, Washington.

Parson Brinckerhoff/Kaiser Engineers Team (Parsons/Kaiser). 1992. Transit Technology overview. Technical Memorandum. Draft Final. Seattle, Washington.

Penhale, E. Indian Remains Discovered at Trade Center Building Site. Seattle Post-Intelligencer. February 6, 1998.

Pojar, J. and A. Mackinnon. 1994. Plants of the Pacific Northwest. Ministry of Forests and Pine Cone Publishing, Redmond, Washington.

Porter & Associates, Inc., An Economic Analysis of Sound Move, October 1996.

Presidential Executive Order 12898. February 11, 1994. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal Register, Vol. 59, No. 32, Wednesday, February 16, 1994, 7629-7633. Washington D.C.

PSRC, Regional Review, Monitoring Change in the Central Puget Sound Region, September 1997.

PSRC. 1993. Multicounty Planning Policies for King, Kitsap, Pierce and Snohomish Counties. (March 1993).

PSRC. 1995. Metropolitan Transportation Plan. May.

PSRC. 1995. Vision 2020 – 1995 Update – Growth Management, Economic and Transportation Strategy for the Central Puget Sound Region.

PSRC. 1995. Metropolitan Transportation Plan – The Transportation Element of Vision 2020, The Region's Growth Management, Economic and Transportation Strategy. (May 1995).

PSRC. 1996. 1996 Amendment to the Metropolitan Transportation Plan for the Central Puget Sound RegionPSRC. 1996. Six-Year Action Strategy. December.

PSRC. 1998. Congestion Management System Baseline.

PSRC. Amendment to the M.T.P. for the Central Puget Sound Region. July 1996.

PSRC. Model Results/Memo. September 29, 1998.

PSRC. VISION 2020. 1995. Update. May 25, 1995.

PSRC. Regional View. July 1998- July 1999.

PSTC. 1998. Sound Transit Link Light Rail Central Line Conceptual Engineering Report, Volume 1. October.

PSRC and the University of Washington Center for Community Development and Real Estate. Industrial Land Supply and Demand in the Puget Sound Region. February 1998.

Puget Sound Council of Governments. 1990. Vision 2020 – Growth and Transportation Strategy for the Central Puget Sound Region (October 1990).

Regional Transit Project. Memorandum to Martin Baker (PB/KE) to Phil Smelley regarding "Statewide Employment and Income Impacts from Construction of Phase I of the Regional Transit System". July 18, 1994.

Reid, A. Archaeological Monitoring at Sbabadid Site (45-KI-51) During the Earlington Woods Development Project, 1990. National Archaeological Database Document No. 1334036 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1991.

Reinartz, Kay Frances. 1991. Tukwila Community at the Crossroads. The City of Tukwila. 1991.

Renton, City of. 1990. Trails Master Plan. September.

Renton, City of. 1990. Shoreline Master Program. (July 16, 1990).

Renton, City of. 1990. Zoning Code. (February 20, 1995).

Renton, City of. 1992. Parks, Recreation and Open Space Master Plan. June.

Renton, City of. 1995. Comprehensive Plan. Revised August 1996. Planning, Building, and Public Works Department.

Renton, City of. 1995. Surface Water Utility Comprehensive Plan. Prepared by HDR Engineering.

Renton, City of. 1996. Comprehensive plan. Adopted February 1995, revised August 1996. Renton, WA.

Renton, City of. 1998a. Information obtained from City of Renton Fire Department Internet page. Internet address: http://www.ci.renton.wa.us/fire/. Date of visit: November 4, 1998.

Renton, City of. 1998b. Information obtained from City of Renton Police Department Internet page. Internet address: http://www.ci.renton.wa.police/. Date of visit: November 4, 1998.

Resources, Wastewater Division, Seattle, Washington.

Robins, J.R. Archaeological Site Record Form for site 45-KI-438, the White Lake Site. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. July 1, 1994.

Robins, J.R., L.L. Larson, and D.E. Lewarch. Cultural Resource Monitoring, Alki Transfer/CSO Facilities Project, Southern Transfer/Interurban Project. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. May 20, 1996.

Robinson, J.M. Archaeological Monitoring of the Washington State Department of Transportation's SR 405:SR 181/Green River Interchange Project, King County, Washington. National Archaeological Database Document No. 1334651 on file, Office of Archaeology and Historic Preservation, Lacey, Washington. August 1995.

Rodrick, E. and R. Milner (eds). 1991. Management Recommendations for Washington's Priority Habitats and Species. Washington Department of Fish and Wildlife, Wildlife Management, Fish Management, and Habitat Management Divisions.

Rosatto, R. June 18, 1998. Personal communication (discussion between Rod Rosatto and Peter Sparhawk, Herrera Environmental Consultants). Nick Raffo Garbage Company, SeaTac, WA.

RTA, Phase I Study Options Results Report, September 9, 1994.

RTA, Regional Transit System Master Plan, October 29, 1994.

RTA, Section 5309 Annual New Starts Report, November 14, 1997.

RTA, Ten-Year Regional Transit System Plan, as adopted May 31, 1996.

Sager, D.P. 1987. Current facts on pacemaker electromagnetic-interference and their application to clinical care. Heart Lung 16(2):211-221.

San Diego Association of Governments, "Economic Contributions of Public Transit in the San Diego Region." 1996.

Saporta, Harry. 1998. Personal communication. August 7, 1998. Staff in a telephone conversation. Tri-Metropolitan Service District. Portland, Oregon. 1998.

Schneider, P. February 2, 1999. Personal communication. (Letter to James Irish, Central Puget Sound Regional Transit, concerning the Central Link Draft EIS). Washington Department of Fish and Wildlife. Mill Creek, Washington.

Scott, J.W. and R.L. DeLorme. Historical Atlas of Washington. University of Oklahoma Press, Norman. 1988.SeaTac, City of, et al. 1997. Draft Des Moines Creek Basin Plan. City of SeaTac, City of Des Moines, Port of Seattle, and King County.

SeaTac, City of. 1991. Department of Planning and Community Development. Sensitive Areas Maps.

SeaTac, City of. 1994. Department of Planning & Community Development. Comprehensive Plan Draft.

SeaTac, City of. "Transit Supportive Land Use Master Plan". 1994.

SeaTac, City of. "Comprehensive Plan". December 1996.

SeaTac, City of. 1997. City of SeaTac Surface Water Plan. Earth Tec, Inc.

SeaTac, City of. 1997. City of SeaTac Surface Water Plan. Prepared by EarthTeck Inc. Bellevue, Washington. 76pp + Appendices City of Seattle. 1995. 1995 Comprehensive Drainage Plan Update. Seattle Engineering Department Drainage and Wastewater Utility.

SeaTac, City of. 1997. Comprehensive Plan. Third Annual Update.

SeaTac, City of 1997. Transit-Supportive Land Use Master Plan.

SeaTac, City of. 1997. Zoning Code. (October 22, 1996).

SeaTac, City of. 1998. SeaTac Fire Department information obtained from the City of SeaTac Internet page. Internet address: http://192.211.16.13/users1/johnsonf. Date of visit: May 18, 1998.

SeaTac, City of. Transit Supportive Land Use Master Plan 1995.

Seattle Central Community College. 1998. Draft Major Institution Master Plan.

Seattle, City of. 1989. Department of Parks and Recreation. Seattle Open Spaces—Parks and Facilities Inventory. January.

Seattle, City of. 1991. COMPLAN—Neighborhood District Preliminary Reports. Madison/Capitol Hill District Parks and Recreation Profile. March.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN—Neighborhood District Preliminary Reports. Downtown District Parks and Recreation Profile. April.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN— Neighborhood District Preliminary Reports. Lake Union District Parks and Recreation Profile. March.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN—Neighborhood District Preliminary Reports. North District Parks and Recreation Profile. April.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN—Neighborhood District Preliminary Reports. Northeast District Parks and Recreation Profile. April.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN—Neighborhood District Preliminary Reports. Southeast District Parks and Recreation Profile. March.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Central Neighborhood District.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Downtown Neighborhood District. October.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Lake Union Neighborhood District. October.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Madison/Capitol Hill Neighborhood District. November.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. North Neighborhood District. November.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Northeast Neighborhood District. November.

Seattle, City of. 1991. Department of Parks and Recreation. New Directions Reports. Southeast Neighborhood District. November.

Seattle, City of. 1991. Department of Parks and Recreation. South Lake Union Park Master Plan. October.

Seattle, City of. 1991. Department of Parks and Recreation. COMPLAN—Neighborhood District Preliminary Reports. Central District Parks and Recreation Profile. March.

Seattle, City of. 1993. Department of Parks and Recreation. COMPLAN—A Functional Plan. May.

Seattle, City of. 1993. Northgate Area Comprehensive Plan.

Seattle, City of. 1993. Seattle Water Department Comprehensive Regional Water Supply Plan.

Seattle, City of. 1994. Office of Management and Planning. Seattle's Comprehensive Plan: Toward a Sustainable Seattle—A Plan for Managing Growth, 1994-2014. Text and appendices. Last printed amendment, November 1995.

Seattle, City of. 1994. Office of Management and Planning. Seattle Comprehensive Plan, Transportation Facilities Map. March.

Seattle, City of. 1994, 1995, 1996, 1997. 1998 Comprehensive Plan – Toward a Sustainable Future – A Plan for Managing Growth 1994 - 2014.

Seattle, City of. 1995. Downtown Plan – Land Use and Transportation Plan for Downtown Seattle. (December 1995).

Seattle, City of. 1995. Office of Management and Planning Seattle Commons/South Lake Union Plan Final Environmental Impact Statement. May.

Seattle, City of. 1995. Seattle Engineering Department, Drainage and Wastewater Utility. 1995 Comprehensive Drainage Plan Update.

Seattle, City of. 1996. Office of Management and Planning. Seattle Comprehensive Plan. November 18.

Seattle, City of. 1996. Seattle City Light. Seattle City Light Existing Resources Portfolio.

Seattle, City of. 1996. Department of Construction and Land Use. Environmentally Critical Areas Folios I, II and III.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Capitol Hill Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Denny Regrade Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Denny Triangle Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Downtown Commercial Core. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. First Hill Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Greater Duwamish Manufacturing Industrial Center. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. International District. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Pike/Pine Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Pioneer Square Neighborhood. August.

Seattle, City of. 1997. Department of Parks and Recreation. Neighborhood Fact Sheets. Queen Anne/Seattle Center Neighborhood. August.

Seattle, City of. 1997. Seattle Transportation Bicycle and Pedestrian Program. Seattle Bicycling Guide Map. January.

Seattle, City of. 1997a. Seattle Police Department 1996 Annual Report.

Seattle, City of. 1997b. Seattle Police Department Strategic Plan: SPD 2001.

Seattle, City of. 1998. Seattle Public Utilities. On the Path to Sustainability: Seattle's Draft Solid Waste Plan for the 21st Century.

Seattle, City of. 1998. Seattle Transportation Bicycle and Pedestrian Program. Seattle Urban Trails Systems Map. January.

Seattle, City of. 1998. Your Seattle Fire Department. Information obtained from the City of Seattle Web page. Internet address: http://www.ci.seattle.wa.us/fire/. Date of visit: May 9.

Seattle, City of. 1998. University Community Urban Center Plan. (adopted November 1998).

Seattle, City of. 1998. Central Area Action Plan II. (adopted November 1998).

Seattle, City of. 1998. Pioneer Square Neighborhood Plan. (adopted November 1998).

Seattle, City of. 1998. Chinatown/International District Strategic Plan. (adopted November 1998).

Seattle, City of. 1998e. Eastlake Neighborhood Plan. (adopted December 1998).

Seattle, City of. 1999. Tomorrow's Roosevelt Neighborhood Plan. (adopted July 1999).

Seattle, City of. 1999. Green Lake 2020 Neighborhood Plan. (adopted July 1999).

Seattle, City of. 1999. First Hill Neighborhood Plan - Final Plan. (adopted March 1999).

Seattle, City of. 1999. Pike/Pine Urban Center Village - Final Neighborhood Plan. (adopted March 1999).

Seattle, City of. 1999. Capitol Hill Urban Center Village - Neighborhood Plan. (adopted May 1999).

Seattle, City of. 1999. The Downtown Urban Center Neighborhood Plan. (adopted May 1999).

Seattle, City of. 1999. Commercial Core Neighborhood Plan. (adopted May 1999).

Seattle, City of. 1999. Belltown Neighborhood Plan. (adopted May 1999).

Seattle, City of. 1999. Denny Triangle Neighborhood Plan. (adopted February 1999).

Seattle, City of. 1999. South Lake Union Neighborhood Plan. (adopted March 1999).

Seattle, City of. 1999. North Beacon Hill Neighborhood Plan, North Beacon Hill Urban Village Plan, and Jefferson Park Concept Plan. (adopted March 1999).

Seattle, City of. 1999. North Rainier Neighborhood Plan. (adopted February 1999).

Seattle, City of. 1999. Draft Greater Duwamish Manufacturing and Industrial Center Plan.

Seattle, City of. 20-Year Comprehensive Plan.

Seattle, City of; department of Construction & Land Use. 1996. Seattle University Major Institution Master Plan.

Seattle, City of; department of Construction & Land Use. 1992. Virginia Mason Medical Center Major Institution Master Plan. (November 1992).

Seattle, City of; department of Construction & Land Use. 1983. Swedish Hospital Medical Center 1983 - 2003 – Proposed Master Plan and Final Environmental Impact Statement.

Seattle, City of; office of Intergovernmental Relations 1997. The Greater Seattle Datasheet.

Seattle, Port of. 1996. Master Plan Update for Seattle-Tacoma International Airport. (January 1996).

Seattle-King County Department of Public Health. November 16, 1995. Georgetown Health Profile. Seattle, Washington.

Seattle-Tacoma International Airport, "Airport Master Plan Update". December 1995.

Seskin, Samuel N., ND. "Development Near Transit: An International Perspective". Taken from "TCRP Project H-1, Transit and Urban Form, Volume 2, Public Policy and Transit Oriented Development: Six International Case Studies," Forthcoming.

Shelton, B. June 18, 1998. Personal communication (conversation with Peter Sparhawk, Herrera Environmental Consultants). City of Tukwila Public Works.

Shinbein, Phillip J., Adler, Jeffrey L, "Land Use and Rail Transit Stations", Transportation Quarterly, Vol. 49, No.3, Summer 1995.

Silver, M. and B. Lemen. July 8, 1998. Personal communication (meeting between Michael Silver, Superintendent of Schools, Beverly Lemen, Transportation Supervisor, and Sound Transit representatives). Tukwila School District #406, Tukwila, WA.

Skolnik, A.M. and D.W. Heiser. Draft EIS: SW 43rd (South 180th) Street, East Valley Road to West Valley Road - - Proposed Joint Project by the Cities of Renton and Kent. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1975.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding Birds of Washington State: Location Data and Predicted Distributions. Volume 4 in Washington State Gap Analysis Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.) Publication in Zoology, No. 1. Seattle Audubon Society, Seattle, Washington.

Solimano, P.S. and L.L. Larson. Addendum to the Seattle-Tacoma Commuter Rail Project Cultural Resource Assessment for the Auburn BN Yard, BN Tacoma Main Yard, and the Fife UP Yard. Letter to Kris Liljeblad (BRW, Inc.) on file, Office of Archaeology and Historic Preservation, Lacey, Washington. January 25, 1995.

Sound Move. 1996. The Ten-Year Regional Transit System Plan. (May 31, 1996).

Sound Transit. 1998. Link light rail conceptual construction impacts assumptions data for draft EIS technical analysis. Internal correspondence between Sound Transit and EIS consultant team regarding construction assumptions, draft Service Implementation Plan, ridership forecasts.

Sound Transit. City of Seattle Briefing Papers. January 1998.

Sound Transit. Documentation of Major Investment Study, March 1997.

Southwest Region University Transportation Center, Center for Transportation Research, the University of Texas at Austin. "Dallas Area Rapid Transit Impact Study: A Framework for Assessing Land Use and Development Impacts." 1993.

Spear, B. October 1997. Personal Communication (telephone). United States Department of Transportation, Statistical Services Section, Washington D.C.

Stoffle, R.W. Cultural Landscapes and Traditional Cultural Properties: A Southern Paiute View of the Grand Canyon and Colorado River. Paper presented at the Arizona State Historic Preservation Office's Traditional Cultural Properties Workshop, Prescott Conference Center, Prescott, Arizona. 1995.

Stoffle, R.W. and M.J. Evans. Holistic Conservation and Cultural Triage: American Indian Perspectives on Cultural Resources. Human Organization 49(2):91-99. 1990.

Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans. Native American Cultural Resource Studies at Yucca Mountain, Nevada. Institute for Social Research, University of Michigan, Ann Arbor. 1990.

Stoffle, R.W., D.B. Halmo, M.J. Evans, and D.E. Austin. PIAPAXA 'UIPI (BIG RIVER CANYON): Southern Paiute Ethnographic Resource Inventory and Assessment for Colorado River Corridor, Glen Canyon National Recreation Area, Utah and Arizona, and Grand Canyon National Park, Arizona. National Park Service, Denver, Colorado. 1994.

Stoffle, R.W., D.B. Halmo, M.J.Evans, and J.E. Olmsted. Calculating the Cultural Significance of American Indian Plants: Paiute and Shoshone Ethnobotany at Yucca Mountain, Nevada. American Anthropologist 92(2):416-432. 1990.

Stoffle, R.W., D.E. Austin, B.K. Fulfrost, A.M. Phillips III and T.F. Drye. Itus, Auv, Te'ek (Past, Present, Future): Managing Southern Paiute Resources in the Colorado River Corridor. Bureau of Reclamation, Tucson, Arizona. 1995.

Stoffle, R.W., L.L. Loendorf, D.E. Austin, D.B. Halmo, A.S. Bulletts, and B.K. Fulfrost. Tumpituxwinap (Storied Rocks): Southern Paiute Rock Art in the Colorado River Corridor. Version 2. Bureau of Reclamation, Tucson, Arizona. 1995.

Stone, Edward H., Visual Resource Management, Landscape Architecture Technical Information Series, Volume 1, Number 2, American Society of Landscape Architects, Washington, D.C., June 1978.

Sustainable Seattle, Indicators of Sustainable Community, April 1998.

SvR Design Company. 1997. Final Feasibility Study: Ravenna Creek Daylighting Project. Prepared for King County Department of Natural

Swanson, J. May 28, 1997. Personal communication (conversation with Letitia Wheeler, Herrera Environmental Consultants). Information obtained for the New Federal Courthouse, Seattle, King County, Washington, Environmental Impact Statement.

Swope Moody, Sandy. May 27, 1998. Personal communication (telephone conversation with Kathleen Adams, Herrera Environmental Consultants). Environmental coordinator, Washington Department of Natural Resources, Natural Heritage Program.

Table of locations and characteristics of public views listed in Attachment 1 to Title 25, Environmental Policies and Procedures, Seattle Municipal Code, undated copy (circa 1978).

The Economic Impact of Transit Related Development in Dade County, ND.

Thompson, G. Archaeological Monitoring Plan for Construction of the Costco Wholesale Underground Gasoline Storage Tanks, Tukwila, Washington. Report on file, Office of Archaeology and Historic Preservation. September 16, 1997.

Title 25, Environmental Policies and Procedures, Seattle Municipal Code, Book Publishing Company, Seattle, as amended (various dates).

Tobin, C. et al. Seattle's Waterfront: A Walker's Guide to the History of Elliott Bay. University of Washington, Seattle. 1982.

Transit Research Board, Transit Cooperative Research Program, "Report 20, Measuring and Valuing Transit Benefits and Disbenefits, Summary." Prepared by Cambridge Systematics, Inc with Apogee Research, Inc. 1996.

Transportation Research Board, TCRP Synthese 20. "Transit-Focused Development, a Synthesis of Transit Practice". Prepared by Douglas R. Porter. 1997.

Tri-Met, "Beyond the Field of Dreams, Light Rail and Growth Management in Portland." 1996.

Troost, K. and J.K. Stein. Geology and Geoarchaeology of West Point. In, L.L. Larson and D.E. Lewarch (eds.), The Archaeology of West Point, Seattle, Washington: 4000 Years of Hunter-Fisher-Gatherer Land Use in Southern Puget Sound. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. 1995.

Tuazon, E. May 13, 1998. Personal communication (letter from Eric Tuazon, Fire Protection Engineer, to Peter Sparhawk, Herrera Environmental Consultants). Seattle Fire Department, Seattle, WA.

Tukwila, City of. 1991. City of Tukwila Surface Water Management Comprehensive Plan. Prepared by Kramer, Chin, and Mayo, Inc. Seattle, Washington. 124 pp + Appendices.

Tukwila, City of. 1991. Surface Water Management Comprehensive Plan.

Tukwila, City of. 1993. Tukwila Parks and Open Space Plan, 1993-1998. September.

Tukwila, City of. 1994. Phase II Draft Urban Center Report. March 1994.

Tukwila, City of. 1995. Comprehensive Land Use Plan. December 4, 1995.

Tukwila, City of. 1995. Department of Community Development. Comprehensive Land Use Plan. Reprinted November 1997.

Tukwila, City of. 1995. Department of Community Development. Comprehensive Land Use Plan. December 4.

Tukwila, City of. 1995. Department of Community Development. Sensitive Areas Maps.

Tukwila, City of. 1996. Stormwater Quality Management Plan: Fostoria Basin. Prepared by Herrera Environmental Consultants, Seattle, Washington.

Tukwila, City of. 1997. Commercial & Commercial/Industrial Design Guidelines Background Report. (July 8, 1997).

Tukwila, City of. 1997. Department of Community Development, Pacific Highway Revitalization Plan.

Tukwila, City of. 1997. Riverton Creek Stormwater Quality Management Plan. Prepared by Entranco, Bellevue, Washington.

Tukwila, City of. 1997. Tukwila Pacific Highway Draft Revitalization Plan. December.

Tukwila, City of. 1997. Tukwila Police Department 1996 Annual Report.

Tukwila, City of. 1997. Zoning Code. (November 17 1997).

Tukwila, City of. 1998. Link Light Rail Tukwila Segment Phase One Market Analysis Report. (July 17, 1998).

Tukwila, City of. 1998. Pacific Highway Revitalization Plan – Final. (August 1998).

Tukwila, City of. 1998. Pacific Highway Revitalization Plan – Draft. (December 1997).

Tukwila, City of. 1998a. Tukwila Fire Department information obtained from the City of Tukwila Web page. Internet address: http://www.ci.tukwila.wa.us/fire/. Date of visit: May 18.

Tukwila, City of. 1998b. Tukwila Police Department information obtained from the City of Tukwila Web page. Internet address: http://www.ci.tukwila.wa.us/police/. Date of visit: May 18.

Tukwila, City of. Tukwila Facilities Guide. Parks and Recreation.

U.S. Army Corps of Engineers. Duwamish River and Tributaries, Sheet 4-5. Map E-12-2-100, on file, U.S. Army Corps of Engineers, Seattle. Microfiche. 1897.

U.S. Bureau of Labor Statistics Data. 1998. Consumer Price Index-All Urban Consumers. [Online Database – located at http://stats.bls.gov.80] Washington, D.C.

U.S. Council on Environmental Quality. 1978. National Environmental Policy Act. 42 U.S.C. 4322 (2) (c). Washington D.C.

U.S. Department of Transportation, Federal Aviation Administration. 1997. Advisory Circular – Hazardous Wildlife Attractants On or Near Airports AC No. 150/5200-33. U.S. Department of Transportation, Federal Aviation Administration.

U.S. Department of Transportation, Federal Transit Administration. 1997. Environmental Impact and Related Procedures. 49 CFR 622. Washington, D.C.

U.S. Department of Transportation. Federal Highway Administration, Urban Mass Transit Administration. 1997. Environmental Impact and Related Procedures; Final Rule 1987. Washington, D.C.

U.S. Department of Transportation. April 15, 1997. DOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal Register, Vol. 62, No. 72, Tuesday, April 15, 1997, 18377-18381. Washington, D.C.

U.S. Department of Transportation, Federal Highway Administration, Visual Impact Assessment for Highway Projects, U. S. Department of Transportation, Washington, D.C., 1981.

U.S. Environmental Protection Agency, 1996. User's Guide to Mobile 5b.

U.S. Environmental Protection Agency, November 1992a. Guideline for Modeling Carbon Monoxide From Roadway Intersections. Report Number EPA-454/R-92-05. Research Triangle Park, N.C.

U.S. Environmental Protection Agency, November 1992b. User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections. Report Number EPA-454/R-92-006. Research Triangle Park, N.C.

U.S. Environmental Protection Agency, Office of Federal Activities. July 19, 1995. Draft Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews. Washington, D.C.

U.S. Environmental Protection Agency. April 1998. Guidance for Incorporating Environmental Justice in EPA's NEPA Compliance Analyses. Washington, D.C.

U.S. Environmental Protection Agency. February 5, 1998. Interim Guidance for Investigating Title VI Administrative Complaints Challenging Permits. Washington, D.C.

U.S. Fish and Wildlife Service. 1987. National Wetlands Inventory map. Des Moines quadrangle. 1:24,000. U.S. Department of the Interior, Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 1987. National Wetlands Inventory map. Seattle North quadrangle. 1:24,000. U.S. Department of the Interior, Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 1987. National Wetlands Inventory map. Seattle South quadrangle. 1:24,000. U.S. Department of the Interior, Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 1988. National Wetlands Inventory map. Renton quadrangle. 1:24,000. U.S. Department of the Interior, Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 1998. Agency correspondence on the presence of endangered, threatened, and candidate species of wildlife in the study area. U.S. Fish and Wildlife Service, Ecological Services Division.

U.S. Geological Survey. 1973. Topographic map. Des Moines quadrangle. 1:24,000. U.S. Geological Survey.

U.S. Geological Survey. 1973. Topographic map. Seattle North quadrangle. 1:24,000. U.S. Geological Survey.

U.S. Geological Survey. 1973. Topographic map. Seattle South quadrangle. 1:24,000. U.S. Geological Survey.

U.S. Geological Survey. 1984. Topographic map. Renton quadrangle. 1:24,000. U.S. Geological Survey.

Uhlar-Heffner, G. June 12, 1998. Personal communication (telephone conversation with Peter Sparhawk, Herrera Environmental Consultants). Seattle Public Utilities, Solid Waste Utility.

University of Washington. 1990. General Physical Development Plan. (adopted May 1992).

University of Washington. 1992. General Physical Development Plan.

University of Washington. 1993. Southwest Campus Plan – A Supplement to the 1991 - 2001 General Physical Development Plan. (April 1993).

University of Washington. 1995. Southwest Campus Public Amenities. July.

University of Washington. 1997. Recommended Plan for the University of Washington North Campus. (January 1997).

URS Corporation and Boas, Inc. The Duwamish No. 1 Site 1986 Data Recovery. Report on file, Office of Archaeology and Historic Preservation, Lacy, Washington. 1987.

USFWS. 1998. Agency correspondence on the presence of endangered, threatened, and candidate species of wildlife in the study area. U.S. Fish and Wildlife Service, Ecological Services Division.

Vance, E.D. Archaeological Site Record Form for site 45-KI-59. Site record form on file, Office of Archaeology and Historic Preservation, Lacey, Washington. October 15, 1980.

Villoresi, G., N.G. Ptitsyna, V.A. Kudrin, N. Iucci, P.M. Voronov, and D.B. Zaitsev. 1997. Health Effects among Engine Drivers: Association with Occupational Exposure to Magnetic Fields from DC Electrified Transport (meeting abstract). in: Abstracts from the Second World Congress for Electricity and Magnetism in Biology and Medicine, 8–13 June 1997, Bologna, Italy.

Walker, D.E. Jr. Synopsis of Comments on Native American Religions and Sacred Geography in the Central Rocky Mountains. Paper presented at a National Park Service Conference, October 29, 1985.

Warren, J.R. King County and its Emerald City: Seattle – An Illustrated History. American Historical Press, Seattle. 1997.

Warren. 1989. The Day Seattle Burned. James R. Warren, Seattle. 1989.

Washington, state of. 1990. Growth Management Act (RCW 36.70A).

Washington, state of; Washington State Convention & Trade Center. 1996. Final Environmental Impact Statement for Proposed Expansion of the Washington State Convention & Trade Center – Seattle, WA. (September 1996).

Washington, state of. State Environmental Policy Act. 1997. Chapter 43.21 C RCW. Olympia, Washington. Revised 1997.

Washington, state of. SEPA Rules. 1998. Chapter 197-11 WAC. Olympia, Washington. Effective 1998.

Washington Department of Fish and Wildlife. 1989. Washington Midwinter Bald Eagle Survey Results for 1989. Washington Department of Wildlife, Olympia, Washington.

Washington Department of Fish and Wildlife. 1997. Washington Salmonid Stock Inventory, Appendix on Bull Trout and Dolly Varden. Washington Department of Fish and Wildlife, Fish Management Section.

Washington Department of Fish and Wildlife. 1998. Fisheries data from spawning surveys and juvenile releases from hatcheries for the Lake Washington and Green River drainage basins from 1993 to 1997. Washington Department of Fish and Wildlife.

Washington State Department of Community Trade and Economic Development. 1997. 1997 Biennial Energy Report–Our Energy Future: At a Crossroads. Washington Department of Community Trade and Economic Development. Olympia, Washington.

Washington State Department of Ecology. 1998. Personal communication with Sally Otterson, June 8, 1998. Olympia, Washington.

Washington State Department of Ecology. 1998. Washington State Department of Ecology Proposed 1998 303(d) List of Threatened and Impaired Water Bodies.

Washington State Department of Ecology. 1998. Open file reports of well installations.

Washington State Energy Office. 1996. Washington State Energy Use Profile. Washington State Department of Energy. Olympia, Washington.

Washington State Office of Financial Management. "1997 Population Trends." September 1997.

Washington State Office of Financial Management. "Letter to City, Town and County Officials by Theresa J. Lowe, Chief Demographer. " July 1998.

Waterman, T.T. The Geographical Names Used by the Indians of the Pacific Coast. The Geographical Review 12:175-194. The American Geographical Society, New York. 1922.

Watershed Restoration Group. 1998. Green/Duwamish early action habitat projects—recommended priorities for 1998-99. Watershed Restoration Group, an interagency committee that includes the City of Tukwila, the Muckleshoot Indian Tribe, the U.S. Army Corps of Engineers, and King County.

WDFW. 1998. Fisheries data from spawning surveys and juvenile releases from hatcheries for the Lake Washington and Green River drainage basins from 1993 to 1997. Washington Department of Fish and Wildlife.

Weisbrod, Glen, "Distinguishing the Wide and Local Area Business Impacts of Transportation Investments", Paper No. 961163, Transportation Research Board, Washington, D.C. 1998.

Weisbrod, Glen, Grovak, Michael, "Comparing Approaches for Valuing Economic Development Benefits of Transportation Projects. 1998.

Wilhelmsen, K.H. Results of Sub-surface Survey at the Allentown Pea Patch Property, Tukwila, Washington. Report on file, Office of Archaeology and Historic Preservation, Lacey, Washington. November 17, 1993.

Williams, W. R., R. M. Laramie, and J. J. Ames. 1975. A Catalog of Washington Streams and Salmon Utilization. Volume 1: Puget Sound Region. Washington Department of Fisheries.

Winthrop, R. Conflicting Perceptions: Tribal and Regulatory Views of Nature, Risk, and Change. Practicing Anthropology 16(3):25-28. 1994.

Workman-Lewis, Steven, Brod, Daniel, "Measuring the Neighborhood Benefits of Rail Transit Accessibility", Transportation Research Record 1576, 147-153, pp.

Wydoski, R. S. and R. R. Whitney. 1979. Inland Fishes of Washington. University of Washington Press, Seattle, Washington.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX E
Section 4(f) Evaluation

Appendix E Central Link Light Rail Section 4(f) Evaluation

INTRODUCTION

Federal law 23 U.S.C. Section 138, commonly known as Section 4(f) from its previous designation in the Department of Transportation Act of 1966, requires that any transportation project financed with federal funds, which will require use of land from a significant publicly owned park, recreation area, wildlife and waterfowl refuge, or historic site, be approved and constructed only if: (1) There is no feasible and prudent alternative to the use of the land, and (2) The project includes all possible planning to minimize harm to the site.

If a feasible and prudent alternative to using such land exists, that alternative must be selected. If such use is unavoidable, then measures must be identified to minimize direct and indirect harm to the property.

Section 4(f) mandates that special efforts are made to "preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites." These special efforts include a Section 4(f) evaluation, which describes resources affected, discusses direct (property acquisition) and indirect impacts to these resources from project alternatives, identifies and evaluates alternatives that avoid such impacts and mitigation measures to minimize unavoidable adverse effects. Indirect impacts, or proximity impacts, occur when the proposed project does not use land from a Section 4(f) property, but the project's proximity results in impacts that are so severe as to substantially impair the activities, features, or attributes of the resource.

This Section 4(f) Evaluation identifies 4(f) resources along the project alternative routes, shows how the alternatives would impact the resources, determines whether there are feasible and prudent alternatives that avoid the use of Section 4(f) properties, and identifies potential measures that should be considered to minimize harm resulting from unavoidable impacts to Section 4(f) properties.

STUDIES AND CONSULTATIONS

Project staff assessed existing conditions at each Section 4(f) property through site visits, consultations with municipality and agency staffs with jurisdiction over the 4(f) properties, and review of available planning documents and files maintained by relevant municipalities and agencies. Staff also determined direct impacts by comparing the location and boundaries of Section 4(f) properties with available plans of the alternative light rail routes. Indirect impacts were evaluated primarily in coordination with analyses of other elements of the environment—specifically, noise and vibration, visual and aesthetic, and transportation.

Coordination with the Washington State Historic Preservation Officer (SHPO) and the City of Seattle Historic Preservation Officer (HPO) identified properties already listed in the National Register of Historic Places (NRHP) or designated as Seattle Landmarks. Previously unrecorded historic resources were evaluated, and inventory forms were prepared for those eligible for the NPHP. The SHPO has concurred in the determination of eligibility for these properties. One Seattle Landmark District is included among the Section 4(f) resources.

DESCRIPTION OF THE PROPOSED ACTION/ALTERNATIVES

See Chapter 2, Alternatives Considered.

PREFERRED ALTERNATIVE

DESCRIPTION OF SECTION 4(F) RESOURCES

This section describes Section 4(f) resources along the preferred alternative light rail route. There is only one identified Section 4(f) resource, Cheasty Boulevard, which is both a recreational facility and a historic property. A property of Native American cultural interest near Boeing Access Road is also described but it has not been determined eligible as a historic property at this time.

Each resource is described in terms of its existing character and value, and any plans for future development.

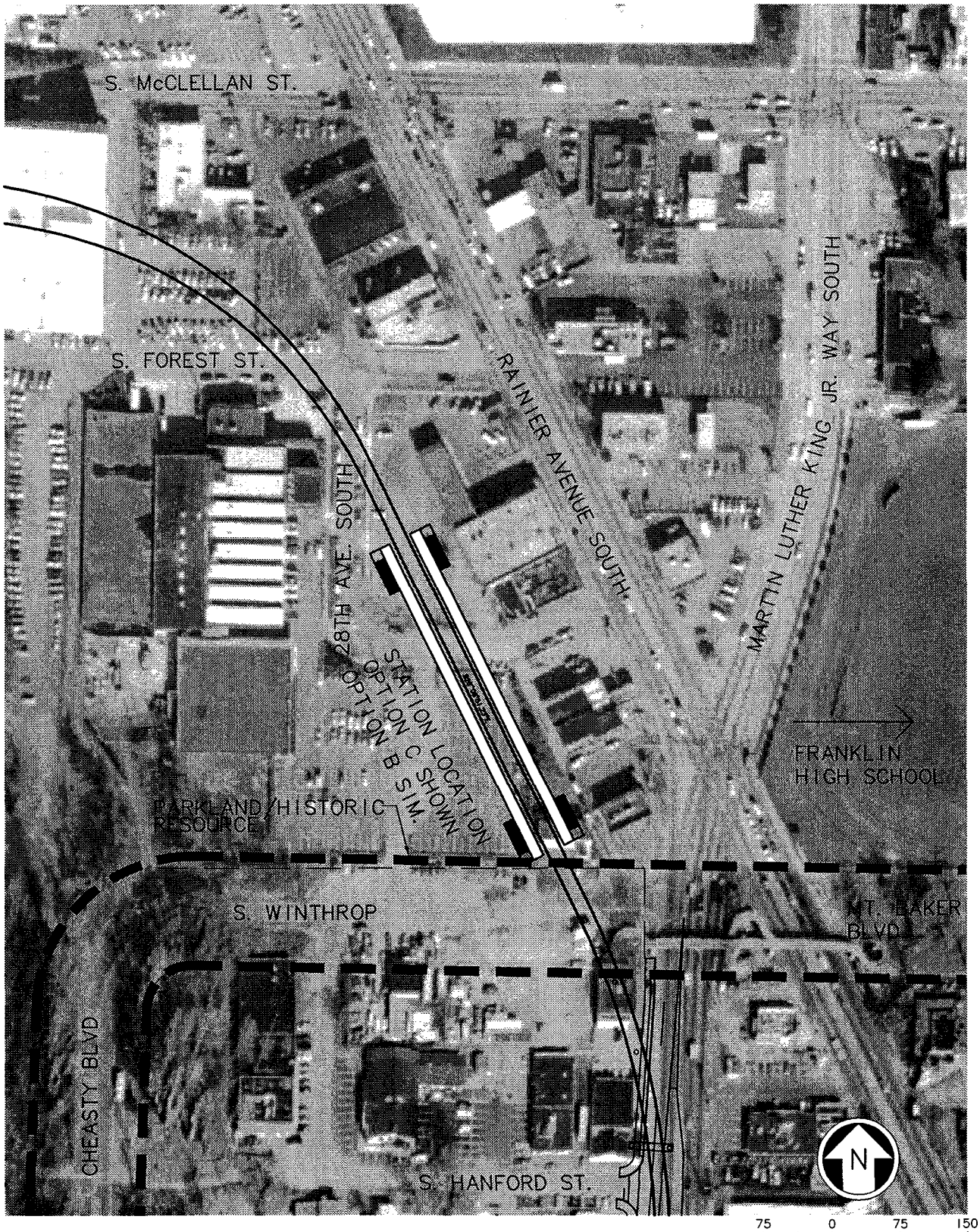
PARKS AND OTHER RECREATIONAL FACILITIES

The facility discussed in this section would be directly impacted and/or would be affected by proximity impacts that are envisioned as sufficiently severe to substantially impair the activities, features, or attributes of the facility, referred to as a "constructive use" (for the location of the facility, refer to Figures 4.15-1 and 4.15-2 in Chapter 4 of the Final EIS). The Parkland Impacts section of this Final EIS also identifies other facilities that would have less than significant project-related impacts. Those facilities are not discussed here because the impacts would not constitute a potential "use" of Section 4(f) resources.

Cheasty Boulevard–This two-lane roadway, wooded for much of its length, extends from Jefferson Park (Beacon Ave. S.) to Rainier Ave. S., a distance of roughly 1.3 miles. Cheasty Blvd. is part of the Olmsted Plan for Seattle's Parks, Boulevards and Playgrounds. The boulevard traverses a primarily residential neighborhood except in the project area where the adjacent uses are commercial; street trees parallel the roadway. The original Olmsted Plan envisioned a direct connection with Mt. Baker Blvd., another Olmsted Boulevard to the east of Rainier Ave. S. The two boulevards are currently separated physically by Rainier Avenue S., MLK Jr. Way S., and a triangular piece of land between these two roadways. A vehicular connection between the two Olmsted Boulevards does not exist. Bicyclists and pedestrians are able to cross between the two boulevards only via a pedestrian bridge structure spanning Rainier Avenue S. and MLK Jr. Way S. The pedestrian bridge and some adjacent vegetation block the visual continuity of the two boulevards. The most northern 500 ft of Cheasty Boulevard (technically signed as S. Winthrop St.) is not developed as a formal boulevard and much of the 120-ft wide right-of-way is unpaved and used for parking by the adjacent uses. It is an unstated, although continuing, goal of the City of Seattle to eventually connect the two boulevards visually and physically. Figure E-1 depicts Cheasty Boulevard in the project area.

HISTORIC PROPERTIES

The historic properties discussed in this section would be directly impacted and/or would be affected by proximity impacts that may be sufficiently severe to substantially impair the historical, cultural, or architectural values of the property. The Historic Resources Impacts section of the Final EIS identifies other historic properties that may also experience project-related impacts. These resources are not included in this evaluation because, based on the impact analysis, they would not be directly impacted, and the proximity impacts could be mitigated or were not considered severe enough to impair the resource value.



PSTC / SOUNDTRANSIT	Scale: 1"=150'	LINK LIGHT RAIL PROJECT CHEASTY BLVD HISTORIC RESOURCE AREA	Drawing No.:	
	Filename: C40_PARK		Sheet No.:	Rev.:
	Contract No.:		FIGURE E-1	
Jurisdiction Drawing No.	Date:			

Historic properties protected by Section 4(f) are those that are listed in the NRHP, are eligible for listing in the NRHP (noted here as eNR), or are designated local landmarks (SL for City of Seattle Landmark). The SHPO has determined that properties noted here as eNR are eligible for the National Register.

Cheasty Boulevard [eNR] See the description of this facility under Parks and Other Recreational Facilities.

South Boeing Access Road Potential Site of Native American Cultural Interest

The South Boeing Access Road site is the location of two low hills ("north hill" and "south hill") that have cultural importance to several local federally recognized Indian Tribes (The Suquamish Indian Tribe and the Muckleshoot Indian Tribe) and a local group - the Duwamish Tribe. The two hills figure prominently in local Indian creation stories that have been recorded by ethnographers working with local Tribal peoples during the early years of the 20th century. The available information suggests that the cultural importance of these two hills lies in their role in various versions of certain creation stories rather than in any specific use of the hill features for traditional subsistence practices (e.g., food or medicinal plant gathering, hunting terrestrial fauna). Available information does not indicate that the hills were used as occupation sites. Although available information suggests there was little to no direct physical use of the hill features, these hills are still recognized by Tribal groups today as being a culturally important location in the Puget Sound area.

Coordination and consultation between the SHPO, the Advisory Council on Historic Preservation, and authorized representatives of the Muckleshoot and Suquamish Indian Tribes and the Duwamish tribal organization have been in progress since April 1998. The coordination and consultations have focused on identification of cultural resources of importance to the local Tribes and tribal organizations. With the identification of the preferred alternative and the presence of the property of cultural interest located at South Boeing Access Road (the "north hill"), several meetings and field trips were conducted to explore the importance of the north hill feature and possible project affects. Some of the more important meetings and fieldtrips include an April 1998 fieldtrip with a Duwamish tribal organization representative; a meeting with the Muckleshoot Tribe in June 1998, a meeting in April 1999 with the SHPO and a Suquamish Tribal representative; a meeting with the Muckleshoot Tribe in May 1999; a meeting with the SHPO, the Advisory Council on Historic Preservation, FTA, and a Muckleshoot Tribal representative in June 1999; a meeting with a Suquamish Tribal representative on July 1999; and a major fieldtrip with the Muckleshoot and Suquamish Tribal representatives, the SHPO, and the FTA in August 1999. Consultations with local Tribes and tribal organizations will continue in accordance with provisions of the Section 106 Programmatic Agreement as the parties work toward resolution of any issues associated with the project and north hill feature.

The north hill has not been determined eligible for the National Register of Historic Places at this time and is not a 4(f) resource.

IMPACTS ON SECTION 4(F) RESOURCES

The following discussion focuses on the identified direct impacts to the resource (the "taking" of land or historic property to accommodate the project) and the proximity impacts that would result in substantial impairment to the activities, features, or attributes of the resource (in the context of Section 4(f), these proximity impacts are referred to as "constructive use").

Parks and Other Recreational Facilities

Segment D

Cheasty Boulevard—In the preferred alternative, the elevated section of the light rail route would cross directly over the right-of-way, and the elevated McClellan Station (options B and C) would be located immediately to the north of the boulevard. The elevated crossing would require a right of use or easement from the City of Seattle. The elevated structure would create shading effects over the boulevard and would also affect the visual linkage with Mt. Baker Blvd. The McClellan Station would increase the amount of traffic and activity along the boulevard as transit riders access the station. In the vicinity of the station, Sound Transit will make streetscape improvements, improve the condition of the roadway, and develop an at-grade pedestrian/bike crossing of MLK Jr. Way. S. and Rainier Avenue S. between the two Olmsted boulevards. The proposed station options (B and C) are shown in Figures E-2 and E-3 and the Visual Simulations.

Historic Properties

Segment D

Cheasty Boulevard—The preferred alternative would include an elevated guideway passing directly over the boulevard and potentially a support column in the right-of-way, with the elevated station located immediately to the north of the boulevard. The guideway and station would be new and intrusive features in the streetscape, and would affect the visual linkage with historic Mt. Baker Boulevard.

Construction Impacts

Construction of the elevated structure across Cheasty Boulevard, and the McClellan Station immediately north of the boulevard, may require temporary street closures and impede access to the boulevard.

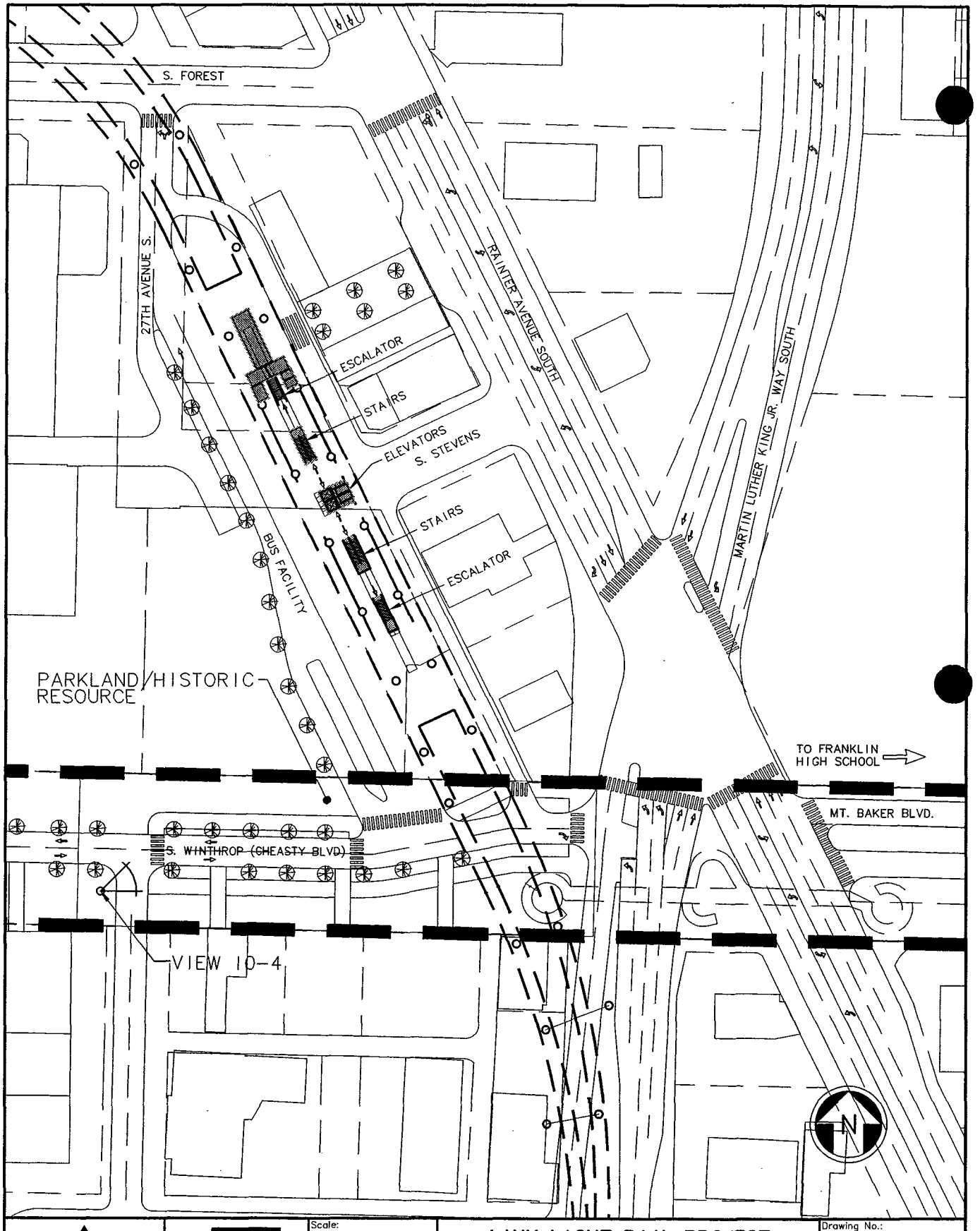
Temporary noise and dust increases during construction are discussed in the Noise and Air Quality sections, respectively, of the Construction Impacts discussion in Section 4.17. Such increases would be considered indirect 4(f) impacts only if they resulted in the violation of the FTA noise abatement criteria or the National Ambient Air Quality Standards. No such violations are anticipated and no 4(f) impacts to noise or air quality are expected to result from project construction.

4(F) RESOURCE AVOIDANCE ALTERNATIVES

Under the requirements of 23 U.S.C. Section 138, NEPA documents in which the proposed build alternatives involve impacts on 4(f) resources must include an analysis of alternative locations for the proposed project that avoid 4(f) impacts through rerouting, design changes, or other methods. Such avoidance alternatives must be selected if they are determined to be "prudent and feasible" methods of meeting the project objectives.

Parks And Other Recreational Facilities

Cheasty Boulevard—All route alternatives include the McClellan Station and cross Cheasty Boulevard. The EIS evaluates an elevated station and guideway (preferred alternative, options B and C) and an at-grade option. The at-grade option would have greater impacts because it would present a barrier to traffic and pedestrian circulation along the boulevard.



PSTC

SOUNDTRANSIT

Jurisdiction Drawing No.

Scale: 1"=100'

Filename: 1117-1a

Contract No.:

Date: 10.01.99

LINK LIGHT RAIL PROJECT

CENTRAL CORRIDOR

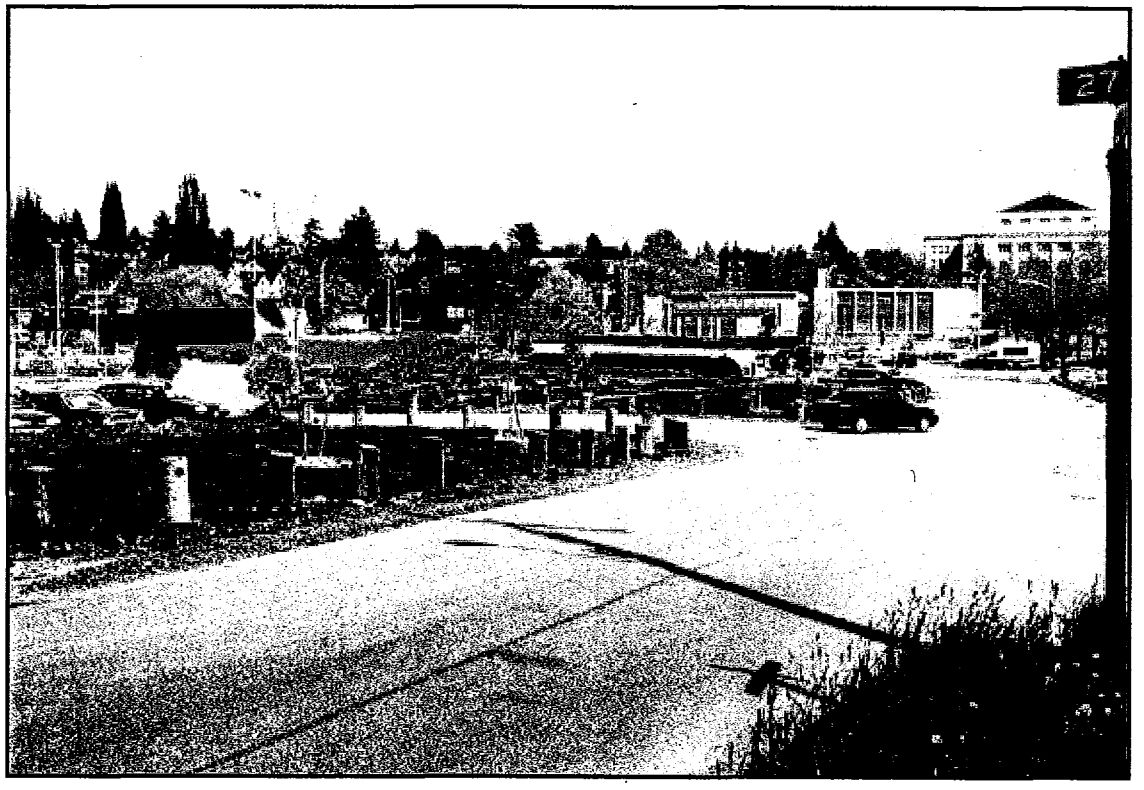
ALIGNMENT D1.1 / D1.3 / D3.4

McCLELLAN STATION
SITE ACCESS PLAN
OPTION B

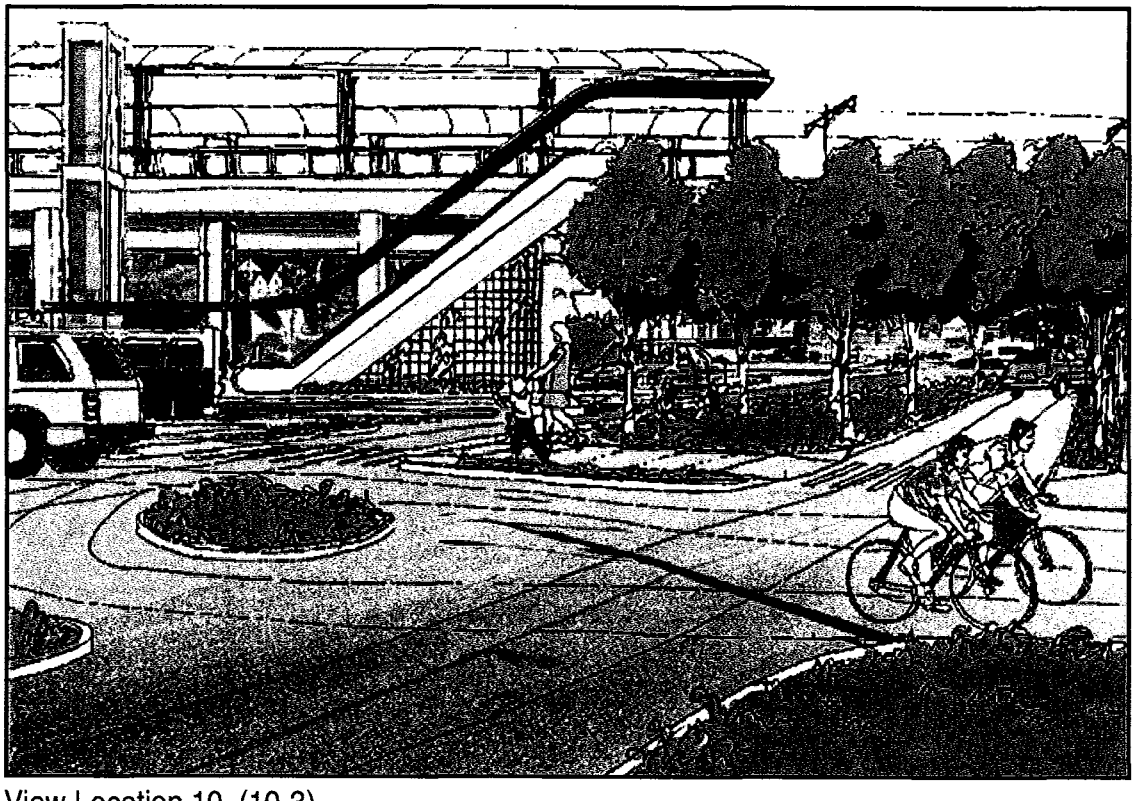
Drawing No.:

Sheet No.: Rev.:

FIGURE E-2

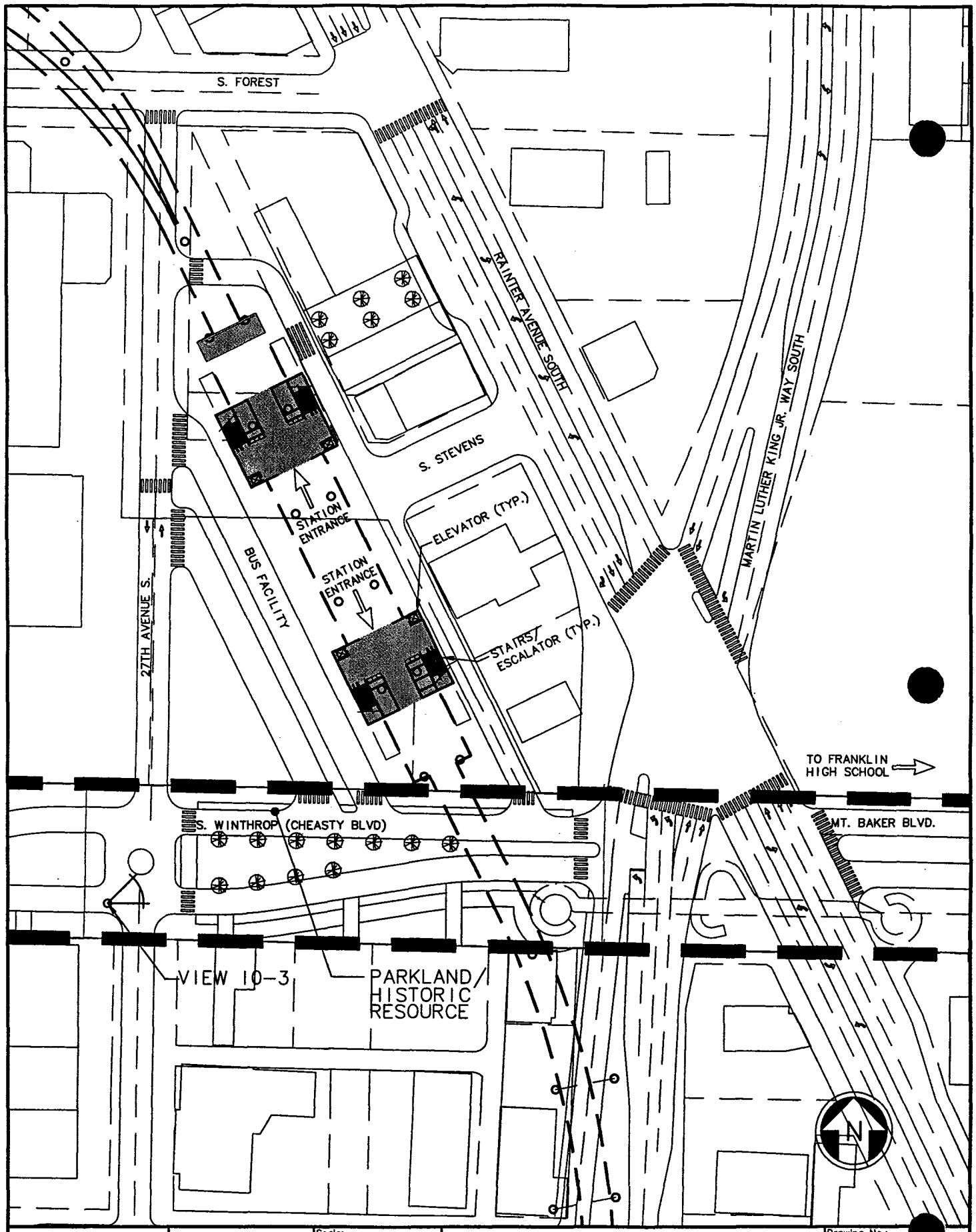


View Location 10. (10-1)
Existing view looking east from S. Winthrop Street and 27th Avenue S.



View Location 10. (10-3)
McClellan Station (Option B) and elevated route (Alternatives D1.1, D1.3 and D3.4)

SOUNDTRANSIT



PSTC

SOUNDTRANSIT

Jurisdiction Drawing No.

Scale: 1"=100'

Filename: 1117-2a

Contract No.:

Date: 10.01.99

LINK LIGHT RAIL PROJECT

CENTRAL CORRIDOR

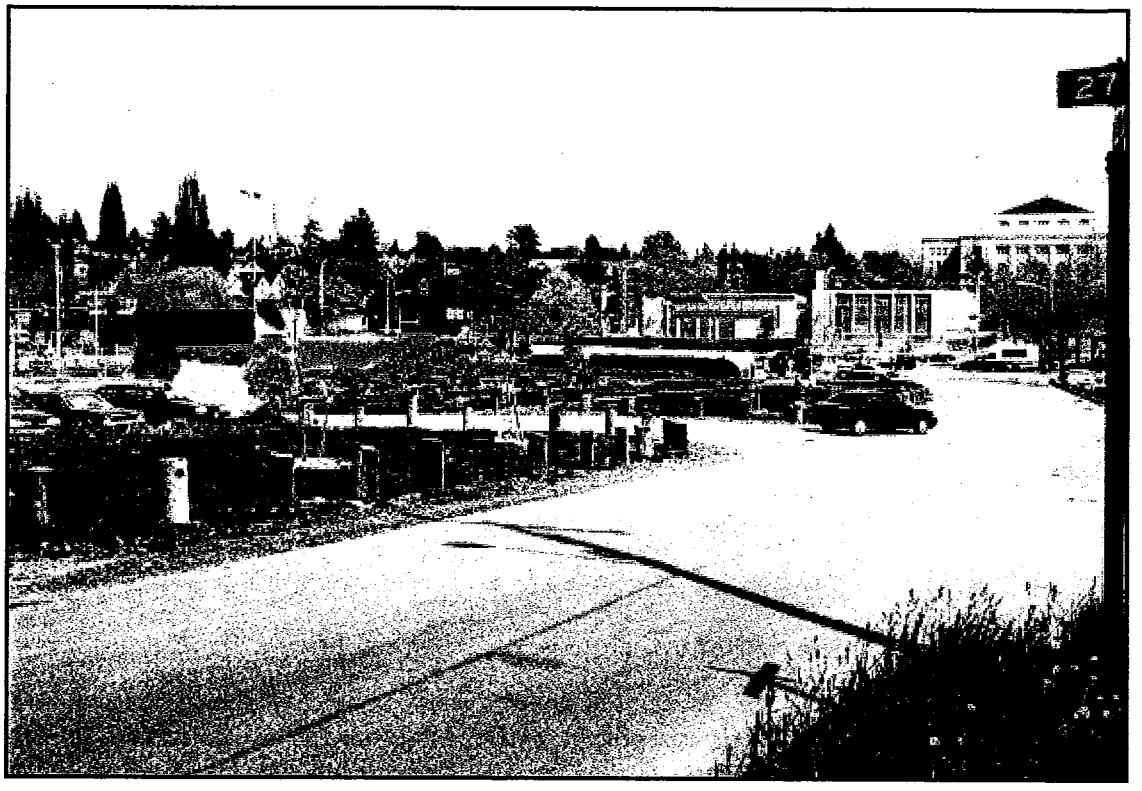
ALIGNMENT D1.1 / D1.3 / D3.4

McCLELLAN STATION
SITE ACCESS PLAN
OPTION C

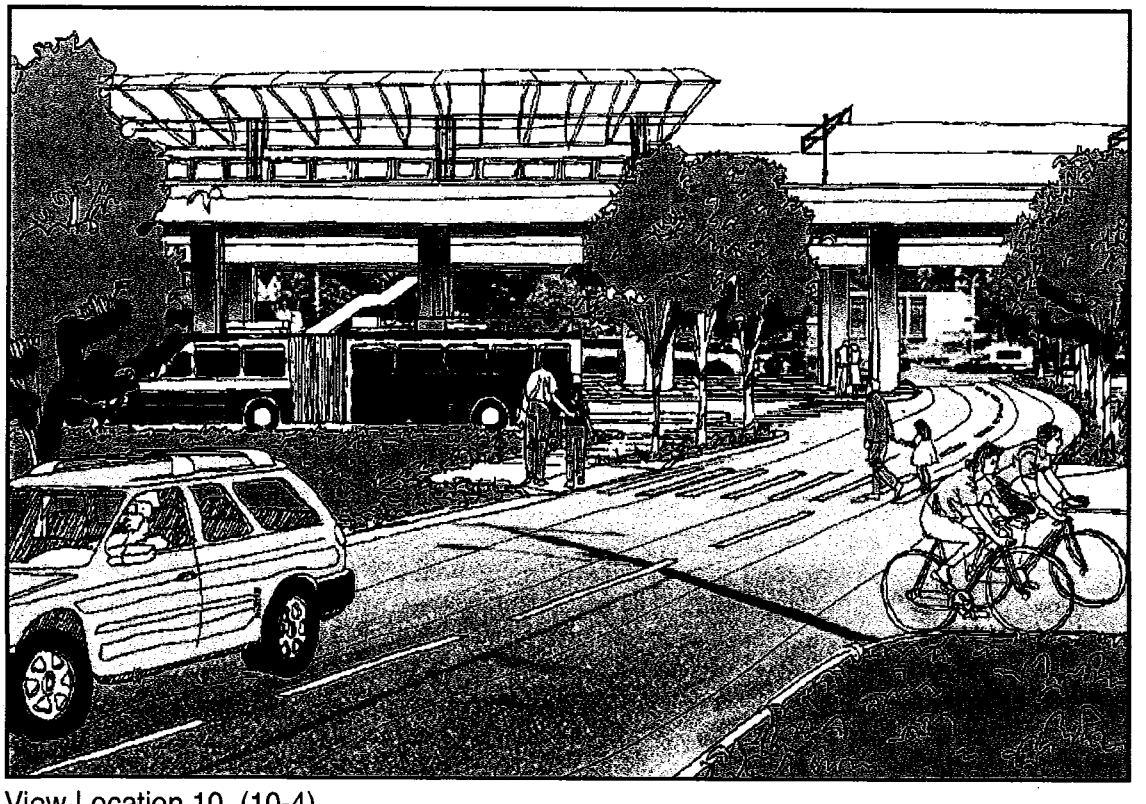
Drawing No.:

Sheet No.: Rev.:

FIGURE E-3



View Location 10. (10-1)
Existing view looking east from S. Winthrop Street and 27th Avenue S.



View Location 10. (10-4)
McClellan Station (Option C) and elevated route (Alternatives D1.1, D1.3 and D3.4)

SOUNDTRANSIT

A tunnel profile would avoid the visual intrusion of the elevated guideway over Cheasty Boulevard. The Beacon Hill tunnel could be extended south to the point where the light rail route reaches the median of MLK Jr. Way S. This tunnel extension would result in an underground McClellan Station and would require an approximately 600-ft long retained cut transition within the median of MLK Jr. Way S. just north of Walden Street. Cut-and-cover construction would be employed for the McClellan Station and the tunnel between the station and the transition area. This extension of the Beacon Hill tunnel would result in an additional cost of $56 million (1995$), have greater property impacts and increased construction impacts as compared to the preferred alternative. Tunneling would not be prudent considering the high cost and greater disruption to the community.

Historic Properties

Cheasty Boulevard – See the discussion of avoidance alternatives under Parks and Other Recreational Facilities above.

MEASURES TO MINIMIZE HARM

Under the requirements of 23 U.S.C. Section 138, impacts on 4(f) resources that cannot be avoided must be minimized, or mitigated, to the greatest possible extent. Mitigation can take the form of design refinements, such as retaining walls to reduce the need for right-of-way acquisition, or compensation (monetary or in-kind) for values lost through project construction. Properties acquired with funding appropriated under the Land and Water Conservation Fund Act are also subject to the requirements of Section 6(f) of that act, which requires mitigation of impacts through replacement with property of equal value and function.

Parks And Other Recreational Facilities

Cheasty Boulevard

All station components, guideway, street improvements, and landscape plans associated with the design of the McClellan Station and guideway overpass at Cheasty Boulevard (S. Winthrop Street) shall be prepared in consultation with the Seattle Landmarks Preservation Board and the SHPO, and be approved by the SHPO. Such plans shall be developed with the objective of:

- Improving Cheasty Boulevard in the light rail station area in a manner compatible with the original Olmsted design;
- Providing at-grade pedestrian and bicycle access across Rainier Avenue S. and MLK Jr. Way S. between the Olmsted-designed Mt. Baker and Cheasty boulevards;
- Minimizing to the extent practicable the physical displacement into the right-of-way of Cheasty Boulevard;
- The Station and guideways design will be architecturally compatible with the character of Cheasty Boulevard.
- Fund research, inventory, planning preservation or interpretation of the Olmsted Plan for Seattle's Parks, Boulevards, and Playgrounds. The results of this work will be incorporated in to the McClellan Station design through an interpretive display or other means.

Historic Properties

Cheasty Boulevard

See measures to minimize harm above under Parks and Other Recreational Facilities.

ALTERNATE ROUTES

Description of Section 4(f) Resources

This section describes potential Section 4(f) resources along the alternative light rail routes. These resources include:

- 10 parks and other recreational facilities
- 15 historic sites

Each resource is described in terms of its existing character and value, and in the case of parks, any plans for future development.

Parks and Other Recreational Facilities

Rainbow Point Park–This City of Seattle passive mini-park (0.6 acre in size, including 0.4 acre leased from WSDOT) overlooks I-5; it is located at N.E. Banner Place and I-5. The park provides impressive westward views toward Green Lake (in the middle distance) and the Olympic Mountains (in the far distance). A walkway from N.E. Banner Place provides access through a lawn area to viewing points and benches. Traffic noise from I-5 is a dominant feature of the park. This noise and the obscure vehicular access may explain its relatively low use level.

Ravenna Boulevard–This tree-lined boulevard extends between Green Lake (E. Green Lake Way) on the west and Ravenna Park (20th Avenue N.E.) on the east (a distance of approximately 1.3 miles). Ravenna Boulevard is part of the Olmsted Plan for Seattle's Parks, Boulevards and Playgrounds. Policies expressed in the 1993 Seattle Parks and Recreation COMPLAN indicate the City's intention to conserve and enhance Olmsted planned and designed facilities as a key element of the citywide parks system. Exclusive bike lanes run along the boulevard, and the treed median is often used for informal play. The boulevard is bridged by I-5, an eight-lane freeway, in the project area. The freeway is a dominating visual barrier and shaded area on the boulevard that precludes street trees and landscaping beneath it.

University Heights School [eNR, SL] Constructed in 1902, the original south pavilion of this wood frame school is the work of the prominent Seattle architecture firm of Bebb & Gould. This was one of the first grammar schools to be built according to the Model School Plan developed by school architect James Stephen and adopted by the Seattle School Board in 1901. Designed in a Spanish Colonial Revival style, the original eight-room building was expanded to the full twenty-room plan in 1908. This prominent school building currently serves as a community center and houses a variety of offices and service agencies. A small playground, consisting primarily of play structures, is located along the western boundary of the property, adjacent to a large parking lot and just southwest of the school building.

North Passage Point Park–This 0.79-acre waterfront park at Sixth Avenue N.E. and N.E. Northlake Way is located along the north shore of the Ship Canal Bridge and under the I-5 Bridge. Roughly 80 percent of the park (that area directly beneath the bridge structure) is owned by WSDOT to allow access to the bridge for maintenance. Seattle City Light has a linear easement (a utility right-of-way) along the west-side of the WSDOT property that comprises roughly 9 percent of the park area. The Seattle Parks and Recreation Department owns a similar linear strip 20 ft wide along the east side of the WSDOT property. This comprises the remaining 11 percent of the park. The City of Seattle developed and maintains the park; amenities include a shorewall, landscaping, a paved pathway from N.E. Northlake Way to the shoreline, and benches and picnic tables. The park is primarily used to observe boat traffic along the ship canal. Traffic noise from the overhead I-5 Bridge is a dominant feature of the park.

South Passage Point Park–This 0.65-acre waterfront park at Fuhrman Avenue E. and E. Fairview Street is located along the south shore of the Ship Canal Bridge and under the I-5 Bridge. Roughly 75 percent of the park (that portion directly beneath the bridge structure) is owned by WSDOT and is used to access the bridge for maintenance. Seattle City Light has a linear easement along the west-side of the WSDOT

property (an extension of the right-of-way in North Passage Point Park) comprising roughly 8 percent of the park area. The Seattle Parks and Recreation Department owns a strip of land along the east side of the WSDOT property, comprising the remaining 17 percent of the park. The City of Seattle developed and maintains the park; amenities include a shorewalk, landscaping, and picnic tables. Similar to North Passage Point Park, this facility is used to observe boat traffic along the ship canal and by rowers at the adjacent Pocock Rowing Club. Traffic noise from the overhead I-5 Bridge is a dominant feature of the park.

Future Sister City Park/I-90 Trail–The Future Sister City Park parallels the southern edge of I-90, extending from Rainier Avenue S. on the east to approximately 16th Avenue S. on the west. This 4.6-acre "greenbelt," acquired by the City of Seattle during the construction of I-90, provides a buffer to residential areas to the south and west of I-90. It will eventually be named for a Seattle sister city. Except for landscaping, the only feature within the park intended for public use is the I-90 trail. The main trail enters the park from the west, parallels I-90, and connects to the I-90 bridge structure over Rainier Avenue S. A trail spur diverts from the main trail at roughly 18th Avenue S. and extends 600 ft eastward to provide pedestrian and bicycle access to Rainier Avenue S.

Cheasty Boulevard–See the description under the Preferred Alternative section.

Duwamish/Green River Trail–This trail forms part of the valley river trail system along the shores of the Duwamish/Green River. When fully completed, the trail will extend 8.4 miles from Tukwila's northern city limits northwest of SR 99 (Tukwila International Boulevard) to the Tukwila/Kent city limits south of S. 180th Street. This is an active bicycle and hiking path with an asphalt surface roughly 12-ft wide; amenities along the trail include picnic tables, river viewpoints, historic sites, and other parks. Portions of the trail (particularly near office parks) are heavily used by daytime employees and local residents.

Lookout Park–This small City of Tukwila park (0.1 acre) is situated along the shoreline of the Duwamish River just south of the I-5/Interurban Avenue interchange and within the City Light right-of-way that parallels Interurban Avenue. The park's two distinct parcels straddle 56th Avenue S. To the north is a wooden viewing platform overlooking the river; to the south is a historical monument commemorating early use of the river. The viewing platform is immediately adjacent to a busy Metro bus stop (a park-and-ride lot is located directly across Interurban Avenue) and receives use by waiting bus passengers. Otherwise, the level of use is relatively low, in part because easy access is lacking.

Foster Golf Course–This City of Tukwila-owned, 70-acre facility located between Interurban Avenue and the Duwamish River consists of a 5,100 yard, par 68, 18-hole golf course, clubhouse, restaurant/lounge, pro shop, and parking area (205 spaces are available, although that number is considered inadequate during peak play periods). On average, approximately 70,000 rounds of golf are played at this facility each year. A new 6-year golf course master development plan calls for construction of a new maintenance building and clubhouse, additional parking, and course improvements. That portion of the facility adjacent to Interurban Avenue (primarily parking and landscaping) is within the Seattle City Light right-of-way (that varies in width from 50 ft to 90 ft).

Angle Lake Park–This 10.5-acre City of SeaTac community park is located along the east side of SR 99 (International Boulevard) at S. 194th Street. This is a very popular facility for local residents. Its primary amenity is the access to freshwater, with 100 ft of beach, a fishing/viewing pier, boat launch, picnic tables, and restrooms. On warm summer days, this park is heavily used. Recent improvements have been made to the park to accommodate the demand and upgrade the general appearance, including an expanded parking area, new concession and restrooms building, and sidewalk and landscaping upgrades along International Boulevard.

Historic Properties

Ravenna Boulevard [eNR] This tree-lined boulevard with planted median is a component of the parks, boulevards, and playgrounds system designed by John Charles Olmsted of the famed Olmsted Brothers landscape architecture firm of Brookline, Massachusetts. Beginning in 1903 Olmsted developed a plan for a comprehensive system of connecting boulevards, parks with distinctive characteristics, and playgrounds for the city's families. Ravenna Boulevard connects the boulevard around Green Lake with Cowen and Ravenna parks. It is an important component of the Olmsted Plan, which is eligible for listing in the National Register under criteria established for designed historic landscapes (NR Bulletin 18).

University Heights School [eNR, SL] Constructed in 1902, the original south pavilion of this wood frame school is the work of the prominent Seattle architecture firm of Bebb & Gould. This was one of the first grammar schools to be built according to the Model School Plan developed by school architect James Stephen and adopted by the Seattle School Board in 1901. Designed in a Spanish Colonial Revival style, the original eight-room building was expanded to the full twenty-room plan in 1908. This prominent school building currently serves as a community center and houses a variety of offices and service agencies.

Lincoln Reservoir and Playfield [deNR, SL] The large oval reservoir is sited within a park-like setting bounded by E. Denny Way and E. Olive Street, and Nagle Place and 11th Avenue. A low, decoratively detailed, cast-concrete wall surrounds the reservoir, which contains a central waterspout. A classically detailed concrete gatehouse (the original pumping station) is located at the southwest edge of the reservoir. Surrounding these features is a running track/path, narrow swaths of grass, and a variety of trees lining the perimeter of the site, including a Chinese Scholar Tree *(sophora japonica)* at the northwest corner. The reservoir was put into operation in 1900. Subsequently, the reservoir site and the adjacent block immediately to the south were developed as Lincoln Park following 1904-06 plans by the Olmsted Brothers. The southern portion was renamed Bobby Morris Playfield in 1980. The entire site is a Seattle Landmark, but the NRHP-eligible portion excludes the playfield south of the reservoir. Seattle Public Utilities (SPU) intends to replace the existing surface reservoir with underground tanks. SPU's site restoration plan calls for a grass-covered lid to be placed over the tanks. Further redevelopment of the reservoir site is envisioned in a Parks Site Master Plan, but funding for this plan has not yet been identified.

Stewart Lumber and Hardware Company [eNR] Occupying a large, irregular parcel along busy Rainier Avenue S., this complex of wood-frame buildings, built in phases over a ten-year period, has always housed a lumber yard. The first structure on the site dates to 1923, but it may have been constructed as early as 1918. A succession of additions and the construction of secondary structures followed through the 1920s to culminate in the present complex. Dominating the site is a large one-story building with a gable-roofed monitor running the width of the building. Centered over the main entrance, a large opening with a sliding wooden door, the monitor contains four large multi-paned industrial sash windows on its north and south elevations. A lumber shed and store are located in this structure. Historic photos indicate that a variety of building materials once clad the main façade, advertising products sold inside. While the exterior has been reclad, the building is remarkably intact with good integrity. Originally owned by the W.G. Savage Lumber Co., the Stewart Lumber and Hardware Company has been in continuous operation at this location since 1926.

Cheasty Boulevard–See the description under the Preferred Alternative section.

York Apartment Building [eNR] The architecture firm of Hancock & Lockman designed this attractive 1932 two-story brick apartment building. It has a hipped roof and a rectilinear form with little exterior ornamentation other than patterned brickwork and a two-story projecting entry pavilion with a stepped parapet over a small semi-circular window. Located in proximity to the York Station of the Rainier Valley streetcar line, the York Apartments comprise one of the few brick apartment buildings built in this area prior to World War II. Containing five units, this structure stands out in an area dominated by the

commercial strip along Rainier Avenue S. and by the surrounding single-family homes. It now houses a variety of small professional businesses.

Ohman House [eNR] Set on a steep slope above Rainier Avenue S., this one-and-one-half-story single-family residence is a particularly fine example of early 20th century residential architecture in the Rainier Valley. Built in 1912 by Franz (later changed to Frank) E. Ohman, a carpenter, the wood-frame dwelling features Craftsman detailing. This includes a front-facing low-pitched gable roof, gabled porches and dormers on the north and west elevations, wide bracketed eaves, knee braces, and plain barge boards with decorative sawn work at the ends. This detailing is combined with narrow clapboard siding at the first story and patterned shingle work in all of the gable ends, reminiscent of late Victorian vernacular architecture. The home dates to the period of rapid urban development that occurred in the Rainier Valley subsequent to its annexation by Seattle in 1907. It is one of many built at this time, but one of the few to remain intact with good physical integrity. Frank Ohman built a matching garage in 1925, and lived in the home with his wife, Selma, until the 1950s.

Gill House [eNR] Situated along the west side of busy Rainier Avenue S. at the base of a hill, this one-story wood frame cottage is a well-preserved example of one of the many small single-family dwellings that once lined this stretch of the thoroughfare. Many still remain, although not with such integrity. This vernacular gable-front-and-wing dwelling has a recessed porch with a shed roof tucked in front of the wing and a full-width lean-to across the west rear elevation. The original rustic beveled siding clads the exterior with decorative shingle work filling the small gable end. It appears that some of the original wooden sash windows have been replaced, but few other alterations are apparent. Typical of early 20th century residential vernacular architecture in the Rainier Valley, the building's ca.1906 construction date places it within the earliest phase of urban development prior to the area's annexation by Seattle a year later.

Foglia House [eNR] Larger in scale than most of the other residences along this stretch of Rainier Avenue S., this two-story single-family dwelling has an unusual two-story gable-roofed porch at the east principal elevation. Well preserved with good integrity, this wood-frame dwelling features Craftsman detailing, such as a front-facing low-pitched gable roof, overhanging bracketed eaves, knee braces, and plain barge boards with slightly flared ends. Combined with this detailing are features more evocative of late Victorian vernacular architecture: narrow clapboard siding, six-over-one and narrower one-over-one double-hung sash windows, and doors leading onto both porch levels, that have windows with one large pane bounded by numerous smaller panes. Although tax assessor records indicate a 1913 construction date, no building permits have been located to confirm this. It is a fine example of the early 20th century residential architecture found in the Rainier Valley.

Albutt House [eNR] Facing S. Lilac Street, a small side street above Rainier Avenue S., this one-story hipped-roof cottage has a full-width recessed porch across the principal north elevation. Set on a high basement clad with rustic, beveled siding, the ca.1909 wood-frame dwelling features narrow clapboard siding, bracketed eaves, and a small-hipped roof dormer on the north elevation. Displaying good integrity, this is a typical, but well-preserved example of early 20th century residential vernacular architecture in the Rainier Valley.

McKinstry House [eNR] Oriented to the west-facing Letitia Avenue S., a quiet street above and parallel to Rainier Avenue S., this one-and-one-half-story single-family dwelling is a well preserved example of late 19th century residential vernacular architecture in the Rainier Valley. Thought to have been constructed about 1895, the wood-frame house appears to have had a gable-front-and-wing plan originally, with the north-facing cross-gable added later. Displaying excellent physical integrity, the house retains its original clapboard siding and double-hung wooden-sash windows, including several tall, narrow two-over-two windows in the earlier portion. Its approximate construction date places it within the earliest phase of development spurred by the improved access to the valley provided by the streetcar service to nearby Columbia City beginning in 1890.

Hubachek House [eNR] This one-and-a-half story single-family residence is a fine example of early 20th century residential vernacular architecture in the Rainier Valley. Reminiscent of a small farmhouse, this gable-front dwelling features a full-width, hipped-roof porch set on tapered corner posts at the first story of the main west elevation. The structure retains its original narrow clapboard siding and wooden sash windows, including a diamond window set just below the eaves on the north elevation. Concrete posts remain at the front of the lot, remnants of an early fence. Situated on a high slope above Rainier Avenue S., this well-preserved house retains a high level of integrity. The approximate construction date (1906) places it within the earliest phase of urban development prior to the area's annexation by Seattle a year later.

Columbia City Historic District [NR, SL] Columbia City is a pleasant mixture of commercial buildings, churches, public buildings, apartments, and houses that together display qualities of a small American community of the late nineteenth and early twentieth centuries. Located in the Rainier Valley, seven miles southeast of downtown Seattle, Columbia City began as the independent mill town (and real estate speculation) of Columbia, first platted in 1891, incorporated in 1893 and annexed in 1907. A private interurban railway between Seattle and Renton ran down Rainier Avenue S. and spurred development after 1890, the year it reached this area. Architects W. Marbury Somervell and Harlan Thomas designed the 1914 Columbia branch public library—built with money donated by Andrew Carnegie—above a ravine deeded to the city in 1891 for a park. The ravine was later filled, and the creek now flows through underground pipes; but the park remains, providing Columbia City with its "village green." The district straddles Rainier Avenue S., encompassing the greatest concentration of intact historic commercial, residential, and institutional buildings and avoiding more recently built intrusive elements.

Monster House [eNR] The Monster House is associated with one of the earliest Black River Junction settlers and is part of one of the few extant farmsteads associated with the dairy industry that once thrived in the Duwamish River valley. The house was built in 1917 for John (and Louise) Monster, the son of Chris Monster, a Danish immigrant who settled here at Black River Junction in the 1880s. Chris Monster established a farm and dairy nearer to the river on the west side of the Beacon Coal Mine Road and transported goods by canoe and barge. The parcel on the east side of the road was developed as an extensive dairy operation by John Monster and once included several early hay and cow barns. In addition to the modest craftsman house, the site includes an older garage, several sheds and a deteriorated barn and water tower.

"Belmont Farm"/Hambach Family Compound [eNR] "Belmont Farm" appears to be one of the most significant ensembles of Craftsman-era residential architecture in King County. This wooded four-acre tract is a remnant of the original Angle Lake community of vacation properties and country estates. The compound includes four Craftsman-era residences, a garage, pump house, and several outbuildings that are located on the west shore of Angle Lake, all in virtually unaltered condition. The compound was built between 1916 and 1928 for Albert Hambach, founder of a successful plumbing supply business located in Pioneer Square. Two of the buildings were designed by the distinguished Seattle architectural firm of Lawson & Moldenhour. The property served as a summer retreat for the extended Hambach family and their friends. It remained in the ownership of the Hambach family until the recent past; it is now owned by the City of SeaTac. All of the historic buildings on the site were demolished by the City of SeaTac in September 1998.

IMPACTS ON SECTION 4(F) RESOURCES

The following discussion focuses on the identified direct impacts to the resource (the "taking" of land or historic property to accommodate the project) and the proximity impacts that would result in substantial impairment to the activities, features, or attributes of the resource (in the context of Section 4(f), these proximity impacts are referred to as "constructive use").

Parks and Other Recreational Facilities

Segment A

Rainbow Point Park–Since the Draft EIS, Sound Transit has lowered the elevation of the light rail guideway in this section in order to reduce visual impacts to this park. However, westward views from Rainbow Point would still be partially impacted. While the top of the elevated structure would be below the level of the park and approximately 70 to 80 ft. from the edge of the park, the passing trains and the associated catenary support poles would be visible to park users in middle distance views (toward the Greenlake area). This impact will vary, depending on the viewers' precise location in the park. Long distance views to the Olympic Mountains would not be affected. This impact is not expected to substantially impair views from the park. However, because Rainbow Point derives its primary recreational value from its viewpoint setting, the effect on available views and the partial view impact could be significant to some park users.

Ravenna Boulevard–Alternatives A2.1 and A2.2 envision an elevated section of the light rail route crossing Ravenna Boulevard parallel to and immediately adjacent to the I-5 bridge over Ravenna Boulevard. To construct the new structure, several median trees, other vegetation, and lawn area within a 27-ft-wide strip under the new structure would be removed. A column to support the structure would also be placed in the median. The approximately 27-ft-wide structure would increase the shading and "tunnel" effect over Ravenna Boulevard already created by the I-5 bridge. The new structure may create some degree of visual intrusion to some viewers within the median or travelling along the boulevard (especially those to the southeast of the structure). The I-5 bridge, however, already creates a significant visual barrier to views along the boulevard; an additional and smaller structure at the same height as the I-5 bridge should not substantially worsen this impact. This indirect impact would not be expected to substantially impair visual or other features of Ravenna Boulevard.

University Heights School – All of the light rail routes in Segment A would be underground in this area and would construct a vent shaft housing within the parking lot on the southern end of this property. The vent shaft housing would be located approximately 100 feet from the play structures and would add potential noise from the operation of the ventilation system. The play structures do not derive their value from solitude or from the affected parking area. Therefore, the location, size and character of the vent shaft housing, and the marginal increase in noise, would not be expected to impair or diminish the use and function of the recreational facility (play structures).

Segment B

North Passage Point Park–Alternative B2.1 proposes a new light rail bridge over the ship canal paralleling and approximately 10 ft east of the existing I-5 bridge. The new bridge would be like the I-5 express lane deck, roughly 110 ft above the park. To accommodate the new bridge, that portion of the park to the east of the I-5 bridge (the 20-ft–wide strip owned by the Seattle Parks and Recreation Department) would be acquired. This strip, which comprises 0.9 acre or 11 percent of the park area, would contain one of the north side bridge piers. The most eastern 10 ft of this 20-ft strip would be under the new bridge (as well as a portion of the adjoining property). As a result, that portion of the park that would be covered by the two bridge structures would increase from its current 80 percent to 85 percent with the project. This additional coverage would result in additional park shading. The bridge pier would be a large, tapered column; the dimensions at its base would be approximately 42 ft by 12 ft. It is currently proposed along the shoreline in the southeast corner of the park. Because of its bulk, it could adversely affect views from the park toward the southeast and Portage Bay. The additional shading and view impacts would diminish the park attributes.

During construction, the park may be closed temporarily to ensure safe access and maneuverability for trucks and heavy equipment.

South Passage Point Park–As with the North Passage Point Park, Alternative B2.1 proposes that the new light rail bridge cross over the eastern edge of the South Passage Point Park. To accommodate the new bridge, that portion of the park to the east of the I-5 bridge (owned by the Seattle Parks and Recreation Department) would be acquired. This strip, which comprises 0.11 acre or 17 percent of the park area, would contain the footing for one of the south side bridge piers. The most eastern portion of this strip would be under the new bridge (as well as a portion of the adjoining Pocock Rowing Club property). That portion of the park that would be covered by the two bridge structures would increase from 75 percent today to 86 percent with the project. Additional shading would result. The large bridge pier placed along the shoreline in the northeast corner of the park would impact views toward the northeast. The cumulative effect of the additional shading and view impacts would diminish the park attributes.
During construction, the park may be closed temporarily to ensure safe access and maneuverability for trucks and heavy equipment.

Segment C

Future Sister City Park/I-90 Trail–The I-90/17th Avenue S. station proposed as part of Alternative C3 would be located entirely within this park (along the park's southern edge between 17th Avenue S. and 19th Avenue S.). Roughly 7.5 percent of the total park area would be required for the proposed elevated station. East of the station, 350 ft of the elevated light rail route would cross directly above the park before turning southward along Rainier Avenue S. The eastern half of the proposed station would be located above the I-90 Trail spur that provides access to Rainier Avenue S. The trail spur would likely be disrupted near the station, thus jeopardizing its continued use as a connection to Rainier Avenue S. The elevated section east of the station would also cross above the trail spur. The cumulative effects of these direct impacts and the resulting proximity impacts of increased traffic and activity in the station area, possible altered and more limited access to the park, and the visual and shading effects of the elevated structure would likely diminish the character of the park and trail (as perceived by users of those facilities) and its value and attributes as a greenbelt buffer to the nearby residential areas.
In addition, during construction, the park and trail could be closed temporarily to ensure safe access and maneuverability for trucks and heavy equipment used to build the station and the placement of the elevated structure foundation.

Segment D

Cheasty Boulevard - In alternatives D1.1, D1.3, D3.3, and D3.4, the at-grade McClellan Station (Option A) would cross the undeveloped Cheasty Blvd. (S. Winthrop St.) right-of-way. In alternatives D1.3, D3.3, and D3.4, the elevated section of the light rail route would cross directly over the right-of-way, with the elevated McClellan Station (options B or C) located immediately to the north of the boulevard. The at-grade or elevated crossing would require a right of use or easement from the City of Seattle. The at-grade crossing of the boulevard would create some safety and traffic impacts, which are discussed in other sections of the Final EIS. The at-grade alignments would make the envisioned connection with Mt. Baker Blvd. more difficult and thus would be contradictory to the unstated but continuing goal of linking these Olmsted boulevards both visually and functionally. The elevated structure would create some shading effects over the boulevard and would also affect the functional and visual linkage with Mt. Baker Blvd. The McClellan Station would increase the amount of traffic and activity along the boulevard as transit riders access the station. In the vicinity of the station, Sound Transit will make streetscape improvements, improve the roadway, and develop an at-grade pedestrian/bike crossing of MLK Jr. Way. S. and Rainier Ave. S. between the two Olmsted boulevards.

Segment E

Duwamish/Green River Trail–Under Alternative E2, the trail along the south shore of the river would be built to pass under the light rail elevated bridge structure and relocated farther east within the Seattle City Light right-of-way to avoid conflicts with the light rail route. Farther south between the river crossing and

the Allentown Bridge, the light rail route and the trail would share the Seattle City Light right-of-way. To avoid any crossing of the trail and the light rail route, this alternative proposes to relocate three sections of the trail: along the south shore of the river where light rail would cross the trail; near the intersection with 40th Ave. S; and just north of the Allentown Bridge. While the distance between the two would vary in width along this section, the relative proximity of the light rail route to the trail could diminish the attributes of the trail (moderate visual intrusion and increased noise within 75 ft of the route particularly). South of I-5, the trail would be parallel to the proposed elevated, retained cut-and-fill, and at-grade route sections. While the proximity impacts of visual intrusion and increased noise would be experienced by trail users, the trail would not be physically moved. South of Foster Golf Course, the trail turns east toward the river along the alignment of S. 140th Street. The trail would cross the at-grade route at that location, creating the potential for safety conflicts.

Lookout Park–Alternative E2 proposes that the elevated section of the light rail route south of I-5 and within the City Light right-of-way would cross directly over the park. The 27 ft-wide, 16 ft-high structure would create additional shading and visual impacts and, in effect, substantially change the character of this park. Based on City of Tukwila Parks and Recreation Department input (see the attached letter from Don Williams, the local official with jurisdiction, in the Agency Coordination section), Lookout Park is rarely used and is not considered to be of significant value to the community. While the park may continue to be used by waiting bus passengers, its value as a place to view the passage of the river would be significantly altered.

Foster Golf Course–The Alternative E2 light rail route would be placed within the City Light right-of-way along the western portion of the golf course. As the route would progressively descend from the elevated section to retained cut-and-fill and at-grade sections, the existing entrance to the golf course would need to be relocated at least 250 ft farther south. This proposed entrance would make the access to/from a planned clubhouse longer and more circuitous. It is estimated that approximately 105 existing parking spaces (all within the City Light right-of-way) would be lost to accommodate the project. This loss would comprise slightly over one-half the currently available spaces. The Tukwila Parks and Recreation Department predicts an increased demand for parking (the result of area growth, course improvements, and a new and enlarged clubhouse). The loss of one-half the current parking supply would complicate the City's efforts to satisfy the growing parking demand. (The City has indicated that replacement parking could be provided as part of the planned redevelopment of the maintenance building and clubhouse, although the specific location of replacement parking has not been identified at this time). South of the proposed entrance and existing parking area, some of the vegetative areas that buffer the golf course from Interurban Avenue (and the light rail route) would be lost to accommodate the project. In addition, potential noise impacts would be experienced within 75 ft of the route. The cumulative effect of these various impacts may change some golf course features and attributes.

Segment F

Angle Lake Park–Alternative F1 proposes that SR 99 (International Boulevard) be widened to the east to accommodate the at-grade light rail route. The result would be the required acquisition of a strip of land 25 ft wide within the park's street frontage; the total "take" would be roughly 0.23 acre, or approximately 2.2 percent of the entire park acreage. The area that would be acquired has recently been upgraded with new street frontage buffer vegetation and a new sidewalk (all of which would be removed to allow for construction). The recently improved parking area would not be affected. In addition to this direct impact, the widened roadway would move the northbound SR 99 traffic lanes 20 to 25 ft closer to the park, thus increasing the potential noise levels within the closest 75 ft of the park. This impact could be considered by park users as diminishing park attributes. According to the City of SeaTac (see letter from Calvin Hoggard in the Agency Coordination section) believes that these impacts should be considered significant and of great concern because the park is the only fresh water lake with a boat launch and public access in a very large geographic area.

Historic Properties

Segment A

Ravenna Boulevard–This boulevard is both a park and recreational property and an historic resource. See the description of impacts on this boulevard included above under Parks and Recreational Facilities.
University Heights School – All of the light rail routes in Segment A would be underground in this area and would construct a vent shaft housing within the parking lot on the southern end of this property. The aboveground housing would add a visible, non-historic feature to the school grounds as well as introduce potential noise from the operation of the ventilation system.

Segment B

There would be no impacts on historic resources resulting from the preferred alternative (B1.1) rail line route. However, four options for the Capitol Hill Station are still under consideration. Option D, an underground station beneath Nagle Place constructed by the cut-and-cover method, would result in the disturbance of a roughly 40-ft-wide strip, 370-ft long, along the northwestern edge of **Lincoln Reservoir**. Although construction of the station would not require permanent use of the parkland, since the disturbed area would be returned to park use after construction, historic plant material, especially the large Chinese Scholar Tree (sophora japonica), would be destroyed.

Segment C

Stewart Lumber & Hardware Company–Alternative C2.3 proposes a retained-fill and supported-ramp transition from an at-grade profile to an elevated profile within the right-of-way of Rainier Avenue S. directly in front of the Stewart Lumber building. This would require the partial destruction of a building corner to accommodate required traffic lanes. This constitutes a direct impact and would result in the likely loss of a portion of the historic building and alteration of its setting. In addition to the direct impacts associated with this alternative, the transition support structure would obscure views of the building from Rainier Avenue S. and substantially alter its setting, thus impairing an important resource attribute.

Alternative C3 proposes an elevated profile within the right-of-way of Rainier Avenue S. and directly in front of the Stewart Lumber building. The elevated trackway could substantially obscure the view of the building from the south and east, altering its setting and impairing an important attribute of the resource.

Segment D

Cheasty Boulevard–In Alternatives D1.1, D1.1d, and D3.3, the McClellan Street at-grade station would be located across the undeveloped Cheasty Boulevard (S. Winthrop Street) right-of-way. In Alternatives D1.3 and D3.4, an elevated section of the light rail route would be over the right-of-way, with the elevated station located immediately to the north. Alternatives D1.1, D1.1d, and D3.3 would make the envisioned connection with Mt. Baker Boulevard more difficult and thus would be contradictory to the unstated but continuing goal of linking these Olmsted boulevards both visually and functionally.
York Apartments–Alternatives D3.3 and D3.4 propose an at-grade route that will require acquisition and destruction or removal of the entire resource. This impact constitutes a direct "taking" and would result in the demolition or loss of the entire resource and its setting.
Ohman House–Alternatives D3.3 and D3.4 propose an at-grade route immediately downhill to the east and abutting the rear property line of this resource. Both alternatives require acquisition and destruction or removal of all of the existing structures to the east of this resource that currently separate it from Rainier Avenue S. This impact constitutes a constructive use of the property that would substantially alter its setting, thus impairing an important resource attribute. Additional indirect impacts include long-term noise impacts that would further impair the property value in terms of its prior setting and enjoyment.
Gill House–Alternatives D3.3 and D3.4 both propose an at-grade route that requires acquisition and destruction or removal of the entire resource. This constitutes a direct "taking" and would result in the demolition or loss of the entire resource and its setting.

Foglia House–Alternatives D3.3 and D3.4 both propose an at-grade route that requires acquisition and destruction or removal of the entire resource. This constitutes a direct "taking" that would result in the demolition or loss of the entire resource and its setting.

Albutt House–Alternatives D3.3 and D3.4 both propose an at-grade route immediately downhill to the east and abutting the rear property line of this resource. The at-grade route will require acquisition and destruction or removal of all of the existing structures to the east of this resource currently separating it from Rainier Avenue S. This constitutes a constructive use of the property that will substantially alter its setting, thus impairing an important attribute. Additional indirect impacts include long-term audible impacts that further impair the property in terms of its prior setting and enjoyment.

McKinstry House–Alternatives D3.3 and D3.4 both propose an at-grade route immediately downhill to the east and abutting the rear property line of this resource. The at-grade route will require acquisition and destruction or removal of all existing structures (to the east of this resource) that currently separate it from Rainier Avenue S. This constitutes a constructive use of the property that will substantially alter its setting, thus impairing an important resource attribute. Additional indirect impacts include the introduction of long-term audible impacts that will further impair the property in terms of its prior setting and enjoyment.

Hubachek House–Alternatives D3.3 and D3.4 both propose an at-grade route to be situated immediately downhill to the east and abutting the rear property line of this resource. The at-grade route will require acquisition and destruction or removal of all existing structures to the east of this resource that currently separate it from Rainier Avenue S. This constitutes a constructive use of the property that will substantially alter its setting, thus impairing an important resource attribute. Additional indirect impacts include the introduction of long-term audible impacts that will further impair the property in terms of its prior setting and enjoyment.

Columbia City Historic District (with boundary increase)–Alternatives D1.1, D1.1d, and D1.3 propose at-grade or elevated routes that follow the alignment of MLK Jr. Way S. through the westernmost portion of the Columbia City Historic District (with boundary increase). Neither of the alternatives includes a station option within the historic district. The elevated route, Alternative D1.3, has a greater potential for significant visual impacts that would be out of character with the turn-of-the century residential setting of the district.

Alternative D3.3 proposes an at-grade route that includes a crossover from Rainier Avenue to MLK, Jr. Way S. via S. Alaska Street, immediately adjacent to the northern boundary of the historic district. This alternative also follows the alignment of MLK Jr. Way S. through the westernmost portion of the Columbia City Historic District (with boundary increase). However, it includes a potential station, (Edmunds Station) within the expanded district boundaries. Alternative D3.3 could introduce indirect impacts that would alter the setting and visual character of the district.

Alternative D3.4 proposes a subway route that follows the alignment of Rainier Avenue S. to 37th Avenue S., through the commercial center of the Columbia City Historic District, and includes a station at S. Edmunds and 37th Avenue S., within the existing district boundaries. The proposed route and station are underground, and the buildings directly impacted by construction of this route are considered to be non-contributing resources within the district. However, subway construction (cut-and-cover) and the design and placement of the station entrances have the potential to introduce direct and indirect impacts that could significantly alter the setting and character of the district.

Segment E

Monster Farmstead–Alternative E3 proposes an at-grade route situated at the eastern edge of the parcel associated with this resource. The route is approximately 300 ft to the east of the closest contributing structure located on this site. This alternative would require the acquisition (or easement) and alteration of a small portion of the rural site. Additional indirect impacts include long-term noise impacts that may further impair the property.

Segment F

"Belmont Farm" Hambach Family Compound–Because this historic property has been recently destroyed, there would be no impacts.

Construction Impacts

Construction of the proposed alternatives would create the potential for temporary access restrictions, increased truck traffic, possible street closures and resulting traffic detours, removal of vegetation, and increased noise and dust at certain Section 4(f) resources. As noted in the preferred alternative section, temporary noise and dust increases are not anticipated to result in violations of the FTA noise abatement criteria or the National Ambient Air Quality Standards.

4(F) RESOURCE AVOIDANCE ALTERNATIVES

Under the requirements of 23 U.S.C. Section 138, NEPA documents in which the proposed build alternatives involve impacts on 4(f) resources must include an analysis of alternative locations for the proposed project that avoid 4(f) impacts through rerouting, design changes, or other methods. Such avoidance alternatives must be selected if they are determined to be "prudent and feasible" methods of meeting the project objectives.

Parks and Other Recreational Facilities

Rainbow Point–The height of the Alternative A2.2 elevated structure is determined primarily by the need to ensure that the structure has adequate clearance over the Lake City Way southbound on-ramp to I-5. As a result, lowering the elevated structure any further is not feasible. The other three Segment A alternatives (A1.1, A1.2, and A2.1) propose tunnel sections under or adjacent to Rainbow Point; one of these three alternatives would be a feasible means of avoiding the view impact, although the high cost for tunneling would not make it a prudent alternative.

Ravenna Boulevard–Under alternatives A2.1 and A2.2, there is no feasible way to avoid the described impacts to Ravenna Boulevard. The other two Segment A alternatives (A1.1 and A1.2) propose tunneling under Ravenna Boulevard. Tunneling is a feasible way to avoid impacts; the high cost of tunneling, however, would not make it a prudent alternative. With appropriate design of the light rail structure, the current visual impacts of the I-5 bridge could actually be reduced.

University Heights School—The vent shaft housing could be moved to another location along the tunnel route; however, in this vicinity single-family homes on small lots are the dominant land use. While it may be feasible to locate the vent shaft on a residential lot, it may not be prudent given the level of disturbance for homeowners and neighbors.

North Passage Point Park–The north shore piers for the proposed ship canal bridge could feasibly be moved some distance farther east. To avoid all impacts to the park (no property acquisition, no additional coverage, and no footing for the piers within the park), the bridge structure would need to be moved a minimum of roughly 45-ft from its currently proposed location. The implications of such a move would be a tighter turning radius as the elevated structure would link to the bridge, and thus slower train speeds, and acquisition of adjoining private property. This would not be prudent. Despite the relocation of the bridge, the park may still be indirectly impacted by the relative proximity of the bridge structure. The only feasible way to avoid these impacts would be to choose another alternative (B1 or B2.2) that would follow a different route.

South Passage Point Park–Similar to North Passage Point Park, the south shore piers to the proposed bridge could feasibly be moved farther east (and would need to be if such an adjustment was made on the opposite shore). To avoid all impacts to the park, the bridge structure would need to be moved a minimum of roughly 60 ft from its currently proposed location. This relocation would require acquisition of

adjoining Pocock Rowing Club property, and possibly other properties farther south, to accommodate the route alignment. This would not be prudent considering the cost to acquire these developed properties and the resulting displacements. As on the north shore, the park may still be indirectly affected because of bridge structure proximity. The only feasible means to avoid the impacts would be to choose another alternative (B1 or B2.2).

Future Sister City Park/I-90 Trail–One avoidance alternative would be to continue the tunnel profile, proposed to the west of the park, under the park. While this alternative would not be feasible, the tunnel section to the west would need to be even deeper than proposed and would need to continue for some distance along Rainier Avenue S. before it could come to an at-grade profile, and eventually to an elevated profile as currently proposed. This additional tunneling would increase the overall project cost considerably and thus would not be prudent. The only other means to avoid the impacts would be to choose another alternative (C1, C2.3 or C2.4) that follows a different route.

Lincoln Reservoir – One avoidance alternative would be to mine the Capitol Hill Station at Nagle Place, thereby avoiding the likely loss of the Chinese Scholar Tree and reducing other surface disturbance. However, soil conditions would require a much deeper station if mined, which would affect the tunnel depth north and south of the station, increase the construction costs significantly, and preclude the use of escalators for station access. The other means to avoid the impacts of the Nagle Place option would be to choose one of the station options on or adjacent to Broadway. A mined station west of Broadway would also need to be a deep station and would have the same cost and access drawbacks as a mined Nagle Place Station. A cut-and-cover option on Broadway may be prudent, although, it would cause some disruption to the Broadway commercial district (traffic diversions, loss of on-street parking and restricted access) during the construction period. Disruption to the business district could be reduced by mining the crossover track associated with the station and using cut-and-cover construction for the station only; however, this would cost almost $20 million more.

Cheasty Boulevard–A tunnel profile would avoid the disruption to the connection between the two Olmsted boulevards. However, tunneling would not be feasible considering the adjoining elevated profiles, and would not be prudent considering the high cost.

Duwamish/Green River Trail–To avoid the sharing of the City Light right-of-way north of the Allentown Bridge, the light rail route proposed under Alternative E2 could be extended south along the Interurban Avenue right-of-way. That alternative would widen Interurban Avenue (an elevated profile would require less space within the street than an at-grade profile). The existing right-of-way is limited through this section (squeezed between the SR 599 right-of-way and the City Light right-of-way) and thus would not be a feasible route at specific locations. The cost of the additional right-of-way acquisition would not be a prudent use of public funds considering that the separation between the light rail route and the trail may be no greater with this approach than is currently proposed in Alternative E2. The impacts to the trail could be avoided if another alternative (E1.1, E1.2, or E3) that follows other routes were chosen.

To avoid conflicts south of I-5, the Alternative E2 route could be re-aligned to run within the Interurban Avenue right-of-way or along the west side of that right-of-way (as opposed to within the City Light right-of-way along the east side of the Interurban Avenue). The Interurban Avenue right-of-way through this section is wider than it is north of the Allentown Bridge. However, additional right-of-way acquisition would be required to accommodate either an at-grade or elevated section. And, to avoid impacts to the trail along the east side of the street, the additional land acquisition would have to occur along the west side of the street. The west side includes the Metro park-and-ride lot and private apartments/condos and commercial establishments. While feasible, moving the light rail route would not be prudent in light of the cost to acquire these developed properties and the likely displacements. Again, the impacts could be avoided if another alternative (E1.1, E1.2, or E3) that follows other routes were chosen.

Lookout Park–As previously discussed, it is feasible to move the light rail route farther west to avoid the impacts to this park. The cost of doing so, however, would not be prudent. In addition, this avoidance alternative would not be prudent in light of the input from the City of Tukwila Parks and Recreation Department that Lookout Park is rarely used and is not considered to be of significant value to the community. Another way to avoid the impacts would be to choose another alternative (E1.1, E1.2, or E3) that follows a different route.

Foster Golf Course–As noted above, it is feasible to move the light rail route farther west to avoid impacts to the golf course under Alternative E2. The cost of doing so, however, may out weigh other considerations and thus would not be prudent. Another option would be to extend the elevated section (that crosses over I-5) farther south than currently proposed. This is a feasible alternative in that this new elevated section could connect to the elevated section proposed farther south. By doing so, the existing golf course entrance could be maintained and, because the elevated section would require less right-of-way than the proposed at-grade section, most of the parking spaces estimated to be lost as a result of the at-grade section could be maintained. The increased cost of the elevated section (this avoidance alternative would add roughly 3,350 extra ft of elevated structures) and the visual impact to golfers and others, however, would make this an imprudent option. Another means to avoid the impacts would be to choose another alternative (E1.1, E1.2, or E3).

Angle Lake Park–To avoid impacting Angle Lake Park under Alternative F1, the land required to accommodate the light rail route could be acquired from the west side of SR 99 (rather than the east side as proposed). While feasible, it would increase project costs considerably because of the more highly developed nature of the land uses along the west side and because of their proximity to the existing right-of-way. As a result, this alternative would not be prudent. Another avoidance alternative would be to place the light rail line on an elevated structure, thus reducing the right-of-way needed. All other Segment F alternatives (F2.1, F2.2, F3.1, and F3.2) would also avoid the impact to the park.

Historic Properties

Ravenna Boulevard–Under alternatives A2.1 and A2.2 there is no feasible means to avoid the described impacts to Ravenna Boulevard. The other two Segment A alternatives (A1.1 and A1.2 propose tunneling under Ravenna Boulevard. Tunneling presents a feasible means of avoiding the impacts but may not be prudent because of high cost.

University Heights School—The vent shaft housing could be moved to another location along the tunnel route; however, in this vicinity single-family homes on small lots are the dominant land use. While it may be feasible to locate the vent shaft on a residential lot, it may not be prudent given the level of disturbance for homeowners and neighbors.

Stewart Lumber & Hardware Company–Under Alternative C2.3 there is no feasible means to avoid impacts on the building and its setting. Constraints posed by the at-grade S. Massachusetts Street crossing and the necessity for the profile transition to be complete before the curve at S. Plum Street, require that the at-grade to elevated transition, with its retained fill, occur in front of the Stewart Lumber building.
Under Alternative C3, in which the trackway is elevated from the I-90 Station to the McClellan Street Station, there is no feasible means to avoid impacts to the setting of the Stewart Lumber building, although these visual impacts are less severe than those associated with Alternative C2.3.
Alternatives C2.4 and C1 are feasible means of avoiding the impacts, but tunneling increases the overall project costs.

Cheasty Boulevard–The Alternatives D1.1, D1.1d, and D3.3 at-grade stations would have the greatest impact on the historic right-of-way and preclude the envisioned connection of Cheasty Boulevard and Mt. Baker Boulevard. The elevated structures proposed under Alternatives D1.1, D1.3, and D3.4 would minimize that impact by making it easier to develop a ground-level landscaped connection between the two boulevards. However, the elevated guideway would have greater visual impacts on the boulevard's setting.

While a tunnel section would completely avoid the impact, tunneling would not be prudent considering the high cost.

York Apartments, Gill House, Foglia House–To avoid direct impacts to these three properties, the land to accommodate the route could be acquired from the east side of Rainier Avenue S. (rather than the west side as proposed in Alternatives D3.3 and D3.4). This may be feasible; however, it would increase project costs due to the more highly developed nature of the land uses on the east side, and disrupt traffic patterns as there are a greater number of major intersecting streets on the east side. Alignment of the route using the street right-of-way, either at-grade or elevated was previously eliminated from consideration due to traffic impacts. The only feasible avoidance alternatives appear to be Alternatives D1.1, D1.1d, and D1.3, both of which follow MLK Jr. Way S. and do not impact any historic properties south of the McClellan Street Station.

Ohman House, Albutt House, McKinstry House, Hubachek House–To avoid the proximity impacts to these four properties, the land to accommodate the route could be acquired from the east side of Rainier Avenue S. (rather than the west side as proposed in Alternative D3.3 and D3.4). This alternative may be feasible; however, it would increase project costs due to the more highly developed nature of the land uses on the east-side, and disrupt traffic patterns, as there are more major intersecting streets on the east-side. Alignment of the route using the street right-of-way, either at-grade or elevated, was previously eliminated from consideration due to traffic impacts. The only feasible avoidance alternatives appear to be alternatives D1.1c, D1.1d, and D1.3, all of which follow MLK Jr. Way S. and do not impact any historic properties south of the McClellan Street Station.

Columbia City Historic District (with boundary increase)–To serve the community, all Segment D routes travel through the Columbia City Historic District (as defined with a boundary increase) and will impact the district to some extent. Alternative D3.4, a subway route with an underground station will directly impact the grounds of the historic school and other buildings considered non-contributing resources within the district. The other alternatives have some lesser proximity impacts. Because of the benefits of the Central Link light rail serving this community, an avoidance alternative is not desirable. To minimize harm, review and approval of trackway and station designs by the SHPO would be required. Because Columbia City is a locally designated landmark district, project plans and designs must also be reviewed and approved by the Seattle Landmarks Preservation Board.

Monster Farmstead–To avoid impacting the Monster Farmstead site, the alignment could be moved to the east. This may be feasible; however, it would increase project costs because of the topography and the proximity of a parallel road to the east.

"Belmont Farm" /Hambach Family Compound–Because this historic property has been recently destroyed, there is no need for avoidance.

MEASURES TO MINIMIZE HARM

Under the requirements of 23 U.S.C. Section 138, impacts on 4(f) resources that cannot be avoided must be minimized, or mitigated, to the greatest possible extent. Mitigation can take the form of design refinements, such as retaining walls to reduce the need for right-of-way acquisition, or compensation (monetary or in-kind) for values lost through project construction. Properties acquired with funding appropriated under the Land and Water Conservation Fund Act are also subject to the requirements of Section 6(f) of that act, which requires mitigation of impacts through replacement with property of equal value and function.

Rainbow Point

The catenary support poles would be placed/spaced to minimize the middle distance view impact (the precise placement would be determined during final project design.)

The elevation of the viewpoint could be potentially raised to allow unobstructed views over the catenary.

Ravenna Boulevard

Where possible, temporarily disturbed areas would be re-landscaped after construction.

University Heights School

Sound Transit would work with the Seattle Landmarks Preservation Board and the University Heights Community Center to design a vent shaft housing that would be compatible with the school setting.

North Passage Point Park/South Passage Point Park

The area surrounding the pier footings and piers would be restored to pre-project conditions after construction.

Future Sister City Park/I-90 Trail

The I-90 Trail spur would be relocated within the park (most likely between the station and the I-90 retaining wall) to ensure its continued use.

Cheasty Boulevard

All station components, guideway, street improvements, and landscape plans associated with the design of the McClellan Station and guideway overpass at Cheasty Boulevard (S. Winthrop Street) shall be prepared in consultation with the Seattle Landmarks Preservation Board and the SHPO, and be approved by the SHPO. Such plans shall be developed with the objective of:

- Improving Cheasty Boulevard in the light rail station area in a manner compatible with the original Olmsted design;
- Providing at-grade pedestrian and bicycle access across Rainier Avenue S. and MLK Jr. Way S. between the Olmsted-designed Mt. Baker and Cheasty boulevards;
- Minimizing to the extent practicable the physical displacement into the right-of-way of Cheasty Boulevard;
- Minimizing to the extent practicable the obstruction of views from Cheasty Boulevard toward Mt. Baker Boulevard; Removing all or a portion of the existing pedestrian overpass across Rainier Avenue S. and MLK Jr. Way S. if agreed to by the City of Seattle, Seattle School District and surrounding community; and
- The station and guideway design will be architecturally compatible with the character of Cheasty Boulevard.

Duwamish/Green River Trail

Provide a buffer between the trail and the light rail route.

Where possible, disturbed areas would be re-landscaped and new vegetation added to help buffer the trail from the light rail route.

To minimize potential safety conflicts, gates and/or signals would be installed wherever the trail and the light rail route would cross, or a grade separation would be provided if feasible.

Support columns for the elevated structure would be placed as far away from the trail as possible.

Lookout Park

Sound Transit would coordinate with the City to identify suitable replacement sites that provide views of the Green River.

Foster Golf Course

Gates and/or signals would be installed at the proposed golf course entrance to minimize potential safety conflicts between golf course users and the light rail line.

Sound Transit would work with the City of Tukwila to identify ways to replace some (if not all) of the lost parking spaces (The planned maintenance building and clubhouse relocation could make land available for replacement parking; other locations within the golf course would also provide space for parking).

Where possible, disturbed areas would be re-landscaped and new vegetation added to help buffer the golf course from the light rail route.

Angle Lake Park

A new sidewalk and a landscaped buffer would be installed along the park's SR 99 frontage.

Historic Properties

Ravenna Boulevard

Implement landscaping that would retain the historic boulevard character.

Obtain SHPO review and approval of elevated trackway and supports, station design, and landscaping plan.

University Heights School

- Sound Transit would work with the Seattle Landmarks Preservation Board to design a vent shaft housing that would be compatible with the school setting.

Lincoln Reservoir

If the Nagle Place/Capitol Hill Station option moves forward as the recommended station configuration:

- Sound Transit will investigate the possibility of successfully transplanting the Chinese Scholar Tree to another suitable location within the Lincoln Reservoir property;
- If transplanting is proven to not be feasible, Sound Transit will provide acceptable replacement trees to be included in a historically-compatible landscape plan for the disturbed area; and
- Sound Transit will participate in the development of this plan with the City of Seattle, the Seattle Landmarks Preservation Board, Friends of Seattle's Olmsted Parks, and other interested parties.

Stewart Lumber Company

Modify project design to limit physical alteration of the building and minimize the visual impacts of the profile transition.

SHPO review by and approval of alterations to the building and profile transition.

Cheasty Boulevard

All station components, guideway, street improvements, and landscape plans associated with the design of the McClellan Station and guideway overpass at Cheasty Boulevard (S. Winthrop Street) shall be prepared in consultation with the Seattle Landmarks Preservation Board and the SHPO, and be approved by the SHPO. Such plans shall be developed with the objective of:

- Improving Cheasty Boulevard in the light rail station area in a manner compatible with the original Olmsted design;

- Providing at-grade pedestrian and bicycle access across Rainier Avenue S. and MLK Jr. Way S. between the Olmsted-designed Mt. Baker and Cheasty boulevards;
- Minimizing to the extent practicable the physical displacement into the right-of-way of Cheasty Boulevard;
- Minimizing to the extent practicable the obstruction of views from Cheasty Boulevard toward Mt. Baker Boulevard; Removing all or a portion of the existing pedestrian overpass across Rainier Avenue S. and MLK Jr. Way S. if agreed to by the City of Seattle, Seattle School District and surrounding community; and
- The station and guideway design will be architecturally compatible with the character of Cheasty Boulevard.

York Apartments, Gill House, Foglia House

Based on consultation, the SHPO could approve removal of the properties to an appropriate receiving site following established procedures for moving historic buildings.

Ohman House, Albutt House, McKinstry House, Hubachek House

Buffers in the form of noise barriers and enhanced landscaping could be introduced to minimize audible and visual proximity impacts.

Review by and SHPO approval of system design and buffer elements.

Columbia City Historic District

Station entrances designed to be compatible with the historic character of the district.

Review by and SHPO approval of trackway and station designs.

Monster House

Landscaping plan to minimize visual intrusion of elevated trackway.

SHPO review and approval of elevated trackway and landscaping plan.

CONCLUSION

As previously noted, one recreational and historic Section 4(f) resource (Cheasty Boulevard), and one potential site of Native American cultural interest would be affected by the preferred alternative. The specific effects of the preferred alternative on Cheasty Boulevard would include:

- the elevated structure would cross directly over the boulevard right-of-way
- the elevated structure would create shading effects over the boulevard
- the elevated structure would be a new and intrusive feature in the streetscape, affecting the visual linkage with Mt. Baker Boulevard
- the elevated McClellan Street station would be located immediately to the north of the boulevard, resulting in an increased amount of traffic and activity along the boulevard as transit riders access the station

The conclusion of this Section 4(f) Evaluation is that the only way to avoid the crossing of the boulevard and the resulting shading effect and the disruption to the visual connection between Cheasty Boulevard and Mt. Baker Boulevard would be to construct a tunnel section in the vicinity of Cheasty Boulevard. However, tunneling under Cheasty Boulevard would not be prudent in light of the very high cost of tunneling. Because of these unique problems and unusual factors involved with a tunneling option and because the cost resulting from the tunneling option would reach extraordinary magnitudes, it is concluded that there is no feasible or prudent alternative to the use of the Section 4(f) land.

To minimize the harm of the impacts to Cheasty Boulevard, Sound Transit will implement a number of streetscape improvements (new street trees, unique paving treatment), improve the condition of the boulevard roadway with new pavement, and develop the at-grade pedestrian/ bicycle crossing of MLK Jr. Way S. and Rainier Avenue S. in order to better connect the two Olmsted boulevards. In addition to these specific improvements included in the design of the McClellan Station and associated elevated structure, Sound Transit will work with the State Historic Preservation Officer, the City of Seattle, Friends of Seattle's Olmsted Parks, and other interested parties to identify additional improvements that could be implemented. In conclusion, despite the project impacts to this Section 4(f) resource, the preferred alternative would be designed in a manner that: 1. would result in the least possible harm to Cheasty Boulevard; and 2. would be more consistent with the original Olmsted boulevard concept by improving the boulevard's visual character and providing an at-grade pedestrian/ bicycle crossing of MLK Jr. Way S. and Rainier Avenue S.

Measures to minimize harm for the potential site of Native American cultural interest will be determined in consultation with the Tribes and SHPO if the site is found to be eligible for National Register listing and if the project is determined to effect its cultural resource values.

AGENCY COORDINATION

The U.S. Department of the Interior reviewed the Draft EIS and indicated that the Final EIS must document coordination with the Washington State Interagency Committee for Outdoor Recreation (IAC) and with the local officials with jurisdiction over park and recreational resources.

The IAC was consulted regarding potential impacts to parklands acquired by/ or developed with the Land and Water Conservation Fund grant program or other state-funded grant programs. A copy of the correspondence from the IAC is included in Appendix A. Based on the information provided by the IAC, Cheasty Boulevard, the only impacted Section 4(f) parkland along the preferred alternative, is not a LWCF- or other state grant-funded facility.

During the preparation of the Draft EIS, Parks and Recreation Department managers (the local officials with jurisdiction) of the cities of Seattle, Tukwila, and SeaTac were consulted for guidance and concurrence on the attributes and significance of identified Section 4(f) resources. Copies of the correspondence from these officials were included in Appendix A of the Draft EIS. During preparation of the Final EIS, these same officials were consulted on the impacts of the Preferred Alternative to these resources and the appropriateness of the proposed mitigation measures. Copies of the correspondence from these officials are included in Appendix A of the Final EIS.

The U.S. Department of the Interior also noted that the Final EIS must demonstrate consultation with the Washington State Historic Preservation Officer (SHPO) and concurrence from the SHPO on the determination of eligibility of properties not listed on the National Register of Historic Places. The SHPO letter of concurrence was included in Appendix A of the Draft EIS. During the preparation of the Final EIS, the SHPO, the Advisory Council on Historic Preservation (ACHP), the Seattle Historic Preservation Officer, and the Friends of Seattle's Olmsted Parks were consulted on the impacts of the Preferred Alternative on Section 4(f) cultural resources and the appropriateness of proposed mitigation measures. The Draft Programmatic Agreement among the Federal Transit Administration, the ACHP, and SHPO to minimize adverse impacts on cultural resources affected by the Preferred Alternative is included in Appendix R of the Final EIS.

Sound Transit initiated consultation with the Muckleshoot and Suquamish Tribes and Duwamish group in Spring 1998 during preparation of the Draft EIS. Consultations were continued in 1999 regarding the Boeing Access Road potential site of cultural resource interest in cooperation with the SHPO and ACHP, and will be continued according to the Draft Programmatic Agreement described above.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX F
List of Preparers

Appendix F List of Preparers

PUBLIC AGENCIES

Federal Transit Administration (FTA) (Federal lead agency for the EIS)

Seattle, Washington

Carol Braegelmann, Realty Specialist
M.P., Planning, University of Virginia, 1994
B.C.P., City Planning, University of Virginia, 1991
American Institute of Certified Planners

Shelly R. Brown, Regional Counsel
J.D., Seattle University School of Law, 1985
B.A., Communications, University of Washington, 1978

Maurice Foushee, Community Planner
M.A., City and Regional Planning, University of North Carolina, Chapel Hill, 1986
B.A., Political Science, University of North Carolina, Chapel Hill, 1984

Linda Gehrke, Deputy Regional Administrator
M.P.A., Seattle University, 1991
B.A. Geography, Western Washington University, 1982

Nick Hockens, Community Planner
Ph.D., Political Science, Northwestern University, 1993
M.A., Political Science, Northwestern University, 1987
B.A., Political Science, Oklahoma State University, 1986

Helen M. Knoll, Regional Administrator
J.D., University of Denver College of Law, 1976
B.A., English Literature, Cornell University, 1964

Ted Uyeno, Regional Counsel
B.A., University of California, Santa Barbara, 1973
J.D., University of Hawaii, School of Law, 1979

Michael J. Williams, Regional Engineer
B.S. Civil Engineering, Morgan State University, 1995

Washington, D.C.

A. Joseph Ossi, Environmental Protection Specialist: Planning, Analysis and Support Division
B.A., Rutgers University, 1971

SOUND TRANSIT

James Irish, Senior Environmental Analyst
M.L.A., Landscape Architecture, University of Washington, 1989
B.A., Philosophy, State University of New York, 1977
Registered Landscape Architect

Anna Mallon, Project Assistant
B.A. Communication Studies, University of California, Santa Barbara, 1993

Jeanne Krikawa, Project Development Coordinator
B.A., Architecture, Rensselaer Polytechnic Institute

Ron Endlich, North Corridor Project Manager
B.A., Geography, University of Washington, 1979
American Planning Association
Professional Geographers of Puget Sound

Don Billen, Project Coordinator
M.S. Transportation Systems, University of Washington, 1997
M.P.A. University of Washington, 1997
B.A. Peace and Global Studies, Earlham College, 1989

Mary Jo Porter, Deputy Director
M.B.A., Harvard University, 1985
M.S., Transportation Engineering, University of California at Berkley, 1974
B.A., Architecture, University of California at Berkley, 1972

Ron Lewis, Project Development Manager
M.S. Transportation Engineering and Planning, University of Washington, 1989
B.A. Urban Planning, University of Washington, 1982

Jeff Munnoch, Community Relations Coordinator
B.A., Political Science, University of Washington, 1991

Johnathan Jackson, South Corridor Project Manager
Planning Association of Washington
Conference of Minority Transit Officials (COMTO)
B.A., Business Administration, Seattle University, 1990

Yuko Kodama, Community Relations Coordinator
M.U.P., Urban Planning & Design Candidate, University of Washington
B.A., Sociology/Anthropology, Lewis & Clark College, 1992

Leonard McGhee, Project Coordinator
M.A., Urban Planning, California State Polytechnic University, Pomona, 1983
B.A., Social Ecology, University of California, Irvine, 1976
B.A., Social Science, University of California, Irvine, 1976
Certificate in Managing the Transportation System, University of California, Irvine, 1982

Shellise Montgomery, Project Coordinator
M.S., Engineering Management, Milwaukee School of Engineering, 1994
B.S., Physics, Fisk University, 1990

Diana Painter, Project Coordinator
Ph.D., Architecture in Research, University of Sheffield, 1990
M.U.P., Urban Planning, University of Washington, 1984
Certificate in Urban Design, University of Washington, 1984
B.A., Graphic & Industrial Design, Western Washington University, 1977
American Planning Association
American Institute of Certified Planners

Kara Palmer, Community Relations Coordinator
B.S., Biopsychology, University of California, Davis, 1989

Tracy Reed, Project Coordinator
M.A., Transportation Engineering, University of Washington, 1997
B.A., Physics, The Colorado College, 1991
Scholarship, Architecture, Harvard Graduate School of Design, 1989

Valerie Rosenkrantz, Project Development Manager
M.B.A., Business Administration, California State University, Sacramento, 1991
B.S., Environmental Policy Analysis & Planning, University of California, Davis, 1985

Michael Rossotto, Community Relations Coordinator
J.D., Stanford Law School, 1992
B.A., Government, Oberlin College, 1984

Chris Townsend, Project Development Coordinator
M.A. Geography, University of Washington, 1993
B.A. Geography, University of Washington, 1991

Michael Williams, Central Corridor Project Manager
M.U.P., Urban Planning, University of Washington, 1980
B.A., Public Administration, San Diego State University, 1977

SOUND TRANSIT CONSULTANTS

Parametrix, Inc. (Primary Consultant for EIS)

George Capestany, Chairman of the Board (Principal-In-Charge and Diversity Manager)
M.S., Civil Engineering, University of Washington, 1964
B.S., Environmental Sciences, University of Havanna, 1960
Professional Engineer

Jeffrey Heilman, Senior Project Manager (Consultant Team Project Manager)
M.S., Urban and Regional Planning, University of Southern California, 1989
B.S., Biology, Washington State University, 1982

American Institute of Certified Planners

John Perlic, Transportation Engineer (Transportation Team Manager)
M.S., Civil Engineering, University of Washington, 1989
B.S., Civil Engineering, West Virginia University, 1983
Professional Engineer

Sandra Fann, Engineer III (Traffic Analysis)
B.S., Civil Engineering, University of Washington, 1995
B.A., Dance, University of Washington, 1995
Engineer-In-Training

Erika Harris, Planner (Project Coordinator)
B.A., Economics, Pacific Lutheran University, 1992
Certificate, Environmental Studies, Pacific Lutheran University, 1992

Catherine Smith, Editor
M.A., English, Washington State University, 1981
B.A., English, Mount Marty College, 1968

Jenna Leavitt, Engineer (Water Resources)
M.S., Environmental Engineering, University of Washington, 1998
B.S., Oregon State University, 1994

David Mattern, Senior Planner (GIS, Mapping)
M.A., Geography, University of Colorado, 1983
B.A., Geography, University of Washington, 1978
American Institute of Certified Planners

Lois Caswell, Senior Graphic Artist (Graphics)
Graduate in Graphic Arts, Burnley Art School, 1979

Jill Czarnecki, Junior Scientist (GIS, Environmental Analysis)
B.S., Geology, University of Puget Sound, 1997

Gary Maynard, Planner IV (Energy Task Manager)
B.A., Geography, University of Washington, 1985
American Institute of Certified Planners

Daryl Wendle, Planner (Lead Editor)
M.A., English, New York University, 1988
B.A., English, University of Oregon, 1986

Rick Rosario (GIS Database)
Graduate, Griffen Business College, 1986

Paul Fendt, Water Resources Engineer (Hydrology)
B.S., Geological Engineering, University of North Dakota, 1981

Professional Engineer

Julie Grialou, Scientist/Biologist I (Wetlands)
M.S., Wildlife Science, University of Washington, 1995
B.A., Anthropology, Harvard University, 1990

Mark Hafs, Landscape Architect II (Visual Analysis)
M.A., Landscape Architecture, University of Virginia, 1995
B.A., Landscape Architecture, University of Washington, 1991

David Jennings, Engineer IV (Water Resources)
B.S., Civil Engineering, University of Lowell, 1988
Professional Engineer, State of Washington

James Kelley, Senior Scientist/Biologist (Wetlands)
Ph.D., Aquatic Ecology, Michigan State University, 1985
M.S., Plant Ecology and Taxonomy, Michigan State University, 1980
B.S., Botany, University of Vermont, 1978

Bill Kleindl, Scientist/Biologist (Ecosystems)
M.S., Aquatic Ecology, University of Washington, 1995
B.S., Botany, University of Wisconsin, 1987
Wetland Professional in Training

Howard Roll, Senior Planner (Traffic)
M.S., Civil Engineering, Stanford University, 1986
B.S., Environmental Earth Sciences, Stanford University, 1985
Professional Engineer (Traffic), Oregon, California

Mel Sears, Transportation Engineer (Construction)
B.S., Civil Engineering, Cogswell College, 1985.
Professional Engineer – Oregon, Washington, California

Pat Togher, CAD Technician
M.A., Geography and Environmental Studies, Northeastern Illinois University, 1996
B.S., Geography/Information Science, Northeastern Illinois University, 1989
Certificate in Wetland Science and Management, University of Washington, 1998

Anne Sylvester, Transportation Planner (Construction)
B.A., Economics, University of the Pacific, 1972
Professional Traffic Engineer

Erik Farstad, Planner (Permitting)
B.A., Planning Studies, University of Washington, 1996

CH2M Hill (Partner Firm for EIS)

Kris Liljeblad, Senior Transportation Planner (Associate Project Manager)
B.A., Urban Studies, University of Minnesota-Duluth, 1973
American Institute of Certified Planners

Mark Assam (Built Environment Team Manager)
B.S., Biology, University of Washington, 1990
American Institute of Certified Planners

Robert Swope (Social Environment Team Manager)
M.S., Urban Planning, University of Arizona, 1973
M.A., Latin American Studies, University of New Mexico, 1969
B.A., Political Science, Pennsylvania State University, 1967
American Institute of Certified Planners

Jim Bard (Archaeological Resources Task Manager)
Ph.D., Anthropology, University of California, Berkeley, 1979
M.A., Anthropology, University of California, Berkeley, 1976
B.A., Anthropology, University of California, Berkeley, 1974

Dan Pitzler (Economics)
M.A., Economics, University of Washington, 1985
B.A., Economics, Western Washington University, 1982

Todd Slind (Transportation)
M.S., Transportation Planning and Engineering, University of Washington, 1995
B.A., Environmental Studies, Evergreen College, 1992

Mike Behn, (Land Use and Neighborhoods)
B.A. Planning, Public Policy and Management, University of Oregon, 1996

Anne Sienko, Planner
B.A. Ecology and Evolution, University of California, Santa Barbara, 1994

Timothy Bevan, Transportation Planner (Traffic)
M.E., Civil Engineering (Transportation Planning), University of California, 1978
B.S., Transportation Engineering, California Polytechnic State University, 1976
Graduate-level Studies, Construction Engineering Management, Oregon

Wynnlee Crisp (Environmental Justice Task Manager)
M.B.A., General Management, University of Washington, 1998
M.S., Natural Resources Management, University of Alaska-Fairbanks, 1973
B.S., Biology and Chemistry, Ball State University, 1969

John Hoey (Parklands, 4(f))
M.A., Environmental Policy Planning, Tufts University, 1997
B.A., Government, Hamilton College, 1992

Tung Le (Traffic)
M.S., Transportation Engineering, Seattle University, 1983
B.A., Architecture, University of Washington, 1980

Robyn McClintock (Archaeological Resources)
B.S., Anthropology/Archaeology, Oregon State University, 1981

Molly McDonald (Land Use)
M.S., Urban Planning, Columbia University, 1995
B.A., American History, Columbia University, 1990

Robert Meadows (Economics)
M.S., Agricultural and Resources Economics, University of California Berkeley, 1976
B.A., Economics, University of California Berkeley, 1970

Lorie Parker (Land Use)
J.D. and Certificate in Environmental and Natural Resource Law, 1984
Northwestern School of Law of Lewis and Clark College
M.A., Library Science, University of Iowa, 1968
B.A., English, University of Iowa, 1967

Mary Beth Yansura (Air Quality Task Manager)
B.A., Chemistry, Rutgers University, 1988

Cheryl Yoshida (Traffic)
B.S., Civil Engineering, University of Washington, 1993
Professional Engineer

Jennifer Young-Sadowski (Neighborhoods)
B.S., English Language and Literature, University of Washington, 1987

Herrera Environmental Consultants (Partner Firm for EIS)

Kittie Ford, Senior Environmental Scientist (Physical Environment Group Manager)
M.U.P., Natural Resource Planning, University of Washington, 1991
B.A., Science Education, Western Washington University, 1979
B.S., Zoology, Oregon State University, 1975
Professional Wetland Scientist
Certified Ecologist
Certified Wetland Delineator

Peter Sparhawk, Environmental Planner (Neighborhoods, Utilities, Public Services)
B.A., History, Cornell University, 1985

Lynne Petersen, (Primary Word Processor and Document Coordinator)
A.A.S, Shoreline Community College, 1993

Arthur Campbell, Senior Environmental Planner (EMF)

M.S., Geological Sciences, University of Washington, 1991
B.S., Environmental Studies, University of Washington, 1975
B.S.E., Biomedical Engineering, Duke University, 1973

Peter Jowise, Senior Engineer (Hazardous Materials Task Manager)
M.S., Environmental Engineering, University of Washington, 1982
B.A., Cell Biology, University of California Santa Barbara, 1976

Kathleen Adams, Environmental Scientist (Ecosystems)
M.S., Natural Resources, University of New Hampshire, 1991
B.S., Wildlife Management, University of Wisconsin at Stevens Point, 1997

Eric Chapman, Environmental Scientist (Hazardous Materials)
B.S., Biology, California State University Bakersfield, 1988

Nona Diediker, Environmental Scientist
B.S., Zoology/Botany, East Texas State University, 1983

Deepa Ghosh, Technical Intern (Hazardous Materials)
B.S., University of Washington, 1998

Quyen Ho, Technical Intern
B.S. Environmental Science/Regional Planning, Washington State University, 1996

Doug Gresham, Environmental Scientist (Ecosystems)
M.S., Biology, Eastern Washington University 1985
B.S., Biology, Eastern Washington University, 1983

David Hirsh, Attorney/Senior Planner (Displacements)
J.D., University of San Diego School of Law, 1989
B.A., Government/History, Oberlin College, 1985

Rebecca Janacek, Environmental Scientist (Ecosystems)
B.S., Western Washington University, 1997

Susan Roth, Environmental Scientist (Hazardous Materials)
M.S., Geology, New Mexico Institute of Mining Technology, 1980
B.S., Geology, South East Missouri University, 1977
Registered Geologist, California, Idaho, Oregon
Registered Site Assessor, Washington

Theresa Wood (Contract Administrator)
B.S., Environmental Science, Anthropology and Geography,
Western Michigan State University, 1981

Carol Newlin (Environmental Analyst and Editor)
M.A., Architecture, University of Washington, 1983
B.A., Philosophy and Political Science, University of California at Berkeley, 1967

Courtois & Associates (Sub-Consultant for Cultural Historic)

Shirley L. Courtois, Architectural Historian (Historic Preservation Consultant)
(Historic/Cultural Task Leader)
M.A., History of Architecture, University of Wisconsin, 1964
B.A., History of Art, University of Illinois, 1960

Katheryn H. Krafft, Historic Resources Specialist (Historic Resources)
B.A., Art History, University of Washington, 1971
Catherine L. Wickwire, Historic Preservation Specialist (Historic Resources)
M.A., Preservation Studies, Boston University, 1996
B.A., History, Whitman College, 1987

DSV International (Sub-Consultant for Transit Impacts)

Jerry Dow (Transit)
Professional Program in Urban Transportation, Carnegie-Mellon University, 1977
M.S.C.E., Transportation, University of Washington, 1971
B.S.C.E., Washington State University, 1969
Professional Engineer

The Duffey Company (Sub-Consultant for Environmental)

Marilyn Duffey (Technical Review)
M.A., Cybernetics Systems (Engineering Department) San Jose University, 1971
B.A., Industrial Design, Michigan State University, 1966

Economic and Environmental Consulting Services (Sub-Consultant for Economics)

Mary Embleton (Economics)
M.S., Applied Economics, Montana State University, 1987
B.S., Political Economy of Natural Resources, University of California, 1982

Entech (Sub-Consultant for Air Quality)

Pete Hummer (Air Quality)
M.S., Physical Oceanography, Polytechnic Institute of New York, 1978
B.S., Meteorology and Oceanography, New York University, 1975

Carl Bloom (Air Quality)
B.S., Forestry, University of British Columbia, 1970

Michelle Jones (Air Quality)
B.S., Civil Engineering, University of Washington, 1992

Harris, Miller, Miller & Hanson, Inc. (Sub-Consultant for Noise and Vibration)

Hugh Saurenman, Vice President (Vibration Analysis)
Ph.D., Mechanical Engineering, Tufts University, 1974
M.S., Mechanical Engineering, Tufts University, 1969

B.S., Engineering , Harvey Mudd College, 1967
Professional Engineer

Herb Singleton Jr., Consultant (Vibration Analysis)
S.B., Mechanical Engineering, Masssachusetts Institute of Technology, 1995

Laura Chan, Consultant (Vibration Analysis)
B.S., Agricultural and Biological Engineering, Cornell University, 1997

Heffron Transportation (Sub-Consultant for Transportation)

Marni Heffron (Transportation)
B.S., Civil Engineering, University of Washington, 1986
Professional Engineer

Tod McBryan, Senior Transportation Engineer (Transportation)
B.S., Civil Engineering, University of Washington, 1992
Professional Engineer

HNTB (Sub-Consultant for Transportation)

Joseph Bervell, Transportation Engineer (Transportation)
M.S., Transportation Engineering, University of Alberta, 1991
B.S., Civil Engineering, University of Science & Technology, Kumasi, Ghana, 1986
HND, Civil Engineering, University of Science & Technology, Kumasi, Ghana, 1982

William James, Transportation Engineer (Transportation)
M.S., Transportation Engineering, Villanova University, 1984
B.S., Civil Engineering, University of Virginia, 1980
Professional Engineer

HWA Geosciences, Inc. (Sub-Consultant for Geotechnical)

Ralph Boirum, Sr. Geotechnical Engineer (Geology)
M.S., Geotechnical Engineering, University of Illinois, Champaign-Urbana, 1973
B.A., Civil Engineering, University of Illinois, Champaign-Urbana, 1972
Professional Engineer

Dan Campbell, Senior Geotechnical Engineer (Geology)
M.S., Geotechnical Engineering, University of California, Davis, 1989
B.S., Civil Engineering, Washington State University, 1988
American Society of Civil Engineers

Michelle Ramos, Geotechnical Engineer (Geology)
M.S., Geotechnical Engineering, University of Alaska, Fairbanks, 1996
B.S., Geological Sciences, University of Washington, 1994

Huckell Weinman Associates (Sub-Consultant for Land Use)

Terry McCann (Land Use)
M.U.P., Urban Planning, University of Washington
B.A., Landscape Architecture, University of Washington, 1970

Helene Kornblatt (Permitting)
M.A., Architecture and Urban Planning, University of California
B.A., Liberal Arts, University of Pennsylvania

Rich Shipanski (Land Use)
M.C.D., City Planning, San Diego State University, 1987
B.A, Landscape Architecture, Washington State University, 1984

J.T. Atkins & Company (Sub-Consultant for Visual Resources)

J. Thomas Atkins, Landscape Architect (Visual Analysis)
M.S., Regional Planning, University of Pennsylvania, 1972
B.A., Landscape Architecture, Louisiana State University, 1968
American Institute of Certified Planners
American Society of Landscape Architects

K2 and Associates, Inc. (Sub-Consultant for Transportation)

Felix Kwakwa, Transportation Engineer (Transportation)
M.S., Civil Engineering (Transportation), University of Washington, 1990
B.S., Civil Engineering (Transportation), University of Washington, 1984
Professional Engineer

Michael Minor and Associates (Sub-Consultant for Noise and Vibration)

Michael Minor, President (Noise Analysis)
B.A., Physics, Whitman College, 1988
B.A., Mathematics, Whitman College, 1988

Newlands & Company, Inc. (Sub-Consultant for Visual Simulations)

Donald Newland (Visual Simulations)
B.A., Oberlin College, Highest Honors in Art, 1986

Pacific Communications Consultants (Sub-Consultant for Diversity Programs)

Regina Glenn, President (Diversity Advisor)
M.B.A., University of Puget Sound, 1971
B.S., University of Puget Sound, 1969
Certificated State and Local Government Program, John F. Kennedy School of Government; Harvard University, 1980

Pacific Rim Resources (Sub-Consultant for Public Involvement)

Rita Brogan (Public Involvement Group Leader)
Doctoral Program, Higher Education Administration, University of Washington, 1978
M.A., Communications Theory and Methodology, University of Washington, 1975

B.A., Editorial Journalism, University of Washington, 1972

Toni Higgs (Public Involvement Central Task Manager)
M.A., Environmental Studies, The Evergreen State College, 1994
B.A., International Studies, Michigan State University, 1982

Pacific Project Management (Sub-consultants for Scheduling)

Matt Williamson (Scheduling)
M.B.A., Technology and Engineering Management, City University, 1991
B.S., Mechanical Engineering, University of Utah, 1983
Project Management Professional Certification, Project Management Institute

Planning Partners (Sub-consultant for Editing)

Bob D. Klousner, Planner (Editor)
B.A., Geography, CSU-Chico, 1980
M.C.R.P., City & Regional Planning, Ohio State University, 1983

Visual Dynamics, Inc. (Sub-Consultant for Visual Simulations)

Dean Alker, Visualization Specialist (Visual Simulations)
B.A., Architecture, University of Idaho, 1996

Walter Brown, President (Visual Simulations)
B.L.A., Landscape Architecture, University of Idaho, 1989

William Blair, Consulting Planner (Sub-consultant for Visual Resources)

William Blair (Visual Resources)
B.A., Architecture, University of Washington 1968
M.L.A., Landscape Architect, Harvard University, 1974
American Institute of Architects
American Society of Landscape Architects
Registered Architect, Massachusetts

PSTC (Civil Design)

Jason Bailey, BRW (CADD Services Manager)
Associate of Science, Computer Drafting, ITT Technical College

Art Borst, PBQ&D (Structures Manager)
M.S., Civil Engineering, Polytechnic Institute of New York
B.S., Civil Engineering, Fairleigh Dickinson University

Gordon Clark, PBQ&D (North Segment Engineer)
M.S., Engineering, University of Texas-Austin
B.S., Civil Engineering, Oregon State University

Ivo Gustetich, ICF Kaiser (South Segment Engineer)
B.S., Civil Engineering, UNI (Peru)

Mahlon Clements, ZGF (Station Design)
B.Arch., University of Notre Dame

Bruce Emory, Manuel Padron (Manager, Transit Operations)
M.S., Civil Engineering, Georgia Institute of Technology
B.S., Civil Engineering, Princeton University

Paul Godlewski, Shannon and Wilson (Geotechnical Manager)
M.S., Civil Engineering, University of Illinois
B.S., Civil Engineering, University of Illinois

Gabe Grijalva, PBQ&D (Manager, Traffic Engineering)
B.S., Civil Engineering, University of Arizona

Greg Hill, Streeter and Associates (Station Design)
M. Arch., University of Washington
B.A., Environmental Design, University of Washington
Certificate of Architecture, Boston Architecture Center

Amarjit Marwaha, PBQ&D (Manager, Technical Services)
M.S., Civil/Highways Engineering, Punjab University
B.S., Civil Engineering, Punjab University

Dave McAllister, PBQ&D (Manager, Tunnel Design)
B.S., Civil Engineering, University of London

Audrey Moreland, PBQ&D (Manager, Downtown Seattle Segment)
B.S., Civil Engineering, Cornell University

Allen Parker, ICF Kaiser (Manager, North Segment)
M.A., Architecture/Urban Design, University of Pennsylvania
B.A., Architecture, University of Minnesota

Jim Parsons, ICF Kaiser (Deputy Project Manager)
B.S., Civil Engineering, Cornell University
MSCE, Transportation, University of Washington

Dick Rudolph, ICF Kaiser (Manager, Aerial Structures)
B.S., Civil Engineering, The Citadel

Ken Winnick, BRW (GIS Manager)
M.S., Ecology, University of Oregon, 1981
B.S., Environmental Science, Union College, 1976

Sound Transit
Central Link Light Rail Final EIS

APPENDIX G
Environmental Justice Technical Report

Table of Contents

List of Tables

LIST OF FIGURES

EXECUTIVE SUMMARY

Environmental justice in Department of Transportation decision making requires: (1) a fair process of developing and selecting the alternative to be funded that involves meaningful outreach to, participation of, and responsiveness to minority and low-income populations; and (2) non-discriminatory treatment of minority and low-income populations. To further those requirements, this analysis describes the public process for the Link light rail project and evaluates whether the preferred alternative, as well as the other alternatives set forth in the Final EIS, would have a disproportionately high and adverse effect on the minority and low-income populations of the Sound Transit District.

This analysis conforms with Department of Transportation ("DOT") requirements. The following findings are made:

- A number of impacts identified in the Final EIS would not be differentially distributed among different minority or income segments of the population. These include impacts to ecosystems, including wetlands, freight movement, water resources, and geology and soils. These impacts were not considered further for environmental justice purposes. Minor adverse impacts or beneficial impacts also were not further considered for environmental justice purposes. These include impacts relating to hazardous materials, public services, visual resources, parklands, historic and archeological resources, and electromagnetic fields.
- Other impacts identified in the Final EIS, however, could be distributed differentially among minority or income segments of the Sound Transit population. For such impacts, this analysis further evaluates their effects, taking into account mitigation measures identified in the Final EIS. This analysis indicates that, for the preferred alternative, neighborhood, noise, and vibration, and transportation impacts would be minimized through design modifications and the use of mitigation measures.
- Residential and non-residential displacements, and construction impacts could also have statistically greater effects on the minority and low-income populations of the Sound Transit District. This conclusion was reached after quantifying the effects of residential displacements identified in the Final EIS. This analysis indicated that residential displacement impacts, which are primarily associated with the at-grade segments of the project, would unevenly affect minority and low-income populations. It is conservatively assumed that non-residential and construction impacts, would also have a statistically greater effect on minority and low-income populations. Section G-4, below, summarizes the potential impacts associated with the preferred alternative, as well as the other alignment alternatives, and describes planned mitigation measures. Attachment B provides a segment-by-segment analysis of the residential displacement impacts associated with the preferred alternative in order to help particular communities better understand the project's impacts.
- The effect of the impacts discussed above are limited when viewed in the context of the Central Link project and would be substantially mitigated. For example, the project would result in 58 residential and 101 non-residential displacements. While these displacements would have a statistically greater effect on minority and low-income residents, they would be mitigated through Sound Transit's provision of relocation assistance and commitment to preserving community cohesion. Construction impacts would be temporary and would likewise be substantially mitigated.

- The preferred alternative would provide substantially improved access to transit, reduced transit travel time, improved accessibility to employment, health care, recreation, shopping, and other amenities, as well as community improvements and potential economic development. The minority and low-income populations of the Sound Transit District would receive more significant benefits from the preferred alternative than other demographic groups. Benefits associated with the preferred alternative and the other alternatives analyzed in the Final EIS are discussed in Section G-5 of this Appendix. Attachment C provides further information on the distribution of benefits of other alternatives.
- The preferred alternative would not have disproportionately high and adverse effects on the minority or low-income populations of the Sound Transit District. Many impacts associated with the preferred alternative would be eliminated or minimized. Further, the remaining impacts are limited in light of planned mitigation measures and the context of the Central Link Light Rail project. The impacts are not disproportionately high and adverse, particularly in light of the offsetting benefits to the minority and low-income populations. These determinations are discussed in Section G-6.
- To assure a fair process, Sound Transit engaged in public outreach from the initial project planning stages through the completion of this Final EIS. Throughout that process, Puget Sound residents have expressed their desire and need for mass transit generally and light rail service specifically. *Sound Move* itself was the product of extensive public outreach and participation. Sound Transit has used public input to identify Link light rail project alternatives, impacts, and benefits. As part of this public process, Sound Transit has also implemented meaningful outreach to minority and low-income communities to assure their active participation in the project's development. These efforts include: the establishment of telephone hotlines in Chinese, Vietnamese, Spanish, and Amharic, and Tigrinya; translation of Sound Transit informational materials and distribution at numerous community events; Sound Transit presentations at community meetings; and the establishment of a Sound Transit field office in the Rainier Valley, an area with relatively high numbers of minority and low-income residents. Sound Transit's outreach efforts are described in Section G-2.
- In response to concerns identified by Rainier Valley community, Sound Transit compared the impacts and benefits of the preferred alternative with a similar alternative that would replace the at-grade alignment in the Rainier Valley with a tunnel throughout the entire length of the Valley. Sound Transit had previously evaluated the environmental impacts of the Rainier Valley Tunnel ("RVT") proposal in a separate Report and concluded that it is not a reasonable alternative. That report is included in Appendix Q of the Final EIS. The comparative analysis of the preferred alternative and the RVT proposal is set forth in Section G-7 of this Appendix. This comparison demonstrates how the RVT alternative was not included in the Draft EIS due to the planning history in Southeast Seattle and because it does not meet Sound Transit's design and engineering criteria for tunneling. In addition, the RVT alternative does not eliminate residential and non-residential displacements and construction impacts that would result from providing service to the Rainier Valley, and would involve greater construction impacts at station areas, as well as greater vibration impacts. It also would not provide the substantial streetscape and other benefits offered by the at-grade alignment. Finally, the RVT alternative would involve costs of extraordinary magnitude. For these reasons, the RVT alternative would not preclude implementation of the preferred alternative under the terms of the DOT Order.

G-1 INTRODUCTION

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations" (Feb. 11, 1994), provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." In the accompanying memorandum, President Clinton urged federal agencies to incorporate environmental principles into analyses prepared under the National Environmental Policy Act ("NEPA") and emphasized the importance of public participation in the NEPA process.

The Department of Transportation, in its Order to Address Environmental Justice in Minority Populations and Low-Income Populations, outlined how environmental justice analyses should be performed and how transportation project decisions should be made to avoid disproportionately high and adverse effects on minority and low-income populations. The DOT Order requires agencies to (1) explicitly consider human health and environmental effects related to transit projects that may have a disproportionately high and adverse effect on minority or low-income populations; and (2) implement procedures to provide "meaningful opportunities for public involvement" by members of those populations during project planning and development. DOT Order, § 5(b)(1). Sound Transit's implementation of the latter requirement is discussed in Section G-2 below. Sections G-4 and G-5 explicitly consider the effects of the Central Link project on the minority and low-income populations of the Sound Transit District. In conducting this analysis, Sound Transit conformed with DOT requirements and consulted with both the Federal Transit Administration ("FTA") and the Environmental Protection Agency ("EPA").

G-2 HISTORY OF SOUND TRANSIT DECISIONMAKING AND OUTREACH TO MINORITY AND LOW-INCOME COMMUNITIES

Public Participation and *Sound Move*

Sound Move and the Central Link project are the product of decades of mass transit planning in the Puget Sound region. These planning efforts are based on public participation and public approval, starting with the Forward Thrust Plan in the 1960s, which proposed the development of a combined bus/rail system with 47 miles of heavy rail rapid transit and room for expansion. Sound Transit's adoption of *Sound Move* and its approval by the public in 1996, followed the voters' rejection of a more extensive $6.7 billion "initial phase" plan.

Public participation was a key component in the development of *Sound Move.* Following the voters' rejection of the more extensive initial phase plan, Sound Transit enlisted an advisory panel of civic leaders to provide overall guidance, and sought review and input from subregional groups of elected officials. Sound Transit also held subarea forums, community and business meetings, and roundtable sessions to gather local input and help develop the plan. These efforts culminated in the voters' approval of *Sound Move.*

Participation of Minority and Low-income Communities in the Development of the Central Link Project

The Central Link project is the result of extensive public participation and transit planning efforts over the last decade. Minority and low-income residents have been active in those efforts. Figures G -1 through G-6 in Attachment A identify minority populations in the vicinity of the segment alternatives by Census Block. As depicted in the figures, the highest concentrations of minority residents living in the vicinity of the alignments occur in the vicinity of Segment C and

Segment D. These Census Blocks span parts of the Pioneer Square, International District, Central Area, Beacon Hill, Rainier at I-90, Columbia City, MLK Jr. Way S. at S. Holly, and Rainier Beach neighborhoods.

Figures G-7 through G-12, in Attachment A, identify low-income areas in the vicinity of the segment alternatives, also by Census Block Group. As depicted in the figures, the highest concentrations of low-income residents living in the vicinity of the alignment are located south and east of downtown Seattle. These Census Blocks span parts of the Central Area, International District, and Pioneer Square neighborhoods. Other aggregations of low-income Block Groups are found in the University District, south of Lake Union, and along MLK Jr. Way S. in the Rainier Valley.

The participation of Southeast Seattle in transit planning processes illustrates how those communities have helped shape *Sound Move* and the Central Link alternatives now under consideration.

Much of the agency planning and analysis that resulted in *Sound Move* occurred in the early 1990s. At that time, regional planning agencies were evaluating transit technologies and alignments for the Puget Sound Area, including Southeast Seattle. As early as 1991, responding to the potential exclusion of Southeast Seattle from rail transit service in favor of an alignment running along Seattle's Duwamish neighborhood, Rainier Valley residents weighed in on their need for and preferences regarding rail service:

- On October 7, 1991 the Mount Baker Community Club strongly endorsed a regional rail alignment through the Rainier Valley, commenting that improved regionwide access to jobs, education, and healthcare would benefit the Rainier Valley.
- On October 10, 1991 the Lakewood-Seward Park Community Club echoed the Mount Baker comments and added that the Club wanted assurance that the line would be built with an adequate number of stations to serve Rainier Valley residents.
- On October 16, 1991, the Genesee Merchants Association strongly supported rapid rail in Rainier Valley with a station at Genesee.

Other community organizations taking official positions in favor of a regional rapid transit system through Southeast Seattle included the Hillman City Neighborhood Association, the Rainier Chamber of Commerce, the North Beacon Hill Council and the Columbia City Neighborhood Association. In response to the community desire for rail service, the Joint Regional Policy Committee (JRPC) selected the Rainier Valley corridor over an E. Marginal Way alternative for inclusion in the 1993 Regional Transit Plan.

The Regional Transit Authority (now known as Sound Transit), charged with developing a regional high-capacity transit plan for voter approval and funding, developed an initial phase Study Options Report (1994) that recognized Southeast Seattle's desire for rail service. The initial phase proposal provided for elevated and at-grade light rail service in Southeast Seattle. Although this plan was rejected in the three-county region (consisting of parts of King, Pierce, and Snohomish Counties) in 1995, it passed heavily in the City of Seattle. (State final certified results, 1995) *Sound Move*, also the product of further community outreach and input, provided for the development of light rail service "primarily on elevated structures and on the surface through Southeast Seattle." [*Sound Move*, page 18] This plan was approved by 56.5 percent of the three-county district's voters, including a 67 percent approval rate in Southeast Seattle (State 37th District final certified results, 1996)

Since then, the Southeast Seattle community has continued to participate in the scoping and alternatives selection process. In April 1997, after the successful *Sound Move* vote, the Rainier Chamber wrote Sound Transit reiterating its commitment "to working towards an attractive and efficient mass transit system/light rail project in Rainier Valley." (letter from Rainier Chamber,

April 1997). It also discussed several ideas for project implementation, which Sound Transit responded to as follows:

- Open a centrally located office in the Rainier Valley to, "create an open and inviting process for the people of Rainier Valley."
- Sound Transit's Southeast Seattle community office opened in Columbia City in early spring 1998.
- Create a three-dimensional scale model of Rainier Valley and display it at the Rainier Valley office.
- The model was completed in the fall of 1998 and is on display in the office. It has also been taken to public meetings.
- Allow the Chamber representation "in all processes in putting this public project forward."
- The Chamber is a member of the Rainier Valley Transit Advisory Committee and has been represented at all the major public events and workshops.
- Hire local and minority businesses in support roles in the construction process and provide training and hiring for Rainier Valley residents.

On July 8, 1999, the Sound Transit Board adopted an innovative policy regarding the use of Project Labor Agreements (PLAs). The policies direct that the community become involved in implementing PLAs, including taking part in the negotiation process and monitoring the agreements. PLAs for Sound Transit contracts will include specific terms to encourage participation of low-income, minorities, and women. The adopted policies also authorize apprenticeship requirements for all other construction contracts not covered by PLAs, on all Sound Transit-funded construction contracts in excess of $1 million, regardless of the contracting entity, with the exception of contracts awarded by private parties for work performed within railroad right-of-way.

Southeast Seattle alternatives were also added and dropped from consideration as a result of public outreach and comments received during the scoping process and throughout the Draft EIS process. This history, as well as other components of the preferred alternative developed in response to specific community concerns, are discussed in more detail in Section G-7, below. The preferred alternative selected by the Sound Transit Board was shaped by specific neighborhood concerns and includes the following elements:

- Segment C - The southern Beacon Hill (Lander) tunnel was identified as the preferred alternative because it avoids most of the community and business impacts associated with other alternatives and extends service to an otherwise unserved area.
- Segment D: Board identified a light rail alignment on MLK Jr. Way S. with the Columbia City station at Edmunds as preferred. The preferred alternative exits the Beacon Hill tunnel in an elevated structure that serves the McClellan station and then connects to MLK Jr. Way S., still elevated, transitioning to at-grade in the road median. The preferred alternative follows MLK Jr. Way S., Jr. Way in the median of the roadway for the length of Rainier Valley. This segment includes five stations. Because the MLK Jr. Way S./Edmunds Station is about ¼-mile from the heart of the historic Columbia City business district, the Board added a pedestrian corridor to the project to connect the station to the district. Planned boulevard improvements will add street amenities that extend the look and feel of the business district to guide pedestrians to and from the light rail station.
- At the City of Seattle's request, the Board added a station at Graham. The City's request was based on community input favoring more access to regional rail service. The Rainier Beach community expressed interest in creating a pedestrian/transit boulevard between Rainier Avenue and MLK Jr. Way S. along S. Henderson. This was included in the Board-identified preferred alternative. Following meetings with potentially affected property owners and in response to community concerns, Sound Transit further improved the

preferred alternative by moving its center line in certain areas. These changes reduced the preferred alternative's displacement impacts

The preferred alternative under consideration directly responds to the Southeast Seattle community's concerns and desires. Other areas with relatively high numbers of minority and/or low-income residents, including the University Central Area, the International District, and Pioneer Square, have also participated in the development of the Central Link project. For example, in the early 1990s, a group of business and community interests in the University District, including groups representing District residents, expressed their support for an a 15th Avenue N.E. alignment, with stations at N.E. 45th Street and Pacific. This alignment was incorporated into the preferred alignment. Similarly, Sound Transit is working with members of the International District and Pioneer Square communities on issues relating to station area planning and use and necessary improvements to the downtown bus system.

Sound Transit Outreach Efforts to Minority and Low-income Populations

Sound Transit has provided the public with information regarding the proposed Central Link project alternatives and their potential environmental impacts throughout the environmental review process. Sound Transit's public outreach efforts throughout the scoping process, Draft EIS preparation, and Draft EIS review are summarized in Appendix B of the Final EIS. Sound Transit received more than 900 comment letters or public hearing testimonies on the analyses set forth in the Draft EIS. These comments, and Sound Transit's responses, are included in the Final EIS. In response to these comments, Sound Transit updated its analysis, made factual corrections, modified some alternatives, developed new alternatives, and made other appropriate project changes.

Sound Transit is committed to minority and low-income involvement in all environmental review and planning processes and has implemented corresponding outreach efforts in connection with the Central Link project.[1]

Sound Transit has held numerous public meetings, public briefings, and informational visits designed to encourage the participation of the low-income and minority populations in the Central Link planning process. Specific Sound Transit outreach efforts include the following:

- Sound Transit translators took comments in the following languages at four meetings (December 1997):
  - 12/10 Chinese
  - 12/11 Amharic, Vietnamese, Tigrinya
  - 12/13 Amharic, Vietnamese, Tigrinya
  - 12/13 Spanish
- Sound Transit established a community field office in the Rainier Valley neighborhood, providing a convenient location for Rainier Valley residents to offer feedback on Sound Transit projects, participate in the environmental review and planning processes, ask questions, and review informational documents and graphics (Spring 1998).
- Sound Transit staff reviewed public school English as a Second Language (ESL) enrollment and public housing data to identify concentrations of ethnic, foreign language and low-income populations along the proposed Link light rail corridor (February 1998).

[1] Sound Transit's outreach efforts to the minority and low-income population build on the efforts made by its predecessor agencies. In April 1993, for example, the Regional Transit Project, retained Celrus Enterprises to assist in the development of a community outreach program targeted towards educating people of color about the Regional Transit Project.

- Sound Transit staff conducted two roundtables and 34 telephone interviews with community leaders from traditionally under-represented communities. The purpose was to get their feedback on the impact of transit projects, their ideas on expanding outreach efforts, and to recruit volunteers to help disseminate Sound Transit information to their communities (June 1998).
- Sound Transit mailed translated informational materials to more than 200 key community, neighborhood, and business leaders (August 1998).
- Sound Transit staff translated "Connecting the Puget Sound with Link Light Rail" (a project overview) into the following languages: Chinese, Vietnamese, Korean, Laotian, Cambodian, Amharic, Tigrinya, Russian, and Spanish (March 1998).
- Sound Transit created telephone "hotlines" in Chinese, Vietnamese, Spanish, and Amharic to provide callers with information in their native language and with an opportunity to leave comments and suggestions. Callers receive responses to their comments and suggestions in that same language (started August 1998).
- Sound Transit staff attended and distributed information at numerous community events, including the following:
  - 6/19 - 6/21, 1998 Juneteenth
  - 7/11-7/12, 1998 Chinatown/ International District Summer Festival
  - 7/25/98 Laotian Educational Assembly
  - 8/15 - 8/16, 1998 Rainier Valley Heritage Festival
  - 8/22 - 8/23, 1998 Bite of Jazz (Black Dollar Days)
  - 8/29 - 9/8, 1998 Lao Community Citizenship Class
  - 9/19 - 9/20, 1998 Fiestas Patrias
  - 9/19/98 Eritrian Community Center
  - 10/28/98 Tukwila School District Friends and Family Night
  - 11/15/98 Filipino Community Center
  - 2/20 - 2/21, 1999 Tet Festival
  - 8/99 Pista Sa Naigon
  - 8/99 Rainier Valley Heritage Festival
- Sound Transit staff participated in the following ethnic and foreign language talk-radio shows:
  - *Finoteselam*, Ethiopian/Amharic (August, 1998)
  - *Bert & Babot*, Tagalog/English (August, 1998)
  - *KSUH Radio Hankook,* Korean (April, 1999)
- Sound Transit translated and published information in ethnic and non-English language newspapers (August and October 1998).
- Sound Transit hosted an informational meeting with the Rainier Valley and International District Vietnamese communities (November 1998)
- Sound Transit translated a summary of the findings of the Draft Environmental Impact Statement (Draft EIS) into Vietnamese (November 1998).
- Sound Transit produced a general information piece on light rail in Somali, Oromo, Spanish, Chinese, Laotian, Vietnamese, Cambodian, Tigrinya, Amharic, Korean, and Braille.

- Between February and June 1998, Sound Transit hosted 6 field trips to Portland and 5 field trips to Vancouver, to provide an opportunity for community residents and business owners along the light rail alignment to observe and experience rail systems. It also provided an opportunity to meet with planners and community leaders from the host cities to discuss what worked and "lessons learned" from their experience with building their transit systems.

Other efforts to involve the minority, low-income, and special needs populations in the Central Link planning process include the following:

- Sound Transit trained nine non-English language interpreters to act as ambassadors in their respective communities (Summer 1998 to present).
- Sound Transit trained volunteers in the blind and deaf communities to do outreach (October 1998) and holds monthly meetings with these volunteers to share information (November 1998 to present).
- Sound Transit briefed non-English journalists from the region on the Light Rail project.
- Sound Transit installed a Vietnamese translator in the Southeast Link Light Rail field office (December 1998 to present).
- Sound Transit took members of the deaf and blind communities on a field trip to Portland's MAX system to explore accessibility issues (April 1999).
- Sound Transit staff made door-to-door visits with interpreters in the following communities between March 1999 and the present:
  - Rainier Vista and Holly Park public housing areas;
  - Ethnic businesses along MLK Jr. Way S;
  - Chinese businesses on Beacon Hill; and
  - Chinese businesses in the International District.
- Sound Transit translated basic Link Light Rail flyers into Spanish, Russian, Korean, Amharic, and Tigrinya and distributed them at community centers and other community gathering places (Summer 1999).
- Sound Transit placed translated information in Korean, Vietnamese, and Russian language newspapers (Summer 1999).
- Sound Transit met with key Hispanic leaders to discuss the light rail project and public outreach (March and August, 1999).
- Sound Transit met with the Mt. Zion Men's Group, which included the leadership of the largest African-American Congregation in the City of Seattle, regarding the impacts and benefits of the Central Link project (February 1999).
- Sound Transit staff participated in a call-in talk show on the most popular urban contemporary hip-hop and rhythm and blues radio station in Seattle (KUBE FM). This show focussed on the Central Link project and its impacts. A similar talk show took place before the public vote on *Sound Move*.

- Over the last several years, Sound Transit has provided numerous local ethnic newspapers with informational publications on Sound Transit Board activities, as well as news releases. These local newspapers include: African Forum News, Hispanic News, International Examiner, Northwest Nikkei, Seattle Chinese Post/NW Asian Weekly, The Jewish Transcript, The Medium, The Skanner, and Diversity Business News.
- Sound Transit arranged individual meetings with property owners and tenants along the preferred alternative route on MLK Jr. Way S. and Tukwila International Boulevard with translators present as needed.

Sound Transit will continue its outreach efforts to ensure that minority and low-income populations continue to participate in the environmental review and planning processes for Central Link and other *Sound Move* projects.

G-3 ENVIRONMENTAL JUSTICE METHODOLOGY

Overall Methodology

As discussed above, whether a proposed transportation project would have "disproportionately high and adverse effects" on minority and low-income populations is the focus of an environmental justice inquiry. The DOT Order provides that a "disproportionately high and adverse effect on minority and low-income populations" means an adverse effect that: "(1) is predominantly borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population." Appendix to DOT Order, § 1.g. The Order further provides that, "[i]n making determinations regarding disproportionately high and adverse effects . . . mitigation and enhancement measures that will be taken and all offsetting benefits to the affected minority and low-income populations may be taken into account, as well as the design, comparative impacts, and the relevant number of existing system elements in non-minority and non-low-income areas." DOT Order §8.b.

The definitions set forth in an appendix to the DOT Order provide guidance on the performance of environmental justice analyses. "Adverse effects" are defined as "the totality of significant individual or cumulative human health or environmental effects, including social and economic effects . . ." Appendix to DOT Order. §1.f. "Minority population" is defined as "any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity." Appendix to DOT Order, § 1.e. The definition for "low-income population" is virtually identical. Appendix to DOT Order, § 1.d.

The DOT Order does not state what data sources should be used to identify the individuals who make up the minority and low-income populations or specify how to determine who would be "similarly affected" by a proposed project. In order to develop a comprehensive and appropriate environmental justice analysis, Sound Transit engaged in extensive discussions regarding these issues with both the Federal Transit Administration ("FTA") and the Environmental Protection Agency ("EPA"). Sound Transit further considered other environmental justice analyses that had been performed for other transit projects.

Sound Transit developed an environmental justice methodology that relies on the extensive information developed through the NEPA process and permits the comparison of significant adverse

effect and offsetting benefits as provided for by the DOT Order. First, Sound Transit identified the impacts described in the Final EIS that could have race or income-based effects. It then considered the extent of such impacts on residents within the Sound Transit District, taking into account associated mitigation and enhancement measures. For potentially significant impacts that could be considered adverse effects under the DOT Order, Sound Transit further considered whether they could have a disproportionately high and adverse effect on the minority and low-income populations of the Sound Transit District. Although many impacts identified in the Final EIS, particularly impacts not characterized as significant under NEPA, are unlikely to be characterized as high and adverse under the DOT Order, this methodology assures that all effects with potential race or income-based effects are considered in the environmental justice context. Finally, Sound Transit evaluated project benefits and their distribution to the minority and low-income populations.

Quantifying Adverse and Beneficial Effects on Minority and Low-Income Populations

As discussed above, Sound Transit considered whether adverse effects of the project could have disproportionately high and adverse effects on the minority and low-income populations of the Sound Transit District. Sound Transit evaluated various alternatives for quantifying the project's effects. After consultation with FTA and EPA, Sound Transit adopted a reference demographic population to determine whether adverse and beneficial effects would be distributed to the minority and low-income populations in a significantly different manner than their representation in the reference population. Sound Transit selected its service area (the Sound Transit District) as the appropriate reference population. The demographic mean composition of the District is 16 percent minority[2] and 9 percent low-income.[3] Sound Transit ultimately selected a statistical measure - a standard deviation from the mean composition in the reference population - to determine whether effects would be distributed in a significantly different manner. A standard deviation from the mean composition is 34 percent minority and 21 percent low-income.

The use of demographic comparisons based on the District boundaries ensures that the entire population potentially affected by the proposed light rail will be considered.[4] It also assures that

---

[2] Sound Transit selected 1990 Census data as the most comprehensive and reliable information on minority composition. Other sources reviewed, but not relied upon by Sound Transit, included Puget Sound Regional Council, Washington State Office of Financial Management, Seattle-King County Department of Public Health, Seattle Housing Authority, and the *Seattle Post-Intelligencer* Neighborhoods website. Sound Transit also evaluated public school enrollment data from the Seattle Public Schools, Tukwila School District, and Highline School District. These school data could not be used to adjust 1990 Census data because they are compiled at different levels of aggregation (i.e., Census Tract or School/School District versus Census Block or Block Group) and represent only about one-fifth of the total population of the District. However, an effort was made to corroborate 1990 Census data with more recent information available from (1) actual collection of data by school districts regarding the race and ethnicity of children; (2) estimates provided by the Seattle-King County Department of Public Health; and (3) the general locations of high concentrations of minorities estimated based on interaction with representatives of minority organizations in the project area. Sound Transit also reviewed statistically updated data on the 1990 Census from the Seattle-King County Department of Public Health. These data were not used because they were only available at the tract level. Sound Transit did review, however, 1997 tract level population estimates to further assess the 1990 Census information.

[3] For low-income populations, data that describe the number and distribution of individuals and families within the Sound Transit District boundaries who fall below the Department of Health and Human Service ("HHS") poverty levels do not exist. Information collected from schools that administer a free or reduced-price lunch program under the National School Lunch Act or Child Nutrition Act was found unusable for similar reasons to those discussed above. Family income information is collected by family size during the decennial census, but is aggregated before being reported. While Sound Transit could determine the median family income of a Census Block Group from publicly available Census files (Letha Lamison-White/Bureau of Census, Poverty Analyst (pers. com. September 1997)), it would not be possible to determine how many families of size 1, 2, 3 or 4 had incomes below the HHS poverty level. Further, disaggregation of the Census data, even if possible, would likely disclose intentionally suppressed information. Collection of new data would be prohibitively expensive and Sound Transit lacks such collection authority. In consultation with FTA, and following EPA guidance, therefore, Sound Transit used the Census Bureau's statistical poverty threshold, for which distributional data are available, to determine the low-income demographic composition of the District boundaries. *Practical Application of Low-Income Guidelines in Environmental Justice Analyses* (Crisp, 1996).

[4] In contrast, Sound Transit determined that the demographic compositions of the three cities through which the project would run, of King County, and of the State were less appropriate references. (The mean composition of the three cities is 24 percent minority

effects on all minority and low-income individuals are taken into account, even those that do not reside within local areas commonly thought of as minority or low-income. Further, because the composition of the affected population rarely, if ever, precisely matches the reference population composition,[5] the use of a one standard deviation from the mean reference threshold assures that only significantly different distributions of impacts are identified.[6]

Sound Transit used the methodology discussed above to develop a preliminary environmental justice analysis in the Draft EIS. This analysis provided a detailed description of the overall distribution of adverse impacts on the minority and low-income populations for the alternative alignments evaluated in the Draft EIS. In addition, the Draft EIS provided detailed analyses of significant adverse impacts and their distribution for alternative alignments by segment areas. As a result of changes to and additional mitigation measures adopted for the preferred alternative, some of the adverse impacts described in the Draft EIS have been minimized. These changes are highlighted in Section 4, below.

The preliminary environmental justice analysis in the Draft EIS also contained a description of the distribution of the benefits of alternative alignments for the minority and low-income populations of the Sound Transit District. In particular, it focused on the benefits of increased transit mobility, access to transit, and transit travel time savings that would result from the Central Link project. This final analysis uses similar analytic methods to further evaluate project benefits.

This final environmental justice analysis, therefore, provides a detailed description of the distribution of adverse effects of the preferred alternative on the minority and low-income populations of the Sound Transit District (Section G-4). Summary information regarding the distribution of adverse effects associated with other alternatives considered in the Final EIS is also provided. A detailed description of the distribution of overall benefits for the preferred alternative is similarly provided in Section G-5. Summary information regarding benefits of other alternatives considered, and the benefits of the preferred alternative for particular segment areas is included in Attachment C. This presentation permits a qualitative comparison between the adverse effects and offsetting benefits, consistent with the DOT Order. As set forth in Section G-6, below, the results of this analysis establish that the implementation of the preferred alternative would not have a disproportionately high and adverse effects on the minority or low-income populations of the Sound Transit District.

---

and 12 percent low-income; the mean composition of King County is 15 percent minority and 8 percent low-income; the mean composition of the State is 11 percent minority and 11 percent low-income.) Adverse and beneficial effects of the project would potentially extend well beyond the three cities, while much of east King County and the State would be wholly unaffected by the project. Thus, these reference populations would not properly reflect the population potentially affected by the project. Although the demographic composition of these alternatives differs from that of the District boundaries, these differences would not affect any of the ultimate conclusions reached in the Final EIS, and would only alter whether any unevenly distributed significant impacts were determined to be statistically significant.

[5] For precisely equal distributions to occur, either (1) all effects would have to be imposed uniformly over the system and all demographic groups would have to reside uniformly throughout the reference area; or (2) the uneven effects resulting from local differences in physical, architectural, social, and economic conditions would have to match precisely the uneven distribution of demographic groups, for each and every effect.

[6] In contrast, focusing on any degree of difference from the reference population mean would potentially result in trivial differences in distribution being considered significantly different. Using higher statistical thresholds (such as two standard deviations from the reference mean) would provide greater confidence that the distributional differences were significant, but also might fail to identify as significant some differences that would be "meaningfully greater" for minority or low-income populations. *CEQ Environmental Justice Guidance Under the National Environmental Policy Act*, at 25 (1998).

G-4 ADVERSE IMPACTS AND THEIR DISTRIBUTION ON MINORITY AND LOW-INCOME POPULATIONS

Introduction

As discussed above, DOT's Order on Environmental Justice requires responsible officials to explicitly consider human health and environmental effects related to transit projects that may have disproportionately high and adverse effects on minority or low-income populations. This section takes the first steps of this analysis by (1) identifying potential adverse effects related to the project that need be considered for environmental justice purposes, taking into account planned mitigation measures; and (2) evaluating whether such impacts would fall on the minority and low-income populations in a statistically more significant manner.

Summary of Central Link Project Impacts and Their Role in the Environmental Justice Analysis

Table G.4-A outlines all of the impacts that are discussed in the EIS for the preferred alternative and other alignment alternatives. This summary provides a starting point for determining the appropriate scope of the project's environmental justice analysis.

Table G.4-A-Impact Summary

Element of the Environment	Impact Summary Preferred Alternative	Impact Summary Non-Preferred Alternatives	Population-Based Impact?*
Transportation Regional Travel	No adverse effects. Reduced vehicle miles traveled.	No adverse effects. Reduced vehicle miles traveled.	Yes
Transit	Improved transit travel times, reliability and convenience. Some trips would require more transfers.	Improved transit travel times, reliability and convenience. Some trips would require more transfers.	Yes
Arterials and Local Streets	Right-in/right-out only restrictions. Cross-street movement delays. Reduction of on-street parking. Potential for "hide-and-ride" parking.	Right-in/right-out only restrictions. Cross-street movement delays. Reduction of on-street parking. Potential for "hide-and-ride" parking. Reduced roadway capacity (number of lanes).	Yes
Freight Movement	Would require out-of-direction movements for some truck trips.	Would require out-of-direction movements for some truck trips.	No
Navigable Waterways	No impacts.	No impacts.	No
Land Use and Economic Activity	Consistent with local/regional plans. Project expenditures increase income and employment. Potential for property value changes. Supports economic development and re-development.	Consistent with local/regional plans. Project expenditures increase income and employment. Potential for property value changes. Supports economic development and re-development.	Yes
Displacements and Relocations	Under the preferred alternative, a total of 145 properties would be acquired.	For the N.E. 45th to SeaTac alternatives, 101 to 338 properties would be acquired. For the Northgate to SeaTac alternatives, 103 to 348 properties would be acquired. MOS A would acquire 33 properties. MOS B would acquire 117 properties. MOS C would acquire 6 properties.	Yes
Neighborhoods and Populations	Improved neighborhood connectivity. Promotes social interaction. Enhanced streetscape features/amenities in Segments D and E. Improved transit access to other parts of the region.	Improved neighborhood connectivity. Promotes social interaction. Improved transit access to other parts of the region.	Yes

Table G.4-A-continued

Element of the Environment	Impact Summary Preferred Alternative	Impact Summary Non-Preferred Alternatives	Population-Based Impact?*
Visual Resources and Aesthetics	Light rail would add an additional visual element. Low to moderate adverse impacts as well as beneficial impacts.	Several of the alternatives which comprise the non-preferred alternatives would have significant adverse visual impacts. These impacts include view obstruction, view incompatibility, view modification, and shadows.	Yes
Air Quality	Light rail would slightly improve CO levels at 2 intersections in SeaTac that may exceed standards.	No new CO violations would occur and no existing violations would be made worse.	Yes
Light Rail Noise	All light rail noise impacts would be mitigated with residential sound insulation and/or sound walls, where appropriate.	All light rail noise impacts would be mitigated with residential sound insulation and/or sound walls where appropriate.	Yes
Traffic Noise	All traffic noise impacts would be mitigated with residential sound insulation and/or sound walls where appropriate.	All traffic noise impacts would be mitigated with residential sound insulation and/or sound walls where appropriate.	Yes
Light Rail Vibration	All light rail vibration impacts would be mitigated below the adverse impact threshold.	After mitigation is applied, adverse light rail vibration impacts would remain with alternatives in Segments A, B, D, and E.	Yes
Ecosystems	2.13 acres of wetland and 1.60 acres of wetland buffer would be filled. 2.0 acres of wildlife habitat would be removed. There would be fish resource impacts at 4 locations. Mitigation would replace wetland function, and avoid adverse effect to fish resources.	Other alternatives would fill between 1.65 and 2.29 acres of wetland, Remover between 1.46 and 2.81 acres of deciduous forest and up to 5 acres of forest and shrub cover. Higher impacts to riparian vegetation.	No
Water Resources	Increases in impervious surface area. Low amounts of fill in local floodplains (most in Segment E). Mitigation, which includes stormwater detention and treatment, and flood storage compensation, would reduce these adverse effects.	Increases in impervious surface area. Low to moderate amounts of fill in local floodplains. Mitigation, which includes stormwater detention and treatment, and flood storage compensation, would reduce these adverse effects.	No
Energy	Energy savings of 0.934×10^9 Btu.	Northgate to SeaTac energy savings of 0.859×10^9 Btu. Energy savings of MOSs range from 0.901×10^9 Btu with MOS A to 0.719×10^9 Btu with MOS C.	No
Geology and Soils	With design mitigation, seismic hazards, potential landslides, and erosion would be avoided.	With design mitigation, seismic hazards, potential landslides, and erosion would be avoided.	No
Hazardous Materials	The preferred alternative would affect 29 known release sites and 84 potential sites. Adverse impacts would be avoided through remediation and implementation of a health and safety plan.	The NE 45th to SeaTac alternative would affect 23 to 43 known release sites and up to 121 potential sites. The Northgate to SeaTac alternative would affect 23 to 45 known release sites and up to 123 potential sites. MOS A would affect 8 known release sites and 30 potential sites. MOS B would affect 13 known release sites and 55 potential sites. MOS C would affect 7 known release sites and 29 potential sites. Adverse impacts would be avoided through remediation and implementation of a health and safety plan.	Yes

Table G.4-A-continued

Element of the Environment	Impact Summary Preferred Alternative	Impact Summary Non-Preferred Alternatives	Population-Based Impact?*
Electromagnetic Fields	No adverse health effects. Potential for EMF impacts at University of Washington research facilities would be avoided through mitigation via an active cancellation system.	No adverse health effects. Potential for EMF impacts at University of Washington research facilities would be avoided through mitigation via an active cancellation system.	Yes
Public Services	Minor delays for emergency response vehicles.	Minor delays for emergency response vehicles.	Yes
Utilities	No long-term impacts.	No long-term impacts.	Yes
Historic Resources	One historic property (Cheasty Blvd.) would be adversely affected. This adverse effect would be mitigated.	Non-preferred would affect same property as preferred, but with some options would not be able to mitigate below significance. In addition, Northgate to SeaTac alternatives would affect 5-27 historic resources (0-3 after mitigation). NE 45th to SeaTac alternatives would affect 5-25 historic resources (0-3 after mitigation).	Yes
Archaeological Resources	Would cross 1 property of Native American cultural interest (Agency consultation is ongoing). Would cross 3 high probability areas for archaeological resources. Would cross areas with important paleontological resources. No known archeological sites are crossed.	Non-preferred alternatives would cross 0-1 property of Native American cultural interest (Agency consultation is ongoing). Between 5-7 high probability areas for archeological resources would be crossed. Areas with important paleontological resources would be crossed. Between 1-2 known archeological sites would be crossed.	Yes
Parklands	Cheasty Blvd would be crossed. This impact would be mitigated.	The Northgate to SeaTac alternatives would affect 10-21 parks (0-7 after mitigation). The NE 45th to SeaTac alternatives would affect 9-19 parks (0-7 after mitigation). The MOS alternatives would not have impacts on parks.	Yes
Construction	Temporary construction impacts include traffic congestion, temporary displacement of existing land uses, intrusion on forested wetlands, utility interruptions, noise disturbances, and air and water quality degradations. These impacts would be reduced through mitigation.	Temporary construction impacts include traffic congestion, temporary displacement of existing land uses, intrusion on forested wetlands, utility interruptions, noise disturbances, and air and water quality degradations. These impacts would be reduced through mitigation.	Yes

* If "No", impacts to these environmental elements are not distributed differentially among racial or income segments of the population and were therefore not reviewed in the environmental justice analysis.

Impacts associated with the environmental elements listed in Table G.4-A fall into the following three categories: (1) those that are not differentially distributed among different minority or income segments of the population; (2) those with minor or no projected negative impacts, including those with projected positive impacts; and (3) potential adverse impacts that could be differentially distributed among different minority or income segments of the population.

Elements in the first category include Ecosystems, Water Resources, Energy, and Geology and Soils. Because they are not differentially distributed among different minority or income populations, they are not relevant to the environmental justice analysis and are, therefore, not analyzed further in this report.

Elements in the second category for the preferred alternative include Air Quality, Hazardous Materials, Public Services, Visual, Historic and Archaeological Resources, Parklands, and

Electromagnetic Fields. Impacts associated with these elements are not reviewed further in this environmental justice analysis. While it is possible for some of these impacts to be distributed among different minority or income segments of the population, the projected impacts are either beneficial or too minor to be considered high and adverse.

Land Use and Economic Activity falls into this category. As discussed in the Final EIS, the major land use impact associated with this project is the acquisition of private property. That impact is separately reviewed in this environmental justice analysis. Most of the remaining Land Use and Economic Activity impacts identified in the Final EIS are positive, including consistency with and support of local/regional plans, increases in income and employment associated with project expenditures, and support for planned land use changes in station areas including development and re-development.[7]

Elements in the third category include Transportation, Noise and Vibration, Neighborhoods, Displacements, and Construction. These impacts are discussed further below.

Consideration of the Preferred Alternative's Impacts and Their Potential Effects on Minority and Low-Income Populations

The following analysis focuses on potential effects of the preferred alternative on residents of the Sound Transit District that could be differentially distributed among racial or income population segments. Although transportation, noise and vibration, and neighborhood impacts fall into this category, their adverse effects would be minimized as a result of project design elements and mitigation measures. These analyses are set forth below. The extent of the remaining impacts, residential and non-residential displacements and construction impacts, and their potential effects on the minority and low-income populations of the Sound Transit District are also considered.

Impacts of the Preferred Alternative that Would Be Minimized Through Project Design Elements and Mitigation Measures

Transportation Impacts

The Draft EIS analysis identified transportation impacts resulting from the preferred alternatives that would be primarily located within Segments D (which includes parts of the Rainier Valley neighborhood), and E (which includes parts of Tukwila). These included: delays to cross-street traffic on MLK Jr. Way S. and Tukwila International Boulevard, as well as impacts to traffic and pedestrian safety, pedestrian circulation, and parking.

The impacts to cross-street traffic would have resulted from restricting 39 or more cross streets to right-in/right-out movements only, and applying a new traffic signal control system that would give light rail full signal preemption (allowing an approaching train to always have a green light at signalized intersections). These design and operational characteristics would have increased delay for vehicles and pedestrians trying to cross either of these roads and would have increased out-of-direction travel to some destinations.

The safety impacts were based on the potential for accidents between light rail vehicles and automobiles and pedestrians. The pedestrian circulation impacts were based on increased distances between pedestrian crossing locations and changes in traffic signal phasing. Parking impacts would have resulted from removing existing parking spaces on the street and from parcels acquired for light rail facilities, as well as from potential transit rider parking around stations.

---

[7]The Land Use and Economic Activity section of the Final EIS reports that this project may cause property values and rental rates in areas adjacent to the rail line or stations to either decrease or increase, depending on other environmental impacts. Because the effect of the project on property values is largely speculative, this environmental justice analysis focuses on the environmental impacts that would impact such values, including visual and noise impacts and loss of access.

Since the Draft EIS, Sound Transit has modified the preferred alternative and incorporated mitigation measures that will minimize the traffic access and circulation impacts of the preferred alternative in Segments D and E. For Segment D, seven new traffic signals on MLK Jr. Way S. are included in the preferred alternative, as compared to three in the Draft EIS. All of these new signalized intersections will provide full cross street access to MLK Jr. Way S. Four of the intersections will provide northbound and/or southbound access from MLK Jr. Way S. to the cross street. U-turn movements for passenger vehicles will also be allowed at these new signalized intersections, increasing traffic circulation. Changes in the signal control system to provide light rail priority, but not full signal preemption, will further reduce impacts on cross-street traffic. In addition, the number of unsignalized intersections limited to right-in, right-out access decreases from 39 in the Draft EIS to 34 with the modified preferred alternative. All of these measures will, by enhancing traffic and pedestrian flows, reduce impacts on neighborhood circulation and access.[8]

While there is a potential for accidents between trains and other vehicles or pedestrians along at-grade sections of MLK Jr. Way S., prohibiting mid-block left turns and new signal controls at currently unsignalized intersections will help make streets safer by reducing opportunities for auto-auto and auto-pedestrian accidents. In addition, it will be safer for pedestrians to cross the roadway at signalized intersections, and at new mid-block pedestrian crossings. See Chapter 3 of the Final EIS.

The preferred alternative would still increase out-of-direction travel for automobiles and trucks accessing properties or cross streets along MLK Jr. Way S. where left-turns would be prohibited. However, the destinations with the highest impacts would have increased travel times for passenger vehicles (compared to existing conditions) by two minutes at the most, and roughly one-minute on average, a marginal increase. See the Transportation Technical Back-up Report to the Final EIS. For larger trucks unable to make a U-turn on MLK Jr. Way S to access a property or cross-street, the maximum travel time increase for rerouting to other nearby arterial streets would be four minutes. Since most businesses requiring large truck deliveries are already located at intersections with traffic signals, this impact would not be expected to cause a significant hardship or inconvenience. See the Transportation Technical Back-up Report to the Final EIS.

For Segment E, Sound Transit has likewise developed mitigation measures that will also reduce the circulation impacts of the preferred alternative (E1.1). New traffic signals were included on Tukwila International Boulevard at S. 140th and S. 148th streets, to minimize adverse impacts resulting from eliminating left-turns at unsignalized intersections. Passenger vehicles will also be allowed to make U-turns at these intersections. With these added traffic signals, the increased vehicular travel time with the preferred alternative is not expected to cause a significant hardship or inconvenience. Travel times would increase by two minutes or less per trip, with an average increase of about one-minute. See the Transportation Technical Back-up Report to the Final EIS.

Where light rail would run at-grade in the street (primarily segments D and E but also in Segment C), it would remove pedestrian crossings that are not signal protected, thereby reducing the number of legal pedestrian crossings. In some locations, this would increase the distances that pedestrians would need to walk. The preferred alternative will add new traffic signals (ten in Segment D; two in Segment E) and new mid-block pedestrian only signals (eight in Segment D; three in Segment E). These signals will generally be located in areas that currently have, or are expected to have, relatively high pedestrian activity, but no signal protection. Therefore, although the project would increase the length of some pedestrian trips (the worst example would result in doubling the distance between legal crossings), it would decrease the distance between signal-

[8] Some or all of these mitigation measures would be used with other route alternatives in Segment D; however, the analysis for Alternatives D1.1c, D1.1d, and D1.3 did not include these mitigation features to show the range of possible alternatives and impacts.

protected crossings (the longest distance would be cut in half with the preferred alternative) and increase pedestrian safety by providing substantially more signal-protected crossing locations. The preferred alternative will also provide improved sidewalks and lighting, and improved east-west pedestrian corridors in Segment D. These streetscape improvements will also have a beneficial impact on pedestrian safety and circulation and would increase neighborhood connectivity.

Parking displacements to business and property owners identified in the Draft EIS will also be largely mitigated. Sound Transit will work with business and property owners along MLK Jr. Way S. (Segment D) and Tukwila International Boulevard (Segment E), on a case-by-case basis to compensate for the parking loss, where appropriate. Compensation could include payment for parking areas acquired by Sound Transit or the development of replacement parking. Sound Transit will also develop a neighborhood parking monitoring and mitigation plan to be implemented just prior to and after the system opens. If needed and desired by the neighborhood, parking restrictions will be implemented to prevent light rail patron parking around stations.

The changes to the preferred alternative and the mitigation measures described above have minimized the transportation impacts that would result from the implementation of the preferred alternative. Transportation impacts, in fact, for the preferred alternative, are not considered significant in the Final EIS. The analysis above sufficiently considers the transportation effects of the preferred alternative under the DOT Order.

Noise and Vibration Impacts

The Draft EIS identified more than 450 residential buildings within the Sound Transit District that would experience noise and/or vibration impacts from the light rail project. The number of impacts varied by alternative, but with all of the alternatives, the majority of impacts were identified in Segment D, followed by Segment E. Segment A was also projected to have notable vibration impacts - about the same number as Segment E. Potential mitigation identified in the Draft EIS would reduce noise impacts to between zero and 50, depending on the alternatives. Mitigation would also reduce vibration impacts to between 36 and approximately 150 receivers.

Since publication of the Draft EIS, both noise and vibration impacts have been eliminated for the preferred alternative through planned mitigation measures. Noise impacts and most vibration impacts have also been eliminated for all other alternatives. Light rail noise impacts along elevated and at-grade segments, and traffic noise impacts, will be mitigated through residential building sound insulation or sound walls, where desirable. Sound walls are proposed in several specific locations, including the elevated guideway and at select locations along at-grade routes. Where sound walls are not desirable or appropriate, residential sound insulation will be used. This approach, although often more expensive than sound walls, is very effective at reducing indoor noise levels, often below existing levels where residences are located near busy roadways or other high noise sources.

Vibration impacts would be reduced through design modifications on the trackway. Vibration impacts that could affect research facilities at the University of Washington will be reduced through the use of air spring isolation floors or tables or other measures.

The mitigation measures described above have minimized the noise and vibration impacts that would result from the implementation of the preferred alternative. Such impacts are no longer considered significant in the Final EIS. The analysis above sufficiently considers the noise and vibration effects of the preferred alternative under the DOT Order.

Neighborhood Impacts

Neighborhood impacts are a cumulative measure of environmental impacts and other effects on community character and composition. Thus, unlike the other impacts evaluated, the assessment of neighborhood impacts considers many different adverse and beneficial impacts.

The Draft EIS analysis identified impacts to neighborhoods. The levels of these impacts reflected a combination of effects, including property displacements, unmitigated noise and vibration impacts, traffic and pedestrian circulation impacts, and visual impacts.

Since the Draft EIS was issued, design modifications have been made and mitigation measures incorporated into the preferred alternative that would minimize adverse impacts on neighborhoods. Design modifications made since the Draft EIS include reducing the right-of-way width in segments D and E, and adjusting the route to minimize displacements of community facilities, residences and other uses. Planned mitigation measures for the preferred alternative relevant to the neighborhoods analysis include the use of residential sound insulation and, where desired, sound walls (mitigating noise impacts as discussed above), additional traffic signals, pedestrian signals and signage, and streetscape improvements such as new curbs, gutters and sidewalks, street paving, street trees, and lighting (mitigating traffic and pedestrian impacts as discussed above). For example:

- Mitigation included with the preferred alternative will reduce the congestion at intersections along MLK Jr. Way S. to levels that in some cases will be better than they would be under the No-Build Alternative. Similarly, planned streetscape improvements along MLK Jr. Way S. and selected east-west corridors (for example, along S. Edmunds Street into the Columbia City business district and along S. Henderson Street into the Rainier Beach business district) will make pedestrian access in the neighborhood easier, safer, and more pleasant, and will enhance connectivity among neighborhoods and activity around neighborhood centers. Other street improvements, such as landscaping, pedestrian lighting, benches, and arwork may be included near statins. Landscaping will additionally be added to some areas between vehicle travel lanes and the light-rail trackway where traffic channelization on a light rail station exists.
- While there is a potential for accidents between trains and other vehicles or pedestrians along at-grade sections of MLK Jr. Way S., prohibiting mid-block left turns, signal controls, and new signals at currently unsignalized intersections will help make streets safer by reducing opportunities for auto-auto and auto-pedestrian accidents. In addition, it will be safer for pedestrians to cross the roadway at signalized intersections, and at new mid-block pedestrian crossings.
- Tukwila International Boulevard (formerly Pacific Highway S.) will be improved where the light rail elevated guideway and at-grade trackway run within the street. This is from approximately S. 120th Street to S. 152nd Street. Improvements will be consistent with the City of Tukwila's Pacific Highway Revitalization Plan and will include landscaping new paving, curbs and gutters, sidewalks and planting strips and trees. Other street improvements, such as pedestrian lighting, benches, and artwork may be included near stations. Landscaping will be added to some areas between vehicle travel lanes and the light rail trackway where traffic channelization or a light rail station exists.

As described below in Section G-5, the project will result in benefits such as improved access to high-quality transit service, reduced transit travel times, and increased accessibility of employment and other amenities. These benefits will positively impact affected neighborhoods. Neighborhoods could also benefit from the potential redevelopment of surplus properties and other economic development.

The mitigation and design measures discussed above have reduced the potential adverse impacts on neighborhoods that would result from the preferred alternative. For example, as documented in the Final EIS, impacts on Tukwila neighborhoods throughout the Tukwila International Boulevard corridor would be low/moderate for the preferred alternative (E1.1) as fewer property acquisitions are associated with the route, and traffic, noise, and aesthetic impacts would be largely or completely mitigated. Since few small community businesses that could function as places of social interaction would be displaced, impacts to social interaction would be limited. Although project-related delays

in traffic movement could cause minor delays and a slight increase in traffic congestion, levels-of-service are expected to be comparable with or better than the No-Build Alternative.

Further, the project measures discussed above include additional traffic signals, additional signal-protected pedestrian crossings, and a signal control system that will minimize impacts on cross street traffic and enhance traffic and pedestrian safety. Faster, more reliable, and more frequent transit service would increase access to community facilities and employment opportunities, benefiting the neighborhoods. Tukwila neighborhoods, for example, would generally experience a moderate transit travel time savings (4 to 8 minutes on average) and would have improved transit access to employment opportunities and services both north and south, including in downtown Seattle, north Seattle, and the Sea-Tac Airport.

With the mitigation measures described above, and the benefits to transit access aesthetics, connectivity and potential economic development, the overall effect from the preferred alternative on neighborhoods is expected to be low. Neighborhood impacts, appropriately, are no longer considered significant in the Final EIS. The analysis above sufficiently considers the neighborhood effects of the preferred alternative under the DOT Order.

Other Impacts of the Preferred Alternative

As discussed above, transportation, noise and vibration, and neighborhood impacts associated with the preferred alternative will be minimized as a result of project design elements and mitigation measures. The remaining impacts that could be differentially distributed among racial or income segments of the population, residential and non-residential displacements and construction impacts, are discussed below.

Residential Displacements

As documented in the Final EIS, the preferred alternative would result in 58 residential displacements. Sound Transit will provide mitigation for these displacements under its Real Property Acquisition and Relocation Policy, Procedures, and Guidelines and the Uniform Relocation Assistance and Real Property Acquisition Policies Act. Sound Transit has begun developing a program that is not only consistent with federal and state laws, but that will fairly and proactively address the concerns of those being relocated. Sound Transit would work closely with affected individuals and families to ensure that their desires, concerns, and special circumstances are addressed. Interpreters would be used to assist those who are unable to speak English or who do not feel comfortable speaking English, to ensure a full understanding of what their choices and options are. The City of Seattle and Seattle Housing Authority have also committed to work with Sound Transit to help investigate a variety of housing choices and opportunities.

While the ultimate choice of relocation site would be up to the affected individuals, Sound Transit would help with detailed investigation of possible locations. Initial surveys by Sound Transit indicate that there are purchase and rental residential properties generally available within Rainier Valley and other affected areas. Sound Transit would make every effort to relocate those who desire it within their present community or neighborhood.

Even in such cases, some temporary disruptions will necessarily result from relocating residences. Particularly in light of Sound Transit's commitment to minimize the effect of residential displacements through the mechanisms outlined above, it is extremely difficult to evaluate, quantify, and compare the magnitude of temporary disruptions and longer-term personal and psychological costs and benefits of residential relocations. To assure that this environmental justice analysis comprehensively evaluates all potentially high adverse effects, the distribution of residential displacements among the minority and low-income populations is considered below.

To estimate the distribution of anticipated residential displacements on the minority and low-income populations, Sound Transit (in consultation with FTA and EPA) used a probabilistic assessment based on aggregated Census Block demographic data. The difficulty of obtaining

accurate and complete information from over 500 potentially impacted residences, coupled with respect for the privacy of individuals, necessitated such an approach.

For each displacement identified, Sound Transit calculated the probability that it would affect a minority or low-income household, based on the Census data for that block. For example, if a potentially displaced residential unit was located in a block group that is 22 percent low-income, there is a 22 percent probability that low-income residents occupy the unit. Sound Transit used such probabilities to predict the total number of minority and low-income residences that would be displaced as a result of the preferred alternative. The number of minority and low income residences affected, and, for purposes of comparison, the number of residences within the area that would most directly benefit from the preferred alternative (within one-half mile of the stations) are:

Residences located within ½ mile of project stations	62,000
Total minority residential displacements	39
Total low-income residential displacements	14

The percentage of minority and low-income residences affected, out of the total displacements predicted, was then calculated. These data are presented in Table G.4-B:

Table G.4-B Residential Displacement Impacts of the Preferred Alternative on the Minority and Low-Income Populations of the Sound Transit District

Total Estimated Displacements	Probable Minority Displacements	Minority Displacements (%)	Probable Low-Income Displacements	Low-Income Displacements (%)
58	39	67	14	24

The values set forth in Table G.4-B indicate that 67 percent of the residences that would be impacted are likely to be minority residences, while 24 percent of the residences impacted would likely be low-income. These values exceed the measure of one standard deviation from the mean minority and low-income composition in the reference population of the Sound Transit District (34 percent minority and 21 percent low-income). Thus, the preferred alternative could result in a statistically greater distribution of adverse displacement impacts for the minority and low-income populations of the Sound Transit District.

The predicted distribution of displacements is largely due to the number of displacements that would occur within Southeast Seattle (Segment D), which has relatively high numbers of minority and low-income residents, although displacements in other areas such as Tukwila also occur. A total of 46 residences within the Rainier Valley would be displaced, out of approximately 19,000 in the Valley. In light of the concerns expressed by the Southeast Seattle community during the Draft EIS comment period, the impacts of the preferred alternative on this community are addressed in detail in Section G-7, below. Further, an analysis of the preferred alternative's residential dislocation impacts by project segment is set forth in Table G-B-6 in Attachment B.

Although there would be more residential displacements affecting minority and low-income populations, these effects are not disproportionately high and adverse under the DOT Order. The 39 minority and 14 low-income residential displacements are limited when viewed in the context of the Central Link project as a whole and would be substantially mitigated through the measures described above. These conclusions are discussed further in Section G-6, below.

Non-Residential Displacements

The displacements analysis set forth in the Final EIS indicates that up to 101 full non-residential property acquisitions would occur as a result of the preferred alternative. As is the case with

residential displacements, these displacements would be concentrated in the Rainier Valley area, although displacements in other areas, such as Tukwila, would also occur. Non-residential properties consist primarily of businesses, but also include private and public institutions (e.g., non-profit organizations, city administrative space, etc.). The location of some of these businesses and institutions have particular importance to the affected communities.

Sound Transit would provide mitigation for these non-residential displacements pursuant to its Real Property Acquisition and Relocation Policy, Procedures, and Guidelines and the Uniform Relocation Assistance and Real Property Acquisition Policies Act. Sound Transit will work closely with the affected owners and users to ensure that it understands their desires, concerns and special circumstances. Sound Transit's Small Business Assistance program will be available to help businesses with their logistical, financial, and operational planning. Interpreters will be used to assist those who are unable to speak English or who do not feel comfortable speaking English to ensure a full understanding of what their choices and options are. The City of Seattle and Seattle Housing Authority have committed to work with Sound Transit to help investigate a variety of business choices and opportunities.

While the ultimate choice of relocation site will be up to the affected business or organization, Sound Transit will help with detailed investigation of possible locations. Initial surveys by Sound Transit indicate that there are purchase and rental sites generally available within Rainier Valley and most other affected areas for business and other purposes. Sound Transit will make every effort to relocate those who desire it within their present community or neighborhood.

Even in such cases, some temporary disruptions will necessarily result from relocating businesses and organizations. Particularly in light of Sound Transit's commitment to minimize the effect of these displacements through the mechanisms outlined above, it is extremely difficult to evaluate, quantify, and compare the magnitude of temporary disruptions and the longer-term effects on productivity, employment, service, and value of condemned or purchased property that are associated with non-residential business displacements. (In contrast to residential displacements, businesses and institutions themselves do not incur personal and psychological costs and benefits, although owners, employees, patrons, and landlords do.) To assure that this environmental justice analysis comprehensively evaluates all potentially high adverse effects, the distribution of non-residential displacements among the minority and low-income populations, therefore, is considered below.

As discussed above, the non-residential displacements associated with the preferred alternative would be concentrated in the Rainier Valley, although displacements in other areas such as Tukwila will also occur. No reliable data exist, however, regarding the minority status of owners, employees, users, and/or patrons of such businesses or institutions, or of the owners of the properties on which they are located. Similarly, although tax records may exist regarding the income status of the businesses and their owners, employees, patrons, and landlords, such records are confidential (and patrons would be extremely difficult to identify). There is thus no reasonable method to predict or analyze the demographic composition of those who would be affected by non-residential displacements in minority and low-income communities.

Because of this lack of data, the distribution of non-residential displacements for the minority and low-income populations of the Sound Transit District could not be estimated. Non-residential properties located in minority and low-income communities may not necessarily be owned by or provide employment and service to minority and low-income individuals in the same percentages as the mean compositions of those communities. As a result, the demographic distribution of non-residential displacements may differ substantially from the demographic distribution of residential displacements. For instance, it is relatively unlikely that owners of business properties in low-income communities are low-income individuals. Nevertheless, to assure that this environmental

justice analysis comprehensively evaluates all potentially high and adverse effects, this analysis conservatively assumes that the impacts of non-residential displacements, like the residential displacements discussed above, would be statistically greater for the minority and low-income populations of the Sound Transit District.

Although it is assumed that non-residential displacements would have a statistically greater effect on minority and low-income populations, these impacts are not disproportionately high and adverse under the DOT Order. The projected displacements would be substantially mitigated, as described above, and are limited when viewed in the context of the Central Link project as a whole. These conclusions are discussed further in Section G-6, below.

Construction Impacts

The Construction Impacts section of the Final EIS describes the construction impacts that would result from the preferred alternative. These impacts include: (1) traffic congestion, resulting from lane closures and on-street construction vehicle activity, and loss of parking; (2) disruption, and in some cases temporary displacement of existing land uses (i.e., businesses, residences, and institutions); and (3) impacts to forested wetlands. Only traffic and land use impacts are discussed in this environmental justice analysis because wetland impacts are generally in more isolated areas and are assumed to affect all demographic groups equally.

The severity and types of construction impacts that would occur as a result of the preferred alternative would vary depending on the type of rail alignment at issue. The duration of construction-related impacts that would be associated with the preferred alternative will likewise so vary. In areas where the rail line is at-grade or elevated (i.e., North Duwamish, MLK Jr. Way S., Tukwila, and SeaTac), construction is expected to take up to 2 years, although substantial disruption at any one location would typically occur over about a one-year period. In other areas where the rail line is underground in a tunnel (i.e., Beacon Hill, Downtown Seattle, First Hill, Capitol Hill, and the University District), construction is expected to typically take 2 to 4 years, with intense activities localized at tunnel portals, station areas, cut-and-cover areas, and vent shafts. Residents in Rainier Valley, and other areas with primarily surface alignments would experience overall construction-related impacts for about half of the time as would residents near the affected areas in tunnel segments of the project. Similarly, the more intense level of construction activities and truck traffic at tunnel stations, portals, vent shafts, and cut-and-cover locations would also be greater than the impacts along the at-grade alignment in Rainier Valley and other areas with surface profiles. Staging and the more intense activities associated with the Beacon Hill tunnel would occur at the west tunnel portal, not in the Rainier Valley neighborhood.

Sound Transit intends to implement a variety of measures to minimize temporary construction impacts. For instance, transportation and land use mitigation will include measures such as:

- Preparation of detailed construction traffic plans in close coordination with local jurisdictions.
- Posting advance notice of temporary street closures, changes in transit service, and parking availability.
- Providing regular updates to schools on construction activities.
- Scheduling traffic lane closures during off-peak hours to minimize delays during periods of higher traffic volumes as much as possible.
- Developing a multi-media public information program (e.g., print, radio, posted signs and electronic web page).
- Providing temporary parking to mitigate temporary parking losses due to construction staging or work activities.

- Developing a business marketing program and providing ethnic marketing assistance.
- Assisting in securing grants and loans for businesses.
- Developing a 24-hour information center.
- Use of best management practices to minimize air quality and other impacts.

These measures would reduce the construction impacts. However, to assure that this environmental justice analysis comprehensively evaluates all potentially high adverse effects, the distribution of transportation and land use construction impacts among the minority and low-income populations is considered below.

Construction impacts would vary due to the intensity, location, and duration of construction activities on the light rail project. Because of these variables, it is not meaningful to simply assign impacts to particular locations and calculate the demographic effects that result. Nevertheless, this environmental justice analysis conservatively assumes that temporary construction impacts, like the residential displacements discussed above, are statistically greater for the minority and low-income populations of the Sound Transit District.

Although it is assumed that construction impacts would have a statistically greater effect on minority and low-income populations, these impacts are not disproportionately high and adverse under the DOT Order. Construction impacts are temporary and would be substantially mitigated by Sound Transit. These conclusions are discussed further in Section G-6, below.

Distribution of Project Impacts for Other System Alternatives

Table G.4-A describes the impacts associated with other potential full-system alternatives. In order to evaluate the effects on minority and low-income populations associated with such alternatives, Sound Transit identified the following system alternatives designed to illustrate the range of potential effects on such populations:

- Scenario 1 is the same as Full-System Scenario 1 from the Draft EIS. This scenario was constructed to generally traverse areas with the highest concentration of minority and low-income populations. The Segment Alternatives that comprise this alternative are: A2.1, B2.2, C1, D1.1, E3, F1, and Maintenance Base M1.
- Scenario 3 is the same as Full-System Scenario 3 from the Draft EIS. This scenario was constructed to generally traverse areas with the lowest concentration of minority and low-income populations. The Segment Alternatives that comprise this alternative are: A1.1, B1, C2.3, D3.4, E2, F2.2, and Maintenance Base M1.
- Minimum Operating Segment A (MOS A). The Segment Alternatives that comprise this alternative are: B1, C1, and Maintenance Base M1.
- Minimum Operating Segment B (MOS B). The Segment Alternatives that comprise this alternative are: B1 (partial, with a northern terminus at the Capitol Hill Station), C1, D1.1E, and Maintenance Base M2.
- Minimum Operating Segment C (MOS C). The Segment Alternatives that comprise this alternative are: B1, C1 (partial, with a southern terminus at the Lander Station), and Maintenance Base M1.
- Rainier Valley Tunnel and preferred alternative (RVT Alternative). This scenario is composed of the preferred alternative in segments B,C,E, and F, with the Rainier Valley Tunnel substituted in Segment D. Evaluation of this alternative in the Rainier Valley Tunnel Technical Report concludes that this is not a reasonable alternative.

Project effects associated with some or all of the alternatives described above that could be differentially distributed to minority or low-income populations include residential and non-residential displacements, and construction, visual, noise and vibration, and recreational impacts.

Table G-B-1 sets forth the anticipated distribution of residential displacement impacts on the minority and low-income populations. This table demonstrates that, with the exception of MOS A and C, the alternatives described above would result in a statistically greater distribution of residential displacements on the minority and low-income populations. Consistent with the discussion of the preferred alternative, it is assumed that, for these alternatives, non-residential displacements and construction impacts would also have statistically greater effects on the minority and low-income populations.

Tables G-B-2 through G-B-4 provide information on the distribution of visual, recreational, and noise and vibration impacts for those alternatives for which these effects are anticipated to be significant.[9] Tables G-B-2 and G-B-4 indicate that Scenario 3 and the RVT Alternative could also result in a statistically greater distribution of adverse visual impacts for the minority population, and noise and vibration impacts for both the minority and low-income populations. As discussed above, since issuance of the Draft EIS, project modifications and neighborhoods mitigation have been incorporated into the project description, minimizing overall neighborhood impacts. However, even with this additional mitigation, neighborhood impacts associated with Scenario 3 could still result in statistically greater effects for the minority and low-income populations.

Finally, Table G-B-3 indicates that, although Scenarios 1 and 3 would have recreational impacts that should be considered in the environmental justice context, they would not have statistically greater effects on the minority and low-income populations.

G-5 DISTRIBUTION OF BENEFITS TO THE MINORITY AND LOW-INCOME POPULATIONS

Introduction

As discussed in Section G-3, under DOT's Order on Environmental Justice, the offsetting benefits of proposed transit projects may be considered when determining whether significant adverse impacts would have a disproportionately high and adverse effect on the minority and low-income populations. The Draft EIS described the substantial benefits of increased transit mobility, access to transit, and transit travel time savings that would result from the Central Link Light Rail project. Since the Draft EIS, Sound Transit has identified additional benefits associated with light rail, and has incorporated them into the preferred alternative design. This section describes the overall distribution of benefits provided by the preferred alternative to the minority and low-income populations of the Sound Transit District. Information on the distribution of benefits for particular segment areas of the preferred alternative are located in Attachment C.

Methodology

The analytic methodology used to evaluate both the distribution of benefits and impacts is similar. However, the demographic composition of the benefited populations differs to some extent, because benefits are generally distributed over a wider geographic area. Although this impedes comparisons within particular areas or for particular individuals, the overall distribution of benefits can be meaningfully compared to the demographic composition of the reference population and to the overall distribution of impacts.

Further, the analytic methodology does not take into account differences in the use or value of benefits, which are generally distributed close to light rail stations. The analytic methodology

[9] Similarly, since issuance of the Draft EIS, transportation impacts associated with all of the alternatives considered in the Draft EIS have been minimized through design changes and the incorporation of mitigation measures. Transportation impacts associated with the project do not require further analysis, therefore, in the environmental justice context.

assumes that benefits are distributed evenly within "clusters," which are approximately 500-acre areas within one-half mile of stations where travelers would derive the most significant effects of the benefits. One-half mile is a commonly used measure of walking distance for evaluating the significant benefits of access to light rail and other transit alternatives. ("Mode of Access and Catchment Areas of Rail Transit," Transit Cooperative Research Project H-1: Transit and Urban Form; PBQD and Howard/Stein-Hudson Associates, Inc.; March 1996).[10] The effects on the minority and low-income populations are then estimated using the demographic composition of the clusters. However, different communities and demographic groups within the clusters may make greater use of and/or more highly value the evenly distributed cluster benefits. In particular, the minority and low-income populations of the Sound Transit District boundary may make greater use of, and more highly value transit benefits than is otherwise suggested by a geographic distribution of benefits.

This phenomenon is supported by national and local data on transit use. National data indicate that both minorities and low-income individuals have a higher propensity to use transit and are less likely to own cars than the general population. As summarized by the American Public Transit Association (APTA), the most notable socioeconomic characteristics indicating a high propensity to use transit are: household vehicle ownership, central city dwelling (especially for single women), and race (especially for African-Americans).[11] U.S. Census data, also reported by APTA, indicate that income is also a strong indicator of transit use, with 50 percent of all passengers in urbanized areas of 500,000 to 1 million and 30 percent of passengers in all urban areas having annual family incomes of less than $15,000.[12]

In regard to car ownership, national studies show that an average of 4 to 10 percent of households do not own a car. African-Americans appear to be the group least likely to own a vehicle, at 30 percent nationwide and 37 percent in central cities.[13] Nationwide, 26 percent of low-income households do not own a car.[14] A sample survey conducted as part of the 1990 Census showed that 16 percent of minority households in the Seattle-Tacoma metropolitan area had no car available compared to 7 percent of non-minority households.[15]

On minority use of transit, APTA further reports that up to 55 percent of transit trips are taken by minorities nationwide. Of that total, 49 of the 55 percent are African-Americans or people of Hispanic origin. Together, however, these two groups comprise only about 21 percent of the total population nationwide. Data collected by the King County Dept. of Transportation (1997 Rider/Non-rider Survey) similarly indicate that minorities make up 26 percent of riders classified as "frequent riders" (riders who have taken five or more one-way trips on Metro Transit over a 30-day period), but make up a lower proportion (15 percent) of the population.

On low-income use of transit, Murakami and Young (October 1997) have provided the most thorough review of national data. Using the 1995 National Personal Transportation Study, they determined that workers from low-income households are more than twice as likely to use transit to

---

[10] In addition, non-overlapping station area circles linked by large block groups that also define local neighborhoods were combined into one station cluster. These clusters were then compared to the 737 alternative analysis zone ("AAZ") system of the ridership model which provide the finest level of detail for transit trip forecasting in the project area. As necessary, Block Groups on the periphery of the half-mile circles were also added to each station cluster to match the pre-defined AAZ boundaries. These zones are not uniform in size or population characteristics, but are instead derived from the density of roads and general purpose trip making in the regional transportation network with some consideration given to walking distances. *See* Section 2.3 of the "Transit Ridership Forecasting Methodology and Results Report" ST 1999. In this way, a reasonable number of destination zones were identified and associated with the 1990 U.S. Census reference population.

[11] *Transit Fact Book*; American Public Transit Association, 1999. Original source: *Commuting in America II: The Second National Report on Commuting Patterns and Trends*, Eno Transportation Foundation, Inc. 1996.

[12] *Transit Fact Book*; American Public Transit Association, 1999.

[13] "Transportation issues in Welfare Reform: Background information"; Demetra Smith Nightingale, 1997.

[14] Murakami and Young, 1997.

[15] *1990 Census, Census Transportation Planning Package (CTPP);* U.S. Census Bureau. Data extracted by Puget Sound Regional Council, 1999.

get to work than those from non-low income households (5 percent versus 2 percent, respectively). Low-income householder public transportation use was found to be 430 per year, as compared to 274 per year for non-low-income householders. This difference is much more notable considering that they also found that low-income householders make 20 percent fewer trips and travel 40 percent fewer person miles than non-low-income householders. About 60 percent of low-income household trips are 3 miles or less, as compared to 50 percent of trips made by non-low-income households.

Thus, a light rail system will be particularly effective in improving the travel abilities of both populations evaluated in this environmental justice analysis. These transit benefits may be more significant for minorities and low-income individuals, even if they are distributed geographically in direct proportion to the minority and low-income mean composition of the Sound Transit District. This phenomenon must be considered when comparing offsetting benefits of providing service and the adverse impacts associated with the preferred alternative.

Significant Benefits Of The Preferred Alternative

Improved Access To Transit

The principal purpose and goal of the light rail transit system is to increase transit options and improve mobility. Improved access to transit (with adequate stations) leads to a number of economic, social, and other benefits. Travel time savings is the main advantage, and is analyzed separately below. However, there are other advantages as well. Light rail, for instance, allows people to avoid the costs of owning, operating, and parking a car. Crash rates and mortality rates are lower for light rail than for automobile use.[16] Dedicated transit systems, like light rail, are highly reliable, assuring that people arrive on-time. Light rail systems reduce pollution and can help prevent suburban sprawl into undeveloped areas. With careful community planning, light rail can increase commercial activity from new businesses attracted to the region, and provide a myriad of other beneficial socio-economic effects.

Similarly, businesses derive many benefits from improved transit systems. Improved access to transit reduces the need for employer-provided parking, increases an employer's potential labor pool, and provides other indirect benefits. Additionally, building new transit systems generates additional construction and related employment, as well as employment associated with on-going rail operations. For example, the American Public Transportation Association (APTA) estimates that 2,400 direct and 5,800 total jobs are created by each $100 million transit capital investment and that $100 million of operating expenditures generate 3,100 direct and 7,300 total jobs associated with the transit project.[17]

Sound Transit analyzed the demographic distribution of these benefits for the preferred alternative and for the other project alternatives that serve substantially different travel markets. To perform these analyses, Sound Transit used station proximity as an indicator of access and then evaluated this proximity in relation to demographic data. In particular, as noted above, "clusters" were drawn around stations to define zones of significant access benefits. Then, using Census Block data, Sound Transit determined the demographic composition of the clusters. The data was summed and compared with the overall population of the clusters. The comparison provided percentages for the minority and low-income populations of the Sound Transit District. A more detailed description of this methodology and its results is provided below.

---

[16] Calculations from *Safety Management Information Statistics (SAMIS) Annual Report,* Federal Transit Administration; *Traffic Safety Facts 1996: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Report System and The General Estimates Systems,* National Highway Traffic Safety Administration; and *Pocket Guide to Transportation 1998,* Bureau of Transportation Statistics USDOT.

[17] *Transit Fact Book*; American Public Transit Association, 1999.

Travel Time Savings

Transit users will experience substantial travel time savings with the Central Link Light Rail Project. Many existing transit trips will take less time after implementation of light rail Individuals will also be able to make new connections and take longer trips on transit due to expanded service and faster travel speeds. In addition to the direct personal benefits of reduced travel time to destinations, travel time savings allow increased access to employment and other amenities. These additional benefits are discussed below.

To calculate the distribution of transit travel time savings, Sound Transit built on the analysis of clusters developed to evaluate transit access. For each cluster, an average travel time saving was first calculated for PM peak period trips to the cluster, using the Sound Transit Ridership Model.[18] These average travel time savings (which included bus transfers) were then attributed evenly to all residents of each cluster. Using the demographic data for each cluster, Sound Transit calculated the total transit travel time savings for minority and low-income populations and compared these savings to that achieved by the overall population. The percentages derived could then be compared to the one standard deviation from the mean composition of the Sound Transit District measure of significance. A more detailed description of the methodology and its results is provided below.

Expanded Access To Employment and Other Amenities

Decreased transit travel times mean riders can travel longer distances in the same amount of time. The Central Link Light Rail system will provide substantially better access with lower travel times to major employment and activity centers, such as downtown Seattle, Sea-Tac Airport and the University of Washington. Today, King County Metro estimates that the average transit trip to three major employment areas in the Seattle metropolitan area is 56 to 75 minutes.[19] This compares unfavorably with nationwide statistics, which range from 38 to 59 minutes for average transit to major employment areas on various forms of transit.[20] Decreased travel times are thus even more important for the Sound Transit District than in many other areas of the country.

By 2020, without the Central Link project, average travel times for all types of transit trips are expected to range from 40 to 70 minutes for riders traveling in the project's immediate service area.[21] With light rail, transit trip times would range from 31 to 62 minutes. Thus, light rail would substantially reduce transit travel times, and directly provide the many benefits of travel time savings.

As current travel time increases, which is expected in the Sound Transit District for most local bus service, access to existing employment opportunities will consequently decrease. Conversely, as travel time decreases as a result of light rail, access to new employment opportunities become available. This is particularly important for transit-dependent persons, who can't take the bus to many areas of the city because of extended trip times or inconvenient bus routes. Because light rail significantly improves travel times over other transit alternatives, its riders may seek employment in areas previously considered too far away.

Because some jobs tend to cluster in particular geographic communities, increased travel opportunities through light rail open up a wider range of employment opportunities. A wider range of industrial, commercial, and service industry jobs is particularly important for minority and low-income individuals, who historically may have been excluded from many types of employment.

---

[18] Transit Ridership Forecasting Technical Report (Sound Transit/FTA, July 1999)
[19] *Equity of Transit Service Study*; King County Metro Transit, 1998. (figures include walk time, in-transit time, wait time at the stop and transfer time to Downtown Seattle, the Duwamish area and University district.)
[20] *Transit Fact Book*; American Public Transit Association, 1999. Original Source: "Commuting in America II: The Second National Report on Commuting Patterns and Trends," Eno Transportation Foundation, Inc. Lansdowne, Virginia, 1996.
[21] Average travel times reported are calculated over all transit trips to the station area clusters analyzed.

Besides employment, the new opportunities provided by decreased transit travel times encompass a whole range of quality of life improvements, including: increased access to job training programs, quality health care (such as hospitals and clinics), shopping, and recreation. These benefits also may lead to corresponding improvements to communities as income levels and quality of life rise.

Sound Transit assessed the distribution of increased employment access that would result from the preferred alternative and other alternatives for the light rail project. See Table G-C-6. It used the Sound Transit Ridership Model to evaluate what geographic areas could be reached within 60 minutes from each cluster, with or without the project. It then calculated the number of jobs accessible to each cluster within 60 minutes, with and without the project, and attributed equal access to these jobs to each cluster resident.[22] Sound Transit then used the demographic composition of each cluster to calculate the increased jobs access for the minority and low-income populations of each cluster and compared this information systemwide on a percentage basis to the one standard deviation from the mean reference composition of the Sound Transit District (34 percent for minority, 16 percent for low-income).[23] The methodology adopted for evaluating the distribution of employment access benefits is described in more detail below. No similar systemwide analysis is provided for increased access to job training, health care, shopping, and recreation. However, Sound Transit expects that a relatively similar geographic and demographic distribution of benefits would result, because these access benefits derive principally from the same transit travel-time savings provided.

Streetscaping and Other Community Improvements

Secondary benefits of light rail systems to the communities in which they are located include area beautification and other improvements and amenities that are provided as a result of increased investment or activity.

An improvement program for existing street rights-of-way is built into the preferred alternative. These improvements generally include upgraded pedestrian amenities, such as wider sidewalks, signage, and crosswalks, as well as beautification features, such as street trees and other landscaping, lighting, and public art. Specific improvements associated with the preferred alternative include the following:

- Street rights-of-way adjacent to deep tunnel stations (45th Street, Pacific Street, Capitol Hill, First Hill, and Beacon Hill) will be improved at station entrances. Improvements will consist of new sidewalks and landscaping adjacent to the affected properties, and may also consist of wider sidewalks, lighting, or the installation of street trees.
- Bus access and pedestrian improvements will be made to the McClellan Station area. A new pedestrian connection from Rainier Avenue S. to the station entry will be designed to provide access from a bus stop. Improvements to S. Winthrop Street between Cheasty Boulevard and Rainier Avenue S. will be completed, consistent with the historic Olmsted Boulevard vision. These improvements may include street reconfiguration (creating a boulevard), new sidewalks and landscaping, pedestrian lighting, and new street trees.
- From MLK Jr. Way S., from approximately S. Steven Street to just north of the MLK junction, the Boeing Access Road will have street improvements that could include new street paving, sidewalks, landscaping/street trees and lighting. At station locations,

[22] Washington State Employment Security data analysis provided by Puget Sound Regional Council, 1999.

[23] This measure of job access overcounts the number of jobs accessible to all clusters, because access from each cluster area may overlap with access from other travel areas. The measure is meaningful, because the focus is on the benefits of increased access to employment for individuals. Increased overall employment as a result of economic development is discussed below, but no quantitative analysis of the distribution of economic development benefits is provided. Further, although the increased access measured is that to existing employment opportunities as documented by the Employment Security department, additional and new opportunities are expected over time due to the expanded overall travel range.

amenities such as benches, trash receptacles, and artwork may be included. Landscaping will be added to some areas between vehicle travel lanes and the light rail trackway where traffic channelization or light rail stations exist.

- S. Edmunds Street between MLK Jr. Way S. and Rainier Avenue S. will have pedestrian improvements to promote a walking connection from Columbia City to the Edmunds Station. These improvements will focus on the sidewalk/landscaping area and could include wider sidewalks, marked or textured crosswalks, new street trees, pedestrian lighting, trash receptacles, benches, and artwork.
- S. Henderson Street between MLK Jr. Way S. and Rainer Avenue S. has been designated a major connector from Rainier Beach community to the Henderson Station. Street improvements will be coordinated with the Metro Combined Sewer Overflow Project and could include either widening or reducing the street width, new curbs and gutters, new sidewalks and planting areas or street trees, marked or textured crosswalks, pedestrian lighting, trash receptacles, benches, and artwork.
- Tukwila International Boulevard (formerly Pacific Highway S.) will be improved where the light rail elevated guideway and at-grade trackway run within the street. This is from approximately S. 120th Street to S. 152nd Street. Improvements will be consistent with the City of Tukwila's Pacific Highway Revitalization Plan and will include new street paving, curbs and gutters, sidewalks and planting strips/street trees. Other street improvements, such as pedestrian lighting, benches, and artwork may be included near stations. Landscaping will be added to some areas between vehicle travel lanes and the light rail trackway where traffic channelization or a light rail station exists.
- S. 144th Street between Military Road and 42nd Ave. S. has been designated by the City of Tukwila as a major pedestrian corridor. Pedestrian improvements such as wider sidewalks marked or textured crosswalks, new street trees, pedestrian lighting, trash receptacles, benches, and artwork may be included in the project. If right-hand-turn pockets are added to S. 144th Street, some rebuilding of this street will occur.

An improvement program for bicycle access to the light rail facilities is also part of the preferred alternative. Bicycle parking facilities (i.e., racks and/or lockers) are included in the preferred alternative site plans. Storage facilities and station plaza pathways will be located to minimize conflicts with pedestrians and allow easy access from bicycle routes and arterials. Other linear improvements for access that are a part of the project include: separated bike trail construction parallel to the light rail line from S. Lander Street to Royal Brougham in Segment C; Chief Sealth trail crossing of MLK Jr. Way S. in the vicinity of Henderson Station and other parallel bicycle improvements in Southeast Seattle (as identified by the Sound Transit Board) for Segment D; and increased outside-lane width on Tukwila International Boulevard to accommodate bike travel on the roadway in Segment E.

Although a detailed analysis of the distribution of these streetscaping and community improvements was not performed, most of the improvements are concentrated in minority and low-income communities. As a result, the benefits of these improvements are likely to most significantly affect the minority and low-income populations of the Sound Transit District.

Economic Development

Because light rail exposes riders to new areas and businesses, being located near the rail line may be economically beneficial.

Construction of the system also provides major economic benefit. Federal funds flowing into the greater Seattle area to build the project will help the regional economy. There would be a demand for construction materials and jobs to build and operate the system. The direct benefits will spin off to firms in other industries that supply material to the construction industry. In addition, the

wages paid to workers in construction trades or supporting industries will be spent on other goods and services. Sound Transit's Guiding Principles for Employment and Contracting and other economic development policies demonstrate commitment to: workforce diversity in the region; the maximum use of local and small businesses; and the maximum use of minority, women, and disadvantaged businesses.

For jurisdictions with supporting policies, land use controls and direct incentives, light rail can substantially increase the development occurring close to (typically within ¼ mile of) transit stations. The benefits of transit-oriented economic development can include improved mobility, access and environmental conditions within communities; more affordable housing; increased income to transit agencies; more efficient urban form; and urban redevelopment.

In many cases, light rail stations have helped redevelop areas with a substantial minority or low-income population. In such cases, the station is the catalyst for financing and community activities that solidify and accelerate redevelopment. In Dallas, Texas, for example, banks, grocery stores and other businesses have sprung up along the South Oak Cliff rail alignment. Improvements such as new sidewalks, better storm drains, street improvements, new streetlights and landscaping were provided. In addition, an existing Veterans' medical center received a substantial addition and a new community center, stores have upgraded their frontage, and a church attracted additional members. The station has proved to be a catalyst that, when merged with careful station planning, design standards, creative financing methods, and community action, has helped solidify and accelerate redevelopment.

Introducing light rail on Baltimore's Howard Street area, however, was not as successful. In 1992, the Metropolitan Transit Authority introduced an at-grade light rail line on Howard Street, through Baltimore's struggling commercial district. The double track light rail was built along one side of the street. Access to adjacent businesses was provided as necessary. Although the MTA went to great lengths to make sure customers could still use businesses during construction, small "mom and pop" shops suffered. In addition, there has been no appreciable economic development along the light rail line in that area, which suffers from a perception of poor security and crime. The Howard Street example illustrate the importance of other supporting factors to ensuring successful economic development along a light rail line.

Sound Transit is actively planning ways to encourage economic development and to make sure that the Central Link project is beneficial to surrounding areas. These steps include: developing measures to minimize impacts on businesses during construction; designing and planning the system to maximize potential economic redevelopment benefits, such as placing stations near residential, retail and commercial centers and using pedestrian- and business-friendly design elements such as pedestrian walkways; developing partnerships with local jurisdictions to encourage transit-related development; and encouraging community involvement in and support of the project. These efforts will help ensure that the Central Link project is an asset and economic catalyst for its surrounding communities. The City of Seattle, supported by Sound Transit, is working with local communities to design stations that include neighborhood ideas and that also incorporate policies and zoning that are conducive to transit oriented-development.

Sound Transit did not perform a quantitative distributional analysis for the potential economic development benefits that would result from the Central Link Light Rail project. Forecasting models are not sufficiently advanced to allow such analyses to be performed with confidence. However, as with access to transit, transit travel time savings, and access to employment and other amenities, these secondary benefits will likely be provided principally to individuals living near stations.

Community Investment Fund

As part of the preferred alternative, Sound Transit has proposed a $50 million Transit Oriented Community Development Fund (Motion M99-14 adopted February 25, 1999), through local initiative, to mitigate impacts of the implementation and operation of light rail in the Southeast Seattle Link light rail corridor. The fund would be used to increase ridership and address project impacts that otherwise would not be mitigated. The funds can be used to leverage local, state and federal dollars for transit-related and supportive investments. A community advisory panel will be established to set priorities and make recommendations to the Sound Transit Board for application of the fund. The fund would also be available to the community for physical and economic improvements to the Southeast Seattle corridor.

Distribution of Significant Benefits of the Preferred Alternative

Improved Access To Transit

Rail catchment areas are influenced by factors such as land use density, parking supply, income levels, station spacing, road network patterns, and connecting transit.[24] It is difficult to predict how far riders will come to a particular station or their demographic composition. Instead of relying on forecasts and estimates, Sound Transit examined the population residing near a station. Sound Transit then estimated the demographic makeup of ridership using the demographics of the nearby areas. As discussed above, to assess the magnitude of potential travel benefits resulting from the preferred alternative, geographically defined station area 'clusters' of roughly one-half mile from stations were developed. The travel benefits among different demographic populations living within each cluster were compared. The results were then summed to approximate the distribution of benefits for the affected population of the Sound Transit District. One-half-mile is a standard measure of walking distances because it captures most nonmotorized access ridership.[25] Because riders could begin or end their trips further than a half-mile from the stations, the measure does not capture all benefits. No sensitivity analysis was performed to determine if minority or low-income ridership varies dramatically if access is evaluated using a smaller or larger radius from stations.

Table G-5-A shows the demographic composition of the cluster areas within one-half mile of each station under the preferred alternative:

[24] Section 10.3; "Mode of Access and Catchment Areas of Rail Transit", Transit Cooperative Research Program Project H-1: Transit and Urban Form; PBQD and Howard/Stein-Hudson Associates, Inc.; March 1996.
[25] Ibid.

Table G-5-A. Access to Transit Benefits for the preferred alternative

Scenario	Total Number of Stations	Total Population w/ Access To Stations	Minority Access	Low-Income Access	Minority Access (%)	Low-Income Access* (%)
Preferred Alternative	21	137,102	55,486	23,443	41	20

*Percentage calculated per non-college adjusted population totals.

The table shows that41 percent of the residents living near stations are likely to be minorities and 20 percent are likely to be low-income. These values exceed the measure of one standard deviation from the mean for minority composition, and just barely miss exceeding one standard deviation for low-income composition. Thus, it is estimated that the preferred alternative will result in a statistically more significant geographic distribution of access benefits for the minority population (and almost a statistically more significant geographic distribution of access benefits for the low-income population) of the Sound Transit District. When the greater value of such access to these populations is taken into account, the distribution becomes even more significant. The anticipated distribution of access benefits is largely due to the proximity that minority and low-income individuals have to stations in the Beacon Hill/McClellan (Segment C), Rainier Valley (Segment D) and other minority and low-income communities where stations would be located in the preferred alternative. The Rainier Valley has the highest percentage of low-income and seniors in the region; 20 percent of Valley households do not have access to a car.

Analysis of Travel Time Savings

Once light rail is running, Rainier Valley residents will save an average of 18 minutes of travel time, according to calculations based on the preferred alternative. By comparison, the average savings for neighborhoods near all light rail stations is eight minutes, also based on the preferred alternative. The travel time savings are greater for the Rainier Valley than for any other neighborhood and more than twice the system-wide average.

The substantial savings for Rainier Valley residents reflect the congestion facing buses traveling through the Valley today. With few opportunities to enter HOV lanes, even express buses encounter many of the same traffic slowdowns as local buses. Worsening congestion over time is expected to slow all bus routes even further. However, because the distances traveled on congested arterial roads in other central Seattle cluster areas are not as long as the Rainier Valley, their comparative transit travel time savings are not as great.

Sound Transit used the Ridership Model to calculate these travel time savings and assess their distribution. Trips originate from throughout the region and are destined for each station cluster in the PM peak period. Year 2020 transit travel times for these trips were compared with and without the light rail project. Because most trips in the PM peak period are made by individuals from the workplace to home, the outcome largely describes travel time savings also experienced in the morning (only in the opposite direction) by people living in the clusters.

An average transit travel time saving was first calculated for all PM peak period trips to the cluster using the Sound Transit Ridership Model. Because data was lacking on the precise racial and income status of each person traveling to the cluster, the average travel time savings were attributed evenly to all residents of each cluster. Using demographic data from Census Blocks, the total travel time savings for minority and low-income populations was then calculated by multiplying the average travel time savings for the cluster by the number of minority and low-income individuals residing within the cluster. The total travel time savings for each cluster was also calculated in the same way. By summing the travel time savings across all clusters along the route, total numbers for

the preferred alternative were developed, and minority and low-income percentages of total travel time savings were then calculated.[26]

Table G-5-B shows the demographic distribution of reduced travel time benefits under the preferred alternative. The table shows that minority and low-income residents will receive 38 percent and 25 percent (respectively) of the total reduced travel time savings experienced by residents near light rail stations. These values exceed the measure of one standard deviation from the mean for minority and low-income composition. Thus, it is estimated that, with the preferred alternative, the minority and low-income populations of the Sound Transit District will save more transit travel time than others. When the greater value of such savings to these populations is taken into account, the distribution becomes even more significant. Again, the anticipated distribution of travel time savings is largely due to the proximity of minority and low-income residents living near stations in the Beacon Hill/McClellan (Segment C) and Rainier Valley (Segment D) clusters and other minority and low-income communities where stations would be located in the preferred alternative.

Table G-5-B. Travel Time Savings for the preferred alternative

Scenario	Minority Travel Time Savings *	Low-Income Travel Time Savings *	Total Travel Time Savings*	Minority Savings (%)	Low-Income Savings** (%)
Preferred Alternative	1,294	860	3,373	38	25

* Cumulative hours saved per pm peak period (3 hours) for travel to neighborhoods within proximity of the stations comprising each scenario.

** Percentage calculated per non-college adjusted population totals.

Analysis of Improved Access To Employment

After Link opens, Rainier Valley residents will have more than 195,000 additional jobs within an hour's ride by transit. Similarly, compared to the No-build scenario, access to education would more than double, and access to health care services would increase by 27 percent. Only riders from the Sea-Tac Airport station would see greater access improvements. This anticipated distribution of access improvements is due in part to the addition of the University District, the region's second largest employment center, to the area accessible within an hour of transit travel from Rainier Valley.

To model the benefits obtained by improved transportation (as measured by travel-time reductions), job access was used as a proxy for all forms of increased quality-of-life opportunities.[27] The Ridership Model was used to determine how far from each station cluster one could travel in any direction within 60 minutes on transit both with and without light rail. Using the Puget Sound Regional Council's Employment Security Department database, the number of jobs in each major industrial sector were counted within the 60-minute travel distance. This comparative approach to evaluating accessibility benefits is well supported by more than 30 years of academic research and is commonly thought to be a reliable measure of change due to infrastructure improvements. The

[26] Because some transit travel time savings and job access benefits are experienced outside the immediate project area (i.e., outside the station cluster areas along the route), the systemwide totals reported for both time savings and increased job access somewhat underestimate total benefits across the entire Sound Transit District. The systemwide totals do however, capture nearly all significant benefits.

[27] Improved accessibility also increases access to day care or job training programs (or to more affordable and better quality care and programs), which in turn may lead to increased employment opportunities. The employment security data can not be utilized at this fine level of detail and consequently the analysis does not quantify these additional benefits, which enhance the usefulness of expanded geographic access to employment opportunities. Other types of services making up a large enough portion of a major industrial sector can be analyzed; for example, the health services sector was analyzed for each cluster area though not summarized systemwide in this report.

method does not, however, provide information on the availability, need, or attractiveness of these employment opportunities for travelers, and the analysis does not account for job growth over time.

The average increase in number of jobs accessible to each cluster as a result of light rail was calculated using the 60-minute travel distances for each cluster with and without the preferred alternative and the Employment Security database of jobs. The number of increased jobs was then multiplied by the number of persons residing within each cluster, and by the number of minority and low-income persons residing within each cluster.[28] Using the Census Block demographic data for each cluster, the total access benefit for minority and low-income populations could then be calculated by multiplying the average increase in job access for each cluster by the number of minority and low-income individuals residing within the cluster. The total increase in job access for each cluster could also be calculated in the same way. By summing these increases in job access across all clusters, total numbers for the preferred alternative were developed. Minority and low-income percentages of total increased job access were then calculated.

Table G-5-C shows the demographic distribution of benefits of increased job access under the preferred alternative. The table shows that minority and low-income residents will receive 47 percent and 17 percent (respectively) of the total increased employment access experienced by persons living near light rail stations. These values exceed the measure of one standard deviation from the mean for minority composition, and do not exceed the one standard deviation for low-income composition. Thus, the preferred alternative is estimated to result in a statistically more significant geographic distribution of access benefits for the minority population of the Sound Transit District. When the greater value of such savings to the minority population is taken into account, the distribution becomes even more significant. Again, the anticipated distribution of job access benefits is largely due to the reduced transit travel times to major employment centers such as the University of Washington and the proximity of minority individuals living near stations in the Beacon Hill/McClellan (Segment C) and Rainier Valley (Segment D) clusters and other minority communities where stations would be located in the preferred alternative.

Table G-5-C. Increased Job Access for the preferred alternative

Scenario	Total Increased Number of Jobs Accessible (jobs)	Minority Increase In Job Access (million jobs*ppl)	Low-Income Increase In Job Access (million jobs*ppl)	Total Increase In Job Access (million jobs*ppl)	Minority Increase (%)	Low-Income Increase* (%)
Preferred Alternative	1,269,885	8,464	3,169	18,112	47	17

*Percentage calculated per non-college adjusted population totals consistent with analysis in other sections.

Distribution of Project Benefits for Other System Alternatives

Information on the distribution of benefits for the non-preferred system alternatives described in Section G-4, above, is located in Attachment C.

Segment Alternatives that serve substantially different travel markets than those that comprise the preferred alternative, were also analyzed for transit access, travel time savings, and employment access benefits. With a Northgate to SeaTac system, there is little variation in the share of benefits received by minorities and low-income populations.

For the Northgate to SeaTac systems analyzed minorities gain between 36 to 38 percent of the transit access benefits, 33 to 34 percent of the travel time saving benefits, and 45 to 48 percent of the

[28] As previously mentioned, the employment access benefits were attributed evenly to all of the residents of each cluster. This is because neither racial and income status nor travel time data can be disaggregated to individual residents.

job access benefits.[29] Low income residents gain 17 to 19 percent of the transit access benefits, 21 to 23 percent of the travel time savings benefits, and 17 to 18 percent of the job access benefits. A tunnel through Rainer Valley would not increase access benefits for neighborhood residents and would only change the average travel time savings for the neighborhood by 1 minute, increasing from 18 minutes with the preferred alternative to 19 minutes with a tunnel.

G-6 ENVIRONMENTAL JUSTICE CONCLUSIONS

As discussed above, Sound Transit conducted a comprehensive evaluation of all potential effects of the project on the minority and low-income populations of the Sound Transit District, relying on the extensive impacts information provided in the Final EIS. This evaluation revealed that project design features, many developed since issuance of the Draft EIS, and mitigation measures would minimize many potentially adverse impacts and their potential effects on minority or low-income segments of the population.

While residential displacements would have statistically greater effects on the minority or low-income populations, and it is assumed that non-residential displacements and construction impacts would be likewise distributed, none of these impacts is disproportionately high and adverse under the DOT Order. Only 39 minority and 14 low-income residential displacements are expected, all of which would be substantially mitigated through relocation assistance. Similarly, only a total of 101 non-residential displacements are expected (it is unknown how many of these are minority or low-income displacements), a fraction of the non-residential properties and uses potentially affected. Mitigation would also be available for such dislocations. When considered in the context of the Central Link Light Rail project, these limited and substantially mitigated dislocation impacts do not constitute disproportionately high and adverse effects on the minority and low-income populations.

The construction impacts that would result from the implementation of the preferred alternative are also not disproportionately high and adverse under the DOT Order. The impacts will be temporary and would be substantially mitigated by Sound Transit. Further, construction impacts, like the residential and business dislocations described above, are a necessary consequence of providing service to minority and low-income communities. None of the evaluated alternatives that provide service to minority communities would eliminate statistically greater distributional differences in displacements or project construction impacts.

Furthermore, according to the DOT Order, the offsetting benefits of providing service to these populations, described above in Section G-5, may be considered in making determinations about disproportionately high and adverse effects on low-income and minority populations. These benefits, as well as the benefits accruing to the remaining population of the Sound Transit District, substantially outweigh the adverse residential and non-residential displacement impacts and temporary construction impacts that would occur with the preferred alternative. Further, the offsetting benefits are likely to be much greater for the minority and low-income populations than is reflected by the geographic distribution of benefits, because they are concentrated in the same minority and low-income communities that are subject to most of the displacement impacts.

For these reasons, this analysis concludes that the preferred alternative would not have disproportionately high and adverse effects on the minority and low-income populations. It further concludes that the principles of environmental justice have been appropriately incorporated into Sound Transit's and FTA's environmental review and planning processes, as required by the DOT Order.

In response to concerns raised by a community group called "Save Our Valley," Sound Transit has compared the impacts and benefits of the preferred alternative to the Rainier Valley tunnel

[29] Segment Alternatives analyzed were B2, C1, C2.3, Rainier Valley Tunnel, and E3.

alternative. This comparison, along with a history of the light rail alignment is set forth in Section G-7, below. That section concludes that the Rainier Valley tunnel alternative is not a reasonable alternative under NEPA. It does not meet Sound Transit's design and engineering criteria for tunneling does not eliminate residential and non-residential displacements and construction impacts that would result from providing service to the Rainier Valley, nor would it provide the substantial streetscape and other benefits offered by the at-grade alignment. It would also involve extraordinary costs. Therefore, the preferred alternative would not be precluded under the DOT Order.

G-7 COMPARATIVE ANALYSIS OF PREFERRED ALTERNATIVE AND RVT ALTERNATIVE

Introduction

This section provides a history of light rail planning in Southeast Seattle, describes the tunnel criteria and how it has been applied to the project, and compares the impacts, benefits and costs in Rainier Valley of the preferred alternative and of the RVT alternative.

History of Light Rail Service Planning for Southeast Seattle

Early Planning Regarding Provision of Service to Southeast Seattle

The Forward Thrust Plan developed in the late 1960s assumed that the Rainier Valley would be served by bus routes connecting with a rapid rail line through Seattle's Central Area that would then continue east across Lake Washington. When rapid transit planning got underway again in the 1980s the initial focus was on the north corridor. It wasn't until the Multi-Corridor Project, completed in 1985, that rapid transit corridors in Rainier Valley were once again analyzed. The Multi-Corridor project evaluated eight rail corridors south of downtown Seattle, two of which served Rainier Valley; the remaining six bypassed it in favor of routes serving the Duwamish Industrial area or West Seattle.

Southeast Seattle Communities Requests For Full Access to Regional Rail Line

Following the successful King County Rail Advisory Ballot in 1988, the Regional Transit Project (RTP) high capacity transit study once again evaluated potential rail routes through Southeast Seattle. As discussed above in Section G-2, by 1991, numerous Southeast Seattle organizations strongly supported rapid rail in Rainier Valley.

The City of Seattle also recognized the transit needs and community desires of Southeast Seattle for rail service. A 1991 City of Seattle Office of Long-Range Planning report recommended continued analysis of two alternative alignments (Rainier Avenue and MLK Jr. Way S.) that would each have 4 stations. It advised against bypassing Southeast Seattle and against an alternative that would have 10 stations that terminate at the south end of the Valley. [Gambrell Urban, Inc, October 1991.]

As discussed above, Southeast Seattle's desire for rail service and participation in regional planning efforts ultimately shaped the development of Sound Move. The initial phase proposal in 1995 included an elevated and at-grade rail alignment in Southeast Seattle, with stations at Rainier and I-90, McClellan, Columbia City, Othello and Henderson. The *Sound Move* plan submitted to the voters in November 1996 stated that the line in the Rainier Valley, "...will be built primarily on elevated structures and on the surface through Southeast Seattle." [*Sound Move*, page 18] This plan was approved by 56.5 percent of the three-county district's voters, including overwhelming support in the City of Seattle and in Southeast Seattle where it passed by over 60 percent.

Southeast Seattle Alternatives Development and the EIS Process

Scoping of Alignments Initially Evaluated for the EIS, Including Tunnel Alignments

In November 1997, Sound Transit issued the Scoping Information Report for Central Link Light Rail, which identified alternatives in Southeast Seattle and elsewhere. The Scoping Report identified two alignments in the northern part of Rainier Valley between downtown Seattle and McClellan Street, including a new tunnel alignment under Beacon Hill. The other alignment located a line parallel to Dearborn and along North Rainier Avenue S. The Beacon Hill tunnel alternative was developed primarily in response to concerns about the impacts of operating light rail on, under, over or alongside Rainier Avenue north of McClellan Street.

South of McClellan Street, the Scoping Report identified various alignments on MLK Jr. Way S. and Rainier Avenue, based on either at-grade or elevated profiles. "The light rail line can run along the side of the street or in the median, either at-grade, or on elevated structures." No tunnel profiles were included south of McClellan. Potential crossovers between routes on Rainier and MLK Jr. Way S. were shown at Alaska, Edmunds, Orcas, and in the vicinity of Henderson Street.

Public comments received during the scoping period were primarily related to the trade-offs between the Beacon Hill tunnel or serving north Rainier Valley, and the appropriate route from I-90 to Columbia City, as well as where stations should be relative to Columbia City. Comments on the profile were mixed, with some members of the community requesting a tunnel in Rainier Valley and some preferring an at-grade profile.

Additional Alternatives and Profiles Considered after Initial Scoping

As a result of comments received during the scoping process, and following public workshops and outreach, Sound Transit added several Southeast Seattle alternatives for study in the Draft EIS. These options included:

- North Rainier Valley and Beacon Hill (Segment C): New options were added including two tunnels in addition to the Beacon Hill tunnel. An alignment on Poplar Place, parallel to Rainier Avenue S. was added, connecting to a tunnel under I-90. A second tunnel alternative under Beacon Hill was added at the north end of the hill, connecting to a new elevated station adjacent to I-90. These options were added to provide service to the north Rainier neighborhood while avoiding the negative traffic and displacement impacts of the other alignments.
- Mid and South Rainier Valley (Segment D): A new option added a tunnel section between Columbia City and Graham/MLK Jr. Way S. under 37th Avenue S., bringing service directly to the Columbia City historic business district. All alternatives in the Draft EIS from Graham south included at-grade service in the south end of the Valley. The Seattle Housing Authority's redevelopment of an all-subsidized housing project, Holly Park, into New Holly – a mixed income, mixed renter/owner with 50-percent more density, had been coordinated for several years with plans for an at-grade station at Othello and MLK Jr. Way S..

Alternatives and Profiles Eliminated from Consideration after Initial Scoping

Besides adding alternatives, some alternatives included in the scoping report were eliminated, in part, because of strong opposition from the community. The alternatives eliminated included: surface or elevated alignments in the median of Rainier Avenue; and any light rail on Rainier Avenue south of Columbia City. These alternatives were eliminated largely as a result of the probable impacts to Rainier Avenue, which has a narrower right-of-way than MLK Jr. Way S. In addition, although the Rainier Beach community (centered on S. Henderson and Rainier Avenue), had participated extensively in neighborhood planning and expressed interest in a light rail station at Rainier and S. Henderson, it could not identify a way to do so without unacceptable impacts.

Workshops on the Draft EIS and Requests for an All-Tunnel Alternative for the Rainier Valley

In October and November of 1998, prior to publication of the Draft EIS, Sound Transit held public workshops throughout the corridor to preview the Draft EIS with all affected communities. These workshops were held prior to publication to maximize community involvement in the identification of the preferred alternative. At the community workshop in Southeast Seattle, many of those participating requested that Sound Transit evaluate an all-tunnel alternative in Southeast Seattle. Immediately after that workshop, all-tunnel proponents formed the community group named Save Our Valley ("SOV").

Shortly after this workshop, Sound Transit's Board directed staff to evaluate an all-tunnel alternative in the Rainier Valley. Sound Transit staff met with members of SOV to obtain their assistance in defining such an alternative. SOV ultimately declined to give direction to Sound Transit on a preferred all-tunnel alternative, stating that an all-tunnel alternative should be entirely bored or mined with no cut-and-cover construction, including at the stations, to reduce construction impacts. Sound Transit declined to follow this request because it would have increased the total cost of the tunnel alternative by approximately $160 million or more. The tunnel alternative that Sound Transit selected for study included bored and mined tunnel sections (required by geological considerations), and cut-and-cover stations.

Between November and February, the City of Seattle and Sound Transit sponsored various public meetings to continue the discussion of light rail alternatives in the Valley, including meetings attended by elected officials on Sound Transit's board. Sound Transit issued the Rainier Valley Tunnel Report on February 1, 1999, with a public hearing jointly sponsored by Sound Transit and the City of Seattle was held on February 11, 1999. The Board identified a preferred alternative on February 25, 1999. The comment period for the Rainier Valley Tunnel report extended 45-days after the report was released (to March 18, 1999) to allow public comments to be submitted for inclusion in the Final EIS. Sound Transit staff have continued to attend SOVs public meetings and SOV representatives have participated in Sound Transit's ongoing planning, as well as in the City of Seattle's Station Area Planning.

Alternatives and Profiles in the Draft EIS and Public Response

The Draft EIS was published on December 4, 1998. A two-month comment period that extended to February 5, 1999, was provided. Five public hearings were held, including one in Rainier Valley. Although a majority of written comments and oral testimony at the hearing support the all-tunnel alternative, many members of Southeast Seattle expressed support for an at-grade alternative.

Community Outreach and Board Identification of the Preferred Alternative

Throughout 1998, while preparing the Draft EIS, Sound Transit worked extensively with the communities in Southeast Seattle. During this process, Sound Transit refined alternative alignments carried into the Draft EIS in developing the preferred alternative identified by the Board in February 1999:

- Beacon Hill and North Rainier Valley (Segment C): The southern Beacon Hill (Lander) tunnel proved to be even more advantageous than originally thought. The analysis of a deep tunnel station on Beacon Hill showed 4,100 projected daily boardings. The route would also serve a neighborhood with significant minority population that the original plan did not intend to serve. This alternative also largely avoids most of the community and business impacts of the other alternatives that followed Rainier Avenue in north Rainier Valley (north of McClellan Street).

- Mid and South Rainier Valley (Segment D): The preferred alternative leaves the Beacon Hill tunnel in an elevated structure that serves the McClellan station and then transitions to MLK Jr. Way S. at-grade in the median. The route continues along the median of MLK Jr. Way S. to the south end of Rainier Valley. The at-grade stations are included at Edmunds, Othello, and Henderson. At the request of the City of Seattle the Board added a station at Graham.
- Because the MLK Jr. Way S./Edmunds station is about a quarter-mile from the heart of the historic Columbia City business district, the Board added a pedestrian corridor connecting the station to the district. Edmunds is a flat, lightly traveled, residential street with traffic-calming planted circles at the intersections; the boulevard improvements will add street amenities that extend the look and feel of the business district to guide pedestrians to and from the light rail station.
- The Rainier Beach community expressed interest in creating a pedestrian/transit boulevard between Rainier Avenue and MLK Jr. Way S. along S. Henderson.
- The elevated alternative between McClellan and Graham in the median of MLK Jr. Way S. was not supported by most of the community because of the significant visual impacts and the reduced accessibility of the stations.
- The proposed alternatives along Rainier Avenue would acquire all the property on one side of Rainier and then transition at-grade to MLK Jr. Way S., or to a tunnel just before Columbia City with a station just west of Rainier in the commercial core. Some members of the community initially supported the tunnel alternative, feeling it provided opportunities to revitalize Rainier Avenue. After further analysis, however, it became clear that the light rail alignment to the west of Rainier would acquire many properties but not leave large enough parcels to support the desired redevelopment and it would remove important community resources.

Revised Preferred Alternative Alignment

In response to community concerns, Sound Transit has developed mitigation measures for the preferred alternative. For instance, the initial design options for the at-grade alternative along MLK Jr. Way S., in the Draft EIS, assumed either a 4-lane street with a 104-ft right-of-way between stations, or a 2-lane street within the existing 90-ft right-of-way between stations. The Board's identified preferred alternative directed that the right-of-way maintain the four travel lanes but be reduced to 93 ft "to the greatest extent possible so as to minimize takings and lessen neighborhood impacts."

In addition to this change, continuing engineering focused on minimizing property impacts by optimizing the alignment. The first step in this process identified and mapped all major community resources such as religious institutions, as well as other property users along the alignment. Instead of just following the centerline of the street, the alignment was carefully designed to move slightly to the east or west as necessary to reduce the total property acquisitions.

In addition to property impacts, a major community concern is traffic circulation on MLK Jr. Way S. The street is intersected or crossed by 54 streets, many entering from one side only at an angle. In addition, a continuous left-turn lane operates along most of the length of the street allowing access to and from both sides of the street not only to cross streets but to driveways as well. About half of the traffic on MLK Jr. Way S. travels through without stopping, speeds are high, and there are more than 300 accidents a year.

The alternative studied in the Draft EIS would have closed all but 14 of the cross streets, leaving the other 40 as right-in-right-out only. Responding to community concerns about circulation, the preferred alternative has been re-engineered to provide 19 fully signalized intersections (compared

to the 12 signalized intersections that exist today), as well as 9 new pedestrian-only crossings. For pedestrians, this provides 28 safe crossing opportunities.

Adoption of a $50 Million Community Development Fund For the preferred alternative

The Board has proposed a $50 million Community Development Fund, through local initiative, as part of the preferred alternative in Southeast Seattle. It is intended to support the opportunity provided by the light rail investment to enhance business and community vitality in this area. The Community Development Fund will "be available to mitigate any of the impacts of implementation and operation of light rail in the Southeast Seattle Link light rail corridor." Community advisory panels will be established to recommend to the Board where the money will go.

Community Reaction to the Preferred Alternative

The primary opposition to an at-grade light rail in the median of MLK Jr. Way S. has been expressed by SOV. The concerns SOV has expressed relate to: social equity (claiming that neighborhoods in the north are being served by a tunnel); safety (claiming that at-grade light rail is inherently unsafe); traffic circulation (claiming that loss of the continuous left-turn lane and limitation of many intersections to right-in, right-out will interfere with traffic and pose hazards); and gentrification and neighborhood character (claiming that the left-over parcels after light rail construction will support new development that speeds the gentrification of the city's most ethnically diverse affordable neighborhood).

Other community organizations continue to support the at-grade alignment. In many cases, these are the same groups that opposed a high-cost tunnel profile in 1991. These organizations , joined by new groups such as Rainier Beach and Holly Park neighborhood planning groups, see at-grade light rail as improving the safety of MLK Jr. Way S. and providing the opportunity to redevelop the street as a "Great Street." They have noted that at-grade stations are more accessible, provide a strong sense of personal safety because of their visibility, and will support economic development around the station areas.

The City of Seattle passed two resolutions endorsing an at-grade light rail alternative in the median of MLK Jr. Way S. The first resolution was passed in conjunction with the scoping for the Draft EIS, and the second resolution was passed prior to the Sound Transit Board's action identifying the preferred alternative.

Timeline for Consideration of Light Rail Alternatives and Profiles in Rainier Valley

The following chart provides a timeline reflecting the history of development and consideration of the preferred alternative for the Rainier Valley, as discussed above.

1960s	**Early Studies** – Assumed rail would serve the Rainier Valley
1985	**Multi-Corridor Project** – Rainier Valley, Duwamish, and West Seattle routes studied. Rail service to residential areas preferred, including Rainier Valley.
1991	**Regional Transit Project (RTP) high-capacity transit study** – Southeast routes re-evaluated, community support for routes to Rainier Valley, concerns over security, cost, community visibility raised regarding tunnel alternatives.
1992	**Joint Regional Policy Committee** – confirms selection of Southeast Seattle for rail route
1994	**RTA initial phase Study** – evaluates at-grade and tunnel routes in Southeast Seattle.
1995	**initial phase Proposal Fails** – included at-grade and elevated alternatives in Southeast Seattle, passed heavily in Seattle.
1996	**Sound Move Passes** – included at-grade and elevated alternatives in Southeast Seattle, over 60 percent support in Seattle.
1997	**Major Investment Study** – accepted by FTA and approved by Puget Sound Regional Council. Identified the light rail alignment and profile in Sound Move as the preferred transportation strategy under federal guidelines.
Nov 1997/Jan 1998	**Draft EIS Scoping Period** – at-grade and elevated profiles in Southeast Seattle; some public comments request that the tunnel alternative be studied.

Mar 1998	**Field Office in Rainier Valley** – Established in the heart of Columbia City for accessibility to the community.
May 1998	**Draft EIS Alternatives Adopted** – include three tunnel sections in North Rainier Valley and Beacon Hill, one tunnel section through Columbia City.
Oct/Nov 1998	**Draft EIS Public Workshops** – Save Our Valley requests consideration of an all-tunnel alternative and Board directs study to be prepared.
Dec 4, 1998-Feb 5, 1999	**Draft EIS Public Comment Period** – 60 day comment period with 5 public hearings.
Feb 1, 1999-Mar 18, 1999	**Rainier Valley Tunnel Report Published** – Includes 45 day public comment period and public hearing.
Feb 25, 1999	**Sound Transit Board Identifies Locally preferred alternative** – Includes at-grade alternative in Rainier Valley and tunnel under Beacon Hill. Supported by Seattle City Council.
Fall 1999	**Final EIS Issued** – Includes optimized at-grade alternative mitigating many impacts identified in the Draft EIS. Includes Updated Rainier Valley Tunnel Report and Environmental Justice Analysis.

Development and Application of Sound Transit's Tunnel Criteria

Electric light rail technology was chosen for the Central Link project because of its versatility to operate at-grade (on the surface), on elevated tracks, or in tunnels. Because of the varied conditions along the proposed corridor, the Central Link project would combine all three profiles. The at-grade operation is preferred where possible; however, each profile type has benefits and disadvantages. As discussed in the Final EIS, the profiles chosen in the preferred alternative provide services to the largest number of potential riders in the most cost-effective fashion. Like other transportation facilities such as roads and railroads, tunnels are used only where necessary. Public transit projects such as Central Link typically have some criteria to help them evaluate when tunneling is feasible by measuring the trade-offs among tunneling and profiles, such as at-grade operation or elevated operations. The criteria used by other light rail transit projects surveyed by Sound Transit are consistent with those used by Sound Transit for the Central Link project.

Sound Transit's Tunnel Criteria: Sound Transit developed its tunneling criteria as part of the process to identify alternatives to be considered in the EIS Scoping process. These criteria guided the selection and refinement of alternatives during and after development of the Draft EIS. The criteria are based on the physical limitations of light rail, and other factors considered in the industry. Tunnel construction is generally the most expensive method of building a light rail line and, as is the case for other transportation facilities such as roads or railroads, is typically used only in situations where the facts and circumstances make such a choice necessary and when sufficient funds exist. New tunneling will comprise only 30 percent of the profile length in the overall system.

For the Draft EIS and for selection of the preferred alternative, Sound Transit used the following criteria to help develop and evaluate alternative profiles for the alternative alignments:

At-grade operation: Light rail operating at-grade is the preferred profile. It is best suited in areas where the grade is 5 to 6 percent or less and there is adequate room within available street or off-street right-of-way. It works well with a moderate number of riders and low to moderate train frequencies when placed in a semi exclusive right-of-way.

The benefits of an at-grade profile include:

- easy access for passengers;
- flexibility to integrate the design of tracks and stations with community plans;
- opportunity to revitalize streets (landscaping, sidewalks, other improvements);
- potential support for sustainable economic redevelopment;
- opportunities to transform auto-oriented arterials into pedestrian- and transit-friendly streets;
- greater safety and security resulting from a visible and easily accessible system; and

- lowest construction costs

Elevated operation: Light rail on elevated structures works well where the system must be grade-separated to cross over geographic or physical barriers, accommodate higher train frequencies, and where existing street rights-of-way or other surface corridors are inadequate to fit at-grade trackway. Maximum allowable grades are 5 to 6 percent.

The benefits of an elevated profile include:

- reduced interference with street traffic operation;
- higher train speeds because tracks are separated from street traffic; and
- more riders served by allowing trains to run more often

Tunnel operation: Tunnels are used only where necessary. They are best suited to situations where slopes are steep (more than 5 to 6 percent), physical barriers must be crossed, right-of-way is inadequate for at-grade or elevated profiles, the density of homes and businesses is high, and/or where ridership and resulting train frequencies to serve it would be so high that street-level operations would be impractical.

The benefits of light rail in tunnels include:

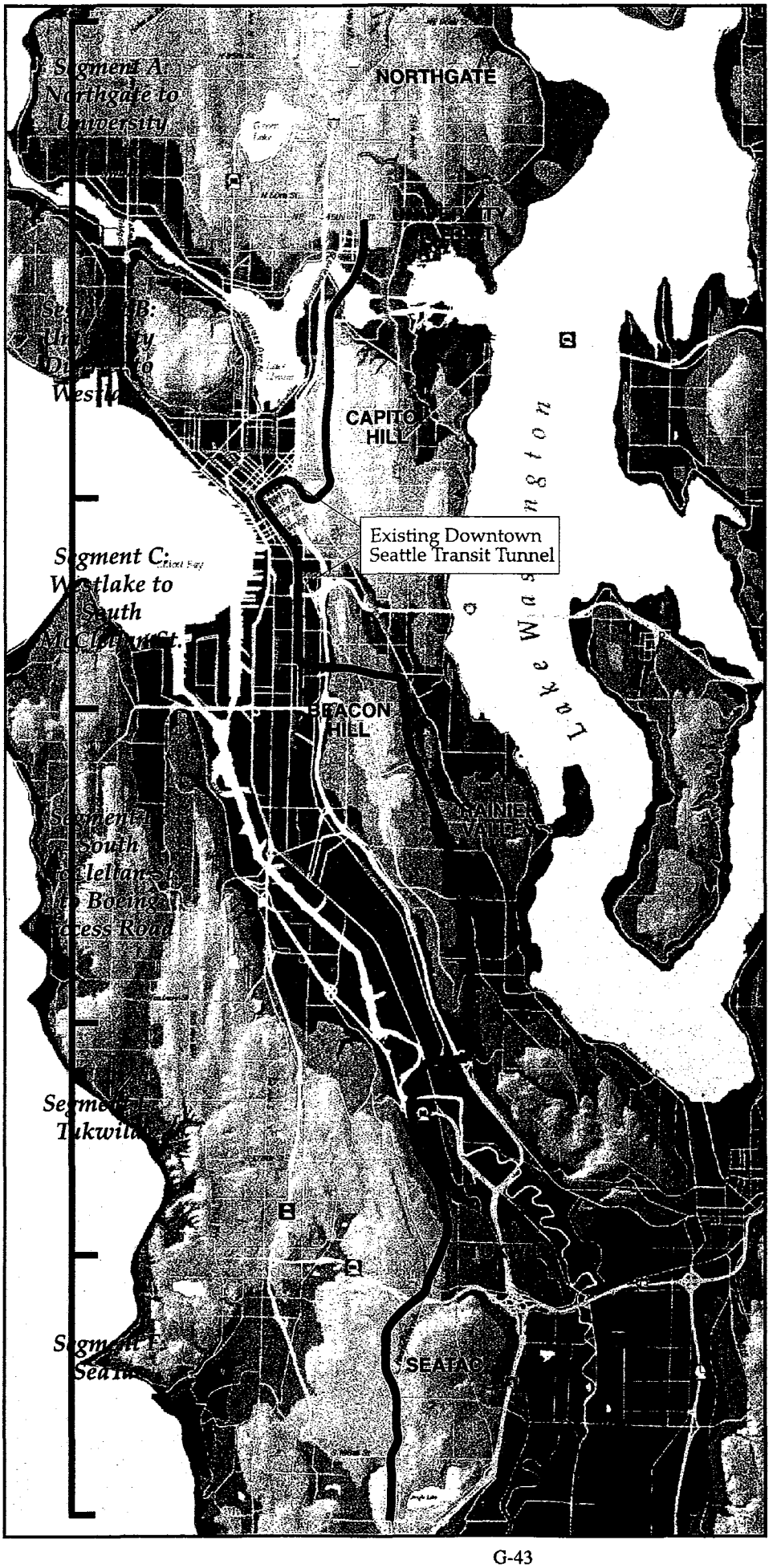
- travel through hills and under other natural barriers;
- higher train speeds because tracks are separated from street traffic; and
- more riders served by allowing trains to run more often

In summary, tunnels are constructed only when necessary and aboveground (either at-grade or elevated) profiles are infeasible. The factors that govern the choice of an appropriate operational profile throughout the Central Link project are (1) topography, (2) physical barriers, (3) available surface right-of-way, (4) train frequency, (5) density, and (6) cost.

Application of Sound Transit Tunnel Criteria to the preferred alternative

The 20-mile preferred alternative extends from the N.E. 45th Station to the S. 200th Station and consists of at-grade, elevated, and tunnel profile alignments. As discussed in the Final EIS, the profiles chosen in the preferred alternative best meet the criteria of providing services to the largest number of potential riders in the most cost-effective fashion, using tunneling only where necessary. New tunneling will comprise only 30 percent of the profile length in the overall system. Tunnel alignments are proposed in three geographic areas; the existing Downtown Seattle Transit Tunnel (DSTT), from the DSTT north to the N.E. 45th Station, and under Beacon Hill. At-grade segments are proposed in the Sodo industrial area, along MLK Jr. Way S. in Southeast Seattle, and along a segment of Tukwila International Boulevard. Elevated guideway is proposed between Southeast Seattle and the at-grade segment on Tukwila International Boulevard, and in the City of SeaTac. Figure G-13 indicates the location of tunnels for the preferred alternative. Figure G-14 shows the project topography, available right-of-way and relative passenger volumes between stations.

Tunnel segments have been proposed only where they are consistent with the tunnel criteria developed for this project. The DSTT is an existing tunnel currently used for bus transit through Seattle's central business district. It was constructed with the purpose of eventually being transformed for use by light rail, which is proposed by the Link project.



SOUNDTRANSIT

Figure G-13
Preferred Alternative Profile

Tunnel Profile

At-grade and Elevated Profile

N

0 1 2
MILES

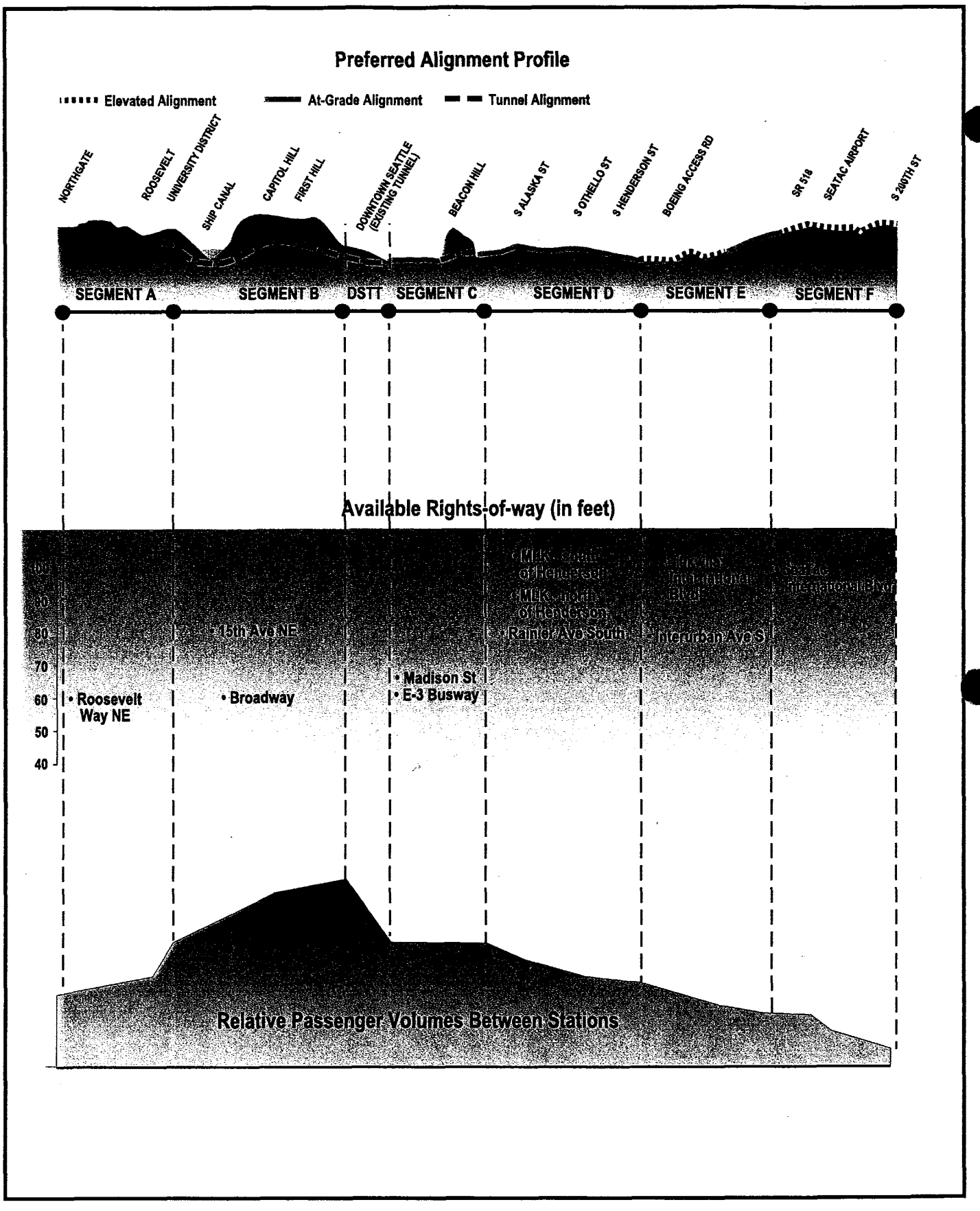


Figure G-14
Route Profile Characteristics

SOUNDTRANSIT

The segment from the DSTT north to the N.E. 45th Station is in a tunnel for a number of reasons. The DSTT ends at the base of Capitol Hill. From there it is not physically possible for a light rail train to climb the grade. Proceeding north from Capitol Hill, the project must cross Portage Bay. Geologic conditions under Portage Bay require a relatively deep tunnel beneath it. The hill north of Portage Bay up to the N.E. 45th Station climbs at about the same grade as the light rail and the route must remain in a tunnel to this station. The preferred route tunnels under Portage Bay to connect with a station at Pacific Street. This station serves the University of Washington and University Hospital, two of the highest ridership markets on the light rail system.

Even if the route were brought to the surface as quickly as physically possible, an at-grade or elevated alignment is not reasonable because Capitol Hill and the University District are two of the densest commercial areas in the city. No right-of-way is available other than along existing roadways. Further, road rights-of-way are only 65 ft wide and would need to be significantly widened, displacing all businesses on one side of the road. Once the light rail system was extended, the high train frequencies would not allow cross traffic. Although a bridge alternative is possible across Portage Bay, it would not provide a station near the University Hospital complex, or effective pedestrian connections to the main University campus. The bridge option also has significantly greater environmental impacts than a tunnel.

A tunnel under Beacon Hill is necessary because of the steep grade on both sides of the hill. Although some of the alternative routes in the Beacon Hill segment (Segment C) include tunnel sections, others follow different routes to Rainier Valley and do not. The advantages of the Beacon Hill tunnel alternative are that it provides a station in the heart of a high minority neighborhood, provides service to a market not otherwise served by other project alternatives, increases ridership by about 5,000 daily boardings locally and systemwide, and has minimal impacts to the Beacon Hill neighborhood. It also avoids significant impacts in the north end of Rainier Valley (another high minority and low income area), most directly serves the new baseball and planned football stadiums, provides a station (Lander) in a high industrial employment area, and provides the most direct connection to the proposed maintenance base sites within the minimum operable segment.

The at-grade alignments (E3 Busway, Lander Street, MLK Jr. Way S., Tukwila International Boulevard) are located within roadways that are essentially flat, have sufficient right-of-way to minimize property acquisition (90-ft for MLK Jr. Way S. and 100 ft for Tukwila International Boulevard), within low to moderate density areas, and where train frequencies would remain low enough to allow good cross traffic circulation. Elevated guideway has been used where major transportation corridors (I-5, SR 518, BNSF, and UP railroad tracks) and the Duwamish River need to be crossed, where there is limited right-of-way but sufficient to allow an elevated guideway while providing station connections to major ridership markets such as the airport.

Application of Sound Transit's Tunnel Criteria to the Rainier Valley Tunnel

A tunnel the length of Rainier Valley is not consistent with the tunnel criteria discussed above. First, the topography for most of Segment D does not warrant tunneling, as the grade is substantially less than 6 percent, except for a small hill south of Columbia City. Second, there are no major physical barriers south of I-90, such as a major freeway or water body. Third, there is substantial available surface right-of-way to permit at-grade construction along MLK Jr. Way S., which has a 90 ft wide right-of-way, and expands to 100 ft wide in the south end of the valley. Fourth, train frequency is proposed at five minute headways, and is planned to stay above four minutes after future system expansions. These headways are suitable to allow cross traffic flow. Fifth, the area is relatively low-density. Sixth, tunneling would add substantial cost without significant transportation benefits. Although, as discussed below, the Rainier Valley Tunnel would provide some incremental

benefits relating to mitigation of significant adverse displacement impacts, it would not eliminate their significance and would impose other construction and vibration impacts.

The Board-identified preferred alternative did not include a tunnel in the Rainier Valley. Nevertheless, the Rainier Valley Tunnel alternative was fully evaluated for significant impacts using the same methodology to evaluate all other alternatives. See Appendix Q.

Funding Constraints

If the overall Central Link financial picture changed dramatically, so that an additional $400 million—the estimated added cost of a tunnel in the Rainier Valley—could be readily obtained, Sound Transit would then face the difficult choice of how best to use that money for the Central Link project. For example, extending Segment A north to Northgate would cost nearly the same amount, but is projected to increase system ridership by approximately 20,000 persons. Thus, the system would be providing transit services to thousands of additional riders. Placing the entire Rainier Valley alignment in a tunnel adds only 100 riders in Rainier Valley compared to the preferred alternative, although it does add approximately 1,300 riders systemwide as riders from other areas benefit because of reduced travel times.[30] Before the 1996 vote on the Sound Move program by the voters in the three county district, the Sound Transit Board established the Northgate extension as the first priority for additional funds, if they become available. It would require a two-thirds vote of the 18-member board of Sound Transit to authorize a change in this prioritization.

The reality is, however, that the prospects for obtaining an additional $400 million for Central Link that could be used for a Rainier Valley tunnel are extremely remote at the present time. There are several reasons:

- First, because Sound Move is based on the principle of subarea equity, any new long-term debt issued to pay for a tunnel in the Rainier Valley would have to be repaid with taxes collected from the residents of the North King County subarea. Sound Transit's financial policies envision the use of long-term debt to bridge gaps between capital expenditures (uses of funds) and tax revenues and grants (sources of funds). In keeping with a policy of using debt conservatively, Sound Transit's debt service ratio is set at an average of 2.0 times net revenues over annual debt service costs, not to fall below 1.3 times in any single year. Because the North King subarea's debt coverage ratio is already at 1.3 times under the current financial plan, its initial phase debt capacity has been exhausted. Thus, no additional bonds can be issued in this subarea to raise funds for a tunnel in the Rainier Valley.
- Second, based on the principle of subarea equity, any additional tax revenues used to pay for a tunnel in the Rainier Valley would also have to come from the residents of the North King County subarea. Any increase in the statewide 0.4 percent sales and use tax and/or the 0.3 percent motor vehicle excise tax would first have to be approved by the voters of the entire Sound Transit district. Only that portion collected within the North King County subarea could be used to pay for a tunnel in Rainier Valley. It appears extremely unlikely that voters would approve the necessary increase. All of North King's initial phase tax revenues under the current financial plan have already been programmed for capital expenditures.
- Third, light rail is not projected to start operating until the end of 2006 and projected rail fare revenues will be fully used to help defray the operation and maintenance of the system, leaving no fare revenues available for additional capital costs of construction. (Fare revenues are projected to cover slightly more than half of the operation and maintenance costs for the system.).

[30] Ridership comparisons are based on 2010 projections in Rainier Valley would not experience reduced travel times from the tunnel compared to the preferred alternative because the shorter on-vehicle time is balanced by longer station access times.

- Fourth, although it is anticipated that will be significant federal grant assistance from the Federal Transit Administration (FTA) would be received for the Central Link project, the magnitude of that assistance remains uncertain. Since our current grant funding assumptions are aggressive by the standards of what similar agencies have received, there is no realistic prospect that FTA would provide an additional $400 million, or anything approaching that amount, for an additional tunnel at any point in the foreseeable future.

In sum, after careful study, funding and constructing the RVT Alternative currently appears to be inappropriate and not a reasonable alternative. The Rainier Valley tunnel would not be justified under the tunnel criteria developed for the Central Link project. Moreover, the funding needed for such a tunnel is highly unlikely to become available and, even if it became available, could not necessarily be used for this purpose.

Advantages of the Preferred Alternative

The preferred at-grade alternative in Rainier Valley would provide many features and benefits not provided by the RVT alternative. These include: substantial urban design and streetscape improvements, an additional station to serve the community, greater accessibility and security, a $50 million Transit-Oriented Community Investment Fund, greater potential to spur economic development along the light rail corridor, utility upgrades, and reduced construction and vibration impacts.

Streetscaping and Other Community Improvements

An improvement program for existing street rights-of-way is part of the at-grade alternative in Rainier Valley. These improvements generally include upgraded pedestrian amenities, such as wider sidewalks, signage, and crosswalks and right-of-way beautification features, such as street trees and other landscaping, and public art. The high cost of the tunnel alternative would not allow provision of these improvements. Specific improvements associated with the preferred alternative include the following:

- Bus access and pedestrian improvements will be made to the McClellan Station area. A new pedestrian connection from Rainier Avenue S. to the station entry will be designed to provide access from a bus stop. Improvements to S. Winthrop Street between Cheasty Boulevard and Rainier Avenue S. will be completed consistent with Olmstead's boulevard vision. These improvements may include street reconfiguration (creating a boulevard), new sidewalks and landscaping, and new street trees.
- MLK Jr. Way S. from Cheasty Boulevard to Boeing Access Road will have street improvements that include new street paving, sidewalks, crosswalks, landscaping/street trees and lighting. At station locations, amenities such as benches, trash receptacles, and artwork may be included. Landscaping will be added to some areas between vehicle travel lanes and the light rail trackway where traffic channelization occurs.
- Edmunds Street between MLK Jr. Way S. and Rainier Avenue S. will have pedestrian improvements to promote a walking connection from Columbia City to the Edmunds Station. These improvements will not include rebuilding the street, but will focus on the sidewalk/landscaping area and could include wider sidewalks, marked or textured crosswalks, new street trees, pedestrian lighting, trash receptacles, benches, and artwork.
- S. Henderson Street between MLK Jr. Way S. and Rainer Avenue S. has been designated a major connector from Rainier Beach community to the Henderson Station. Street improvements will be coordinated with the Metro Combined Sewer Overflow Project and could include either widening or reducing the street width, new curbs and gutters, new sidewalks and planting areas or street trees, marked or textured crosswalks, pedestrian lighting, trash receptacles, benches, and artwork.

- Improvements for bicycle access that are a part of the project include: separated bike trail construction parallel to the light rail line from S. Lander Street to Royal Brougham in Segment C; Chief Sealth trail crossing of MLK Jr. Way S. in the vicinity of Henderson Station and other parallel bicycle improvements in Southeast Seattle (as identified by the Sound Transit Board) for Segment D

Utility Upgrades

Reconstruction of MLK Jr. Way S. to accommodate light rail would also require upgrading the existing affected utilities. One specific upgrade along MLK Jr. Way S. Jr. Way S. would separate stormwater from discharge into a combined sewer overflow (CSO) system. This would benefit water quality in Lake Washington.

Accessibility and Security

At-grade is more accessible to transit riders because station platforms are at street level and entered via a street crosswalk (true for all the Rainier Valley stations except the elevated McClellan Station). Tunnel stations can only be reached from a stairway, escalator, or elevator, and therefore require additional travel time to reach the train platform. The higher visibility of the at-grade station platforms to the surrounding community also provides greater personal security than more isolated tunnel station platforms.

Community Investment Fund

As part of the preferred alternative, Sound Transit has proposed to establish a $50 million Transit Oriented Community Development Fund, through local initiative, to be available to mitigate the impacts of the implementation and operation of the preferred alternative in Southeast Seattle. This fund would be used to increase transit ridership, address project impacts, and to leverage other funding sources for transit-related and transit-supportive investments. It would not be available with a tunnel alternative because of its additional cost.

Environmental Impacts Of The Preferred Alternative And The RVT Alternative

Design improvements and committed mitigation measures have reduced all but two potential long term impacts of the preferred at-grade alternative to a level that is not significant. The main improvements and mitigation measures added since the Draft EIS are: a reduction of the necessary street right-of-way by about 11 ft (from 104 to 93 ft wide for the standard cross section), the addition of seven signalized intersections allowing traffic across MLK Jr. Way S., the addition of nine signalized pedestrian-only crossing locations, and commitment to fully mitigate noise and vibration impacts using standard mitigation.

Significant long-term impacts for the at-grade alternative includes only residential and business displacements. Property acquisitions from the at-grade alternative in Rainier Valley would total 84, with 46 residential displacements. This is reduced from 110 property acquisitions and 69 residential displacements for the at-grade alternative in the Draft EIS. The tunnel alternative has fewer acquisitions by about half, but would also have some residual significant vibration impacts (to 29 receptors) during operation because it would be shallow and pass under older wooden structures.

The preferred at-grade alternative also may have significant short-term construction impacts in some areas. These impacts may be greater for the high minority and low-income Rainier Valley area than for other segments of the preferred alternative. This is because construction impacts from at-grade profiles would affect a greater area than more localized construction required for tunnel station areas and portals. This is offset by the fact, however, that construction activity in tunnel areas would have a longer duration and be more intense. This would be particularly true in spoils removal and cut and cover construction zones. Overall construction of an RVT alternative would take approximately four years, with cut-and-cover construction areas of the tunnel substantially disrupted for about 2 years. Construction of at-grade light rail along the length of MLK Jr. Way S. would take

approximately one to two years at any one location with the most significant impacts taking about one year. The RVT alternative's construction intensity, time period and impacts would be greater in cut-and-cover sections at stations and portals, construction staging areas and along truck haul routes. Cut and cover construction would disrupt the heart of the Columbia City historic business district. Small businesses are particularly vulnerable to prolonged periods of construction activity, especially near cut and cover construction. If such construction impacts are sufficiently severe, such businesses could fail, be forced to relocate, or experience a substantial temporary decline in revenues.

Transportation Safety on MLK Jr. Way S.

Currently, vehicles on MLK Jr. Way S. are involved in nearly 300 accidents per year. Between 1994 and March 1999 there were 1,555 total accidents reported. This is a rate of 6.26 accidents per million vehicle miles which is slightly higher than for other similar arterials in Seattle. Replacing the center left turn lane with at-grade light rail in a new median, would likely eliminate accidents caused by vehicles turning left from the center lane, as well as head-on and mid-block U-turn accidents, and accidents involving vehicles crossing the street at non-signalized intersections. These types of accidents accounted for 233 of the total 1,555 accidents recorded, or about 44 per year that would be eliminated with at-grade light rail.

To assess the potential for future motor vehicle accidents on MLK Jr. Way S. with the at-grade light rail estimates were made of future accidents between motor vehicles and between motor vehicles and light rail vehicles. Most light rail/vehicle accidents occur when vehicles turn left across the tracks in front of the train.

Based on accident benchmarks from a survey of western urban light rail systems (Korve Engineering 1999), new light rail vehicle accidents with motor vehicles would be assumed to occur. However these benchmarks indicate that, with light rail on MLK Jr. Way S., there would be fewer overall accidents involving motor vehicles with the preferred alternative compared to a No-build Alternative. The tunnel alternative would not change traffic conditions on MLK Jr. Way S. and the at-grade alternative is estimated to have fewer total accidents than the tunnel alternative because mid-block left-turns would be eliminated, oncoming traffic would be separated by a median, and cross traffic could cross only at signalized intersections.

A review of accident records on MLK Jr. Way S. also indicated that 7 accidents per year between motor vehicles and pedestrians or cyclists occurred mid-block or at unsignalized crossings. The preferred alternative with a raised median and additional signal-protected pedestrian crossings would likely have prevented at least some of these collisions. In comparison, light rail vehicle accidents with pedestrians and bicyclists are expected to be low, based on the experience of other comparable light rail systems.

Capital Costs

The preferred alternative would cost approximately $196 million compared to about $604 million for the Rainier Valley tunnel. A deeper tunnel alternative was also considered for Rainier Valley to minimize the amount of cut and cover construction. This would add another $82 million to the costs. Even with a deeper tunnel, cut and cover construction would still be required at the Henderson Station because it is near a tunnel portal.

Advantages of the Rainier Valley Tunnel

Location and Numbers of Stations

One advantage of the tunnel alternative is that although it only provides four stations, one station is located in the heart of the Columbia City business district—where the preferred alternative station in this area is three blocks away. The preferred alternative would provide streetscape

improvements to create a connecting pedestrian corridor between the station and Columbia City. The tunnel alternative would also have about a 2.2-minute shorter travel time from one end of the valley to the other. This is partly a result of having one fewer station. This does not affect ridership in the Rainier Valley but does increase overall system ridership slightly because riders from other neighborhoods experience shorter travel times. The time-savings for Rainier Valley residents is partially offset by the longer access times to the tunnel stations. The tunnel would cost slightly less to operate and maintain than the at-grade preferred alternative due to faster travel times associated with operating on an exclusive right-of-way and with one less station.

Environmental impacts

Property acquisitions in Rainier Valley resulting from the at-grade preferred alternative would total 84, with 50 residential displacements. This is a reduced from 110 property acquisitions and 69 residential displacements for the at-grade alternative in the Draft EIS. The tunnel alternative would result in 42 acquisitions and 33 residential displacements.

Although mitigation measures have assured that many adverse effects evaluated for the Final EIS will not be considered significant, there would be some reductions in non-significant effects as a result of switching from the at-grade profile to the tunnel alternative. These reduced adverse effects include:

- The at-grade alternative would degrade operations at 5 more intersection approaches and require right-in/right-out movements at 34 more intersections than the tunnel alternative.
- The at-grade alternative would remove 3 on-street and 232 off-street compared to 15 on-street parking spaces and 20 off-street for the tunnel alternative.
- The preferred at-grade alternative would cause medium public service delays compared to low for the tunnel alternative.

Economic Development Benefits

As described in Section G-5, it has been shown that in jurisdictions where local government and community groups provide favorable zoning, financing incentives, strong real estate markets, and when there is a strong general economy, light rail can increase the amount of development occurring close to (typically within one-quarter mile) of transit stations. When successful, the benefits of transit-oriented economic development can include improved mobility, access and environmental conditions within communities; increased affordable housing; increased income to transit agencies; more efficient urban form; and urban redevelopment.

Experiences of other light rail lines in other cities indicate that the light rail also can strengthen low-income and minority communities. One key component to this is the participation of the transit agency and local government in planning and financing. A second key is the meeting of urban design goals of station access, particularly clear and safe pedestrian walkways to and from the station. For example, in Dallas, Texas, light rail has served as a catalyst for redevelopment of an area with a substantial minority or low-income population. Businesses have sprung up along the rail alignment including banks and grocery stores. Improvements such as new sidewalks, better storm drains, street improvements, new streetlights and landscaping were provided, an existing Veterans' medical center received a substantial addition and a new community center, stores have upgraded their frontage, and a church attracted additional members. In such cases, the station has proved to be a catalyst that, when merged with careful station planning, design standards, creative financing methods, and community action has helped solidify and accelerate redevelopment in disadvantaged areas. Similar success stories exist in many other communities.

The preferred at-grade alternative, rather than the tunnel alternative, would include more of the features conducive to promoting economic development. Many of the factors necessary for successful economic development exist in Rainier Valley. The City of Seattle, supported by Sound

Transit, is actively engaging the community in a station area planning process to provide neighborhood plans, policies and zoning around stations conducive to transit-oriented development.

An immediate benefit of an at-grade, light rail system in Rainier Valley would be to provide positive visibility for the area. This will benefit Southeast Seattle in several ways. It will give riders who may have never otherwise come through the area, a picture of what Southeast Seattle is really like. Rather than relying on second hand information such as news reports, transit riders will have an opportunity to form their own opinions. Second, it will expose them to businesses in the area that they may have formerly been unaware of. This latter point seems to have been borne out in a report prepared for Tri-Met in Portland entitled, The Portland Business Experience: The Benefits and Impacts of Being Located Near the MAX Light Rail. This report concluded that, "The strongest benefits of MAX were attributed to increased business visibility, rather than to customers getting off the light rail and making purchases."

Another important feature of the at-grade alternative is the physical streetscape and urban design improvements along MLK Jr. Way S., Cheasty Boulevard, Edmunds, and Henderson streets. These improvements provide clear and safe pedestrian pathways to the stations while improving the aesthetic character of the area.

Finally, although not defined at this time, the $50 million Transit Oriented Community Investment Fund proposed as part of the preferred alternative would be used to increase ridership and address project impacts that would not otherwise be mitigated. The funds can be used to leverage local, state and federal dollars for transit-related and supportive investments. A community advisory panel will be established to set priorities and make recommendations to the Sound Transit Board for application of the fund. The Fund will be available to the community for physical and economic improvements to the Southeast Seattle corridor.

The RVT Alternative Does Not Provide A Reason To Reject The Preferred Alternative

Total property acquisitions from the RVT alternative would be about half those of the preferred at-grade alternative, and residential displacements for the RVT would be about two thirds of those for the at-grade alternative. Nevertheless, even under the RVT alternative, property acquisitions and displacements would remain statistically more significant for the minority and low-income populations of the Sound Transit District.

As discussed above, Sound Transit determined, based on its tunneling criteria, the RVT alternative is not a reasonable alternative under NEPA, and, in any event, funding does not exist to implement it. Based on the evaluation of the relative advantages and disadvantages of tunneling and the preferred at-grade alignment, Sound Transit also concluded that the at-grade alignment is preferred for the Rainier Valley. In particular, the comparative analysis demonstrates that the preferred alternative would provide significantly improved social and potential economic benefits and improved safety on MLK Jr. Way S. In addition, the RVT alternative would not eliminate residential and non-residential displacements and construction impacts that would result from providing service to the Rainier Valley. It also has greater construction impacts near stations and portals and has greater vibration impacts. Finally, the RVT alternative would involve costs of extraordinary magnitude. For these reasons, the RVT alternative would not preclude implementation of the preferred alternative under the terms of the DOT Order.

ATTACHMENT A

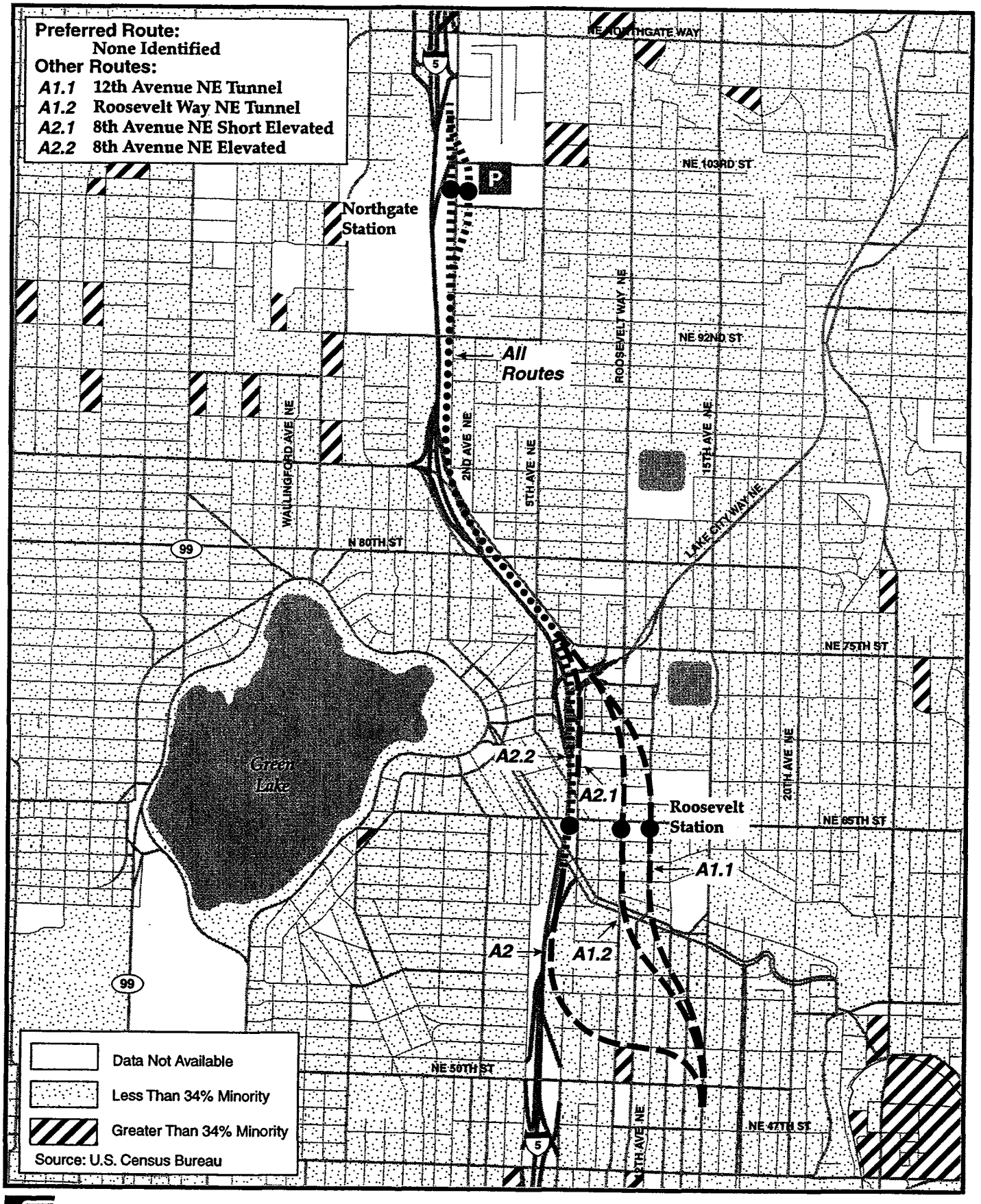
The attached maps identify the locations of minority and low-income populations along the light rail route alternatives.

Minority Populations

Figures G-1 through G-6 identify minority populations in the vicinity of the Segment Alternatives by Census Block. As depicted on Figures G-3 and G-4, most of the Census Blocks located in the vicinity of the Segment C and Segment D Segment Alternatives are above the 34 percent minority threshold and can be described as minority areas. This aggregation of minority Blocks spans parts of the Pioneer Square, International District, Central Area, Beacon Hill, Rainier at I-90, Columbia City, MLK at S. Holly, and Rainier Beach Neighborhoods. This is in contrast to the Census Blocks in the vicinity of Segments A, B, E, and F, (Figures G-1, G-2, G-5, and G-6). In these latter areas, few of the Blocks located in the vicinity of the route alternatives exceed the 34 percent minority threshold. While minority individuals may be present in many of these Census Blocks, their numbers are too few to identify entire Blocks as minority Blocks.

Low-Income Populations

Figures G-7 through G-12 identify low-income areas in the vicinity of the Segment Alternatives by Census Block Group. The largest aggregation of Block Groups which exceed the 21 percent low-income threshold is located south and east of downtown Seattle. This grouping is illustrated on Figure G-9 (Segment C) and spans parts of the Central Area, International District, and Pioneer Square Neighborhoods. Other aggregations of low-income Block Groups can be found in the University District and south of Lake Union on Figure G-8 (Segment B), and along MLK Jr. Way S. in the Rainier Valley on Figure G-10 (Segment D). Along the Segment Alternatives in Segments A, E, and F, (Figures G-7, G-11, and G-12) few of the Census Block Groups exceed the 21 percent poverty threshold. While low-income individuals may be present in many of these Block Groups, their numbers are too few to identify entire Block Groups as low-income Block Groups.



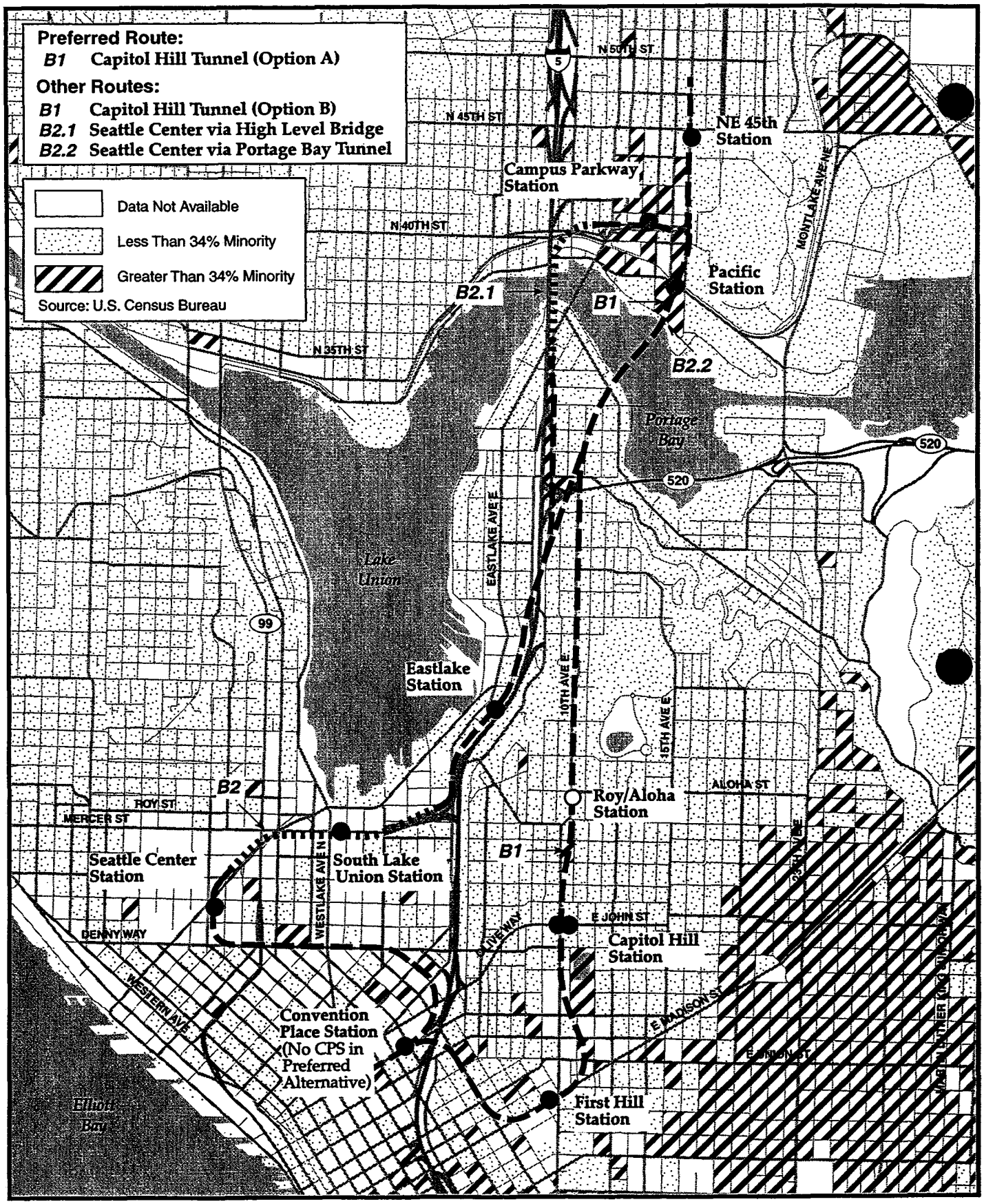
SOUNDTRANSIT

0 1,000 2,000
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
P Park & Ride

Figure G-1 Segment A: Minority Population



SOUNDTRANSIT

N

0 1,000 2,000
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
P Park & Ride

Figure G-2 Segment B: Minority Population

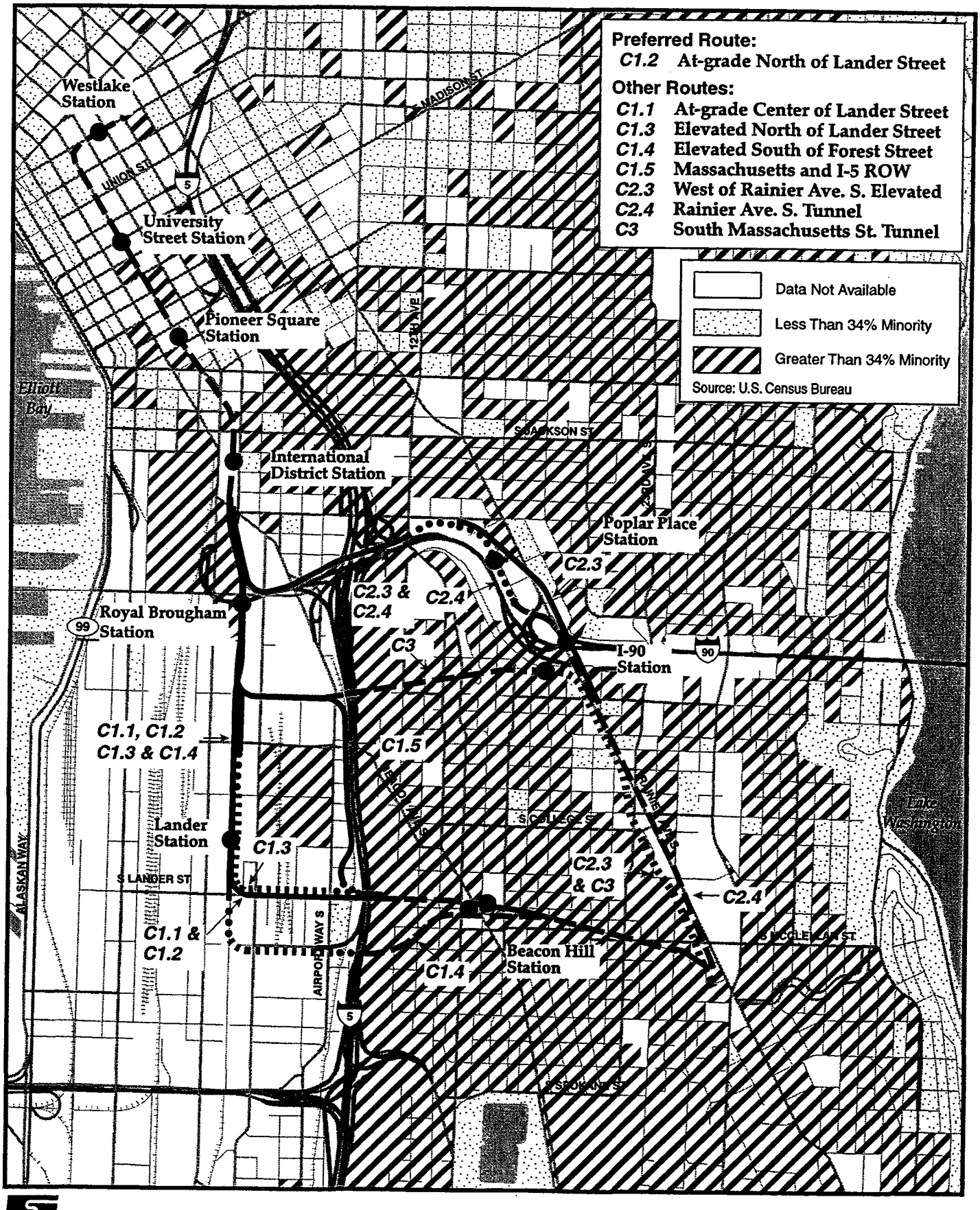


Figure G-3 Segment C: Minority Population

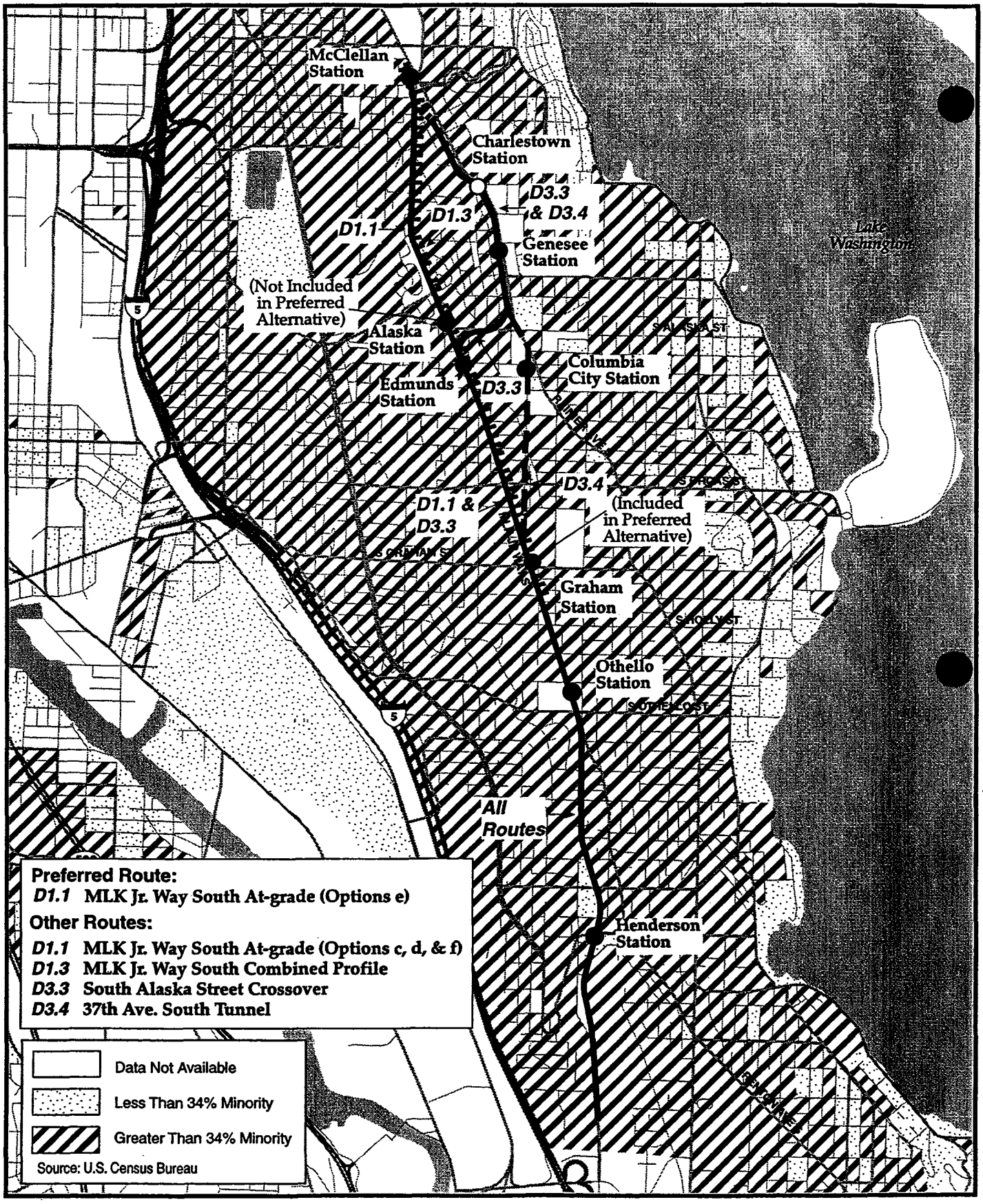
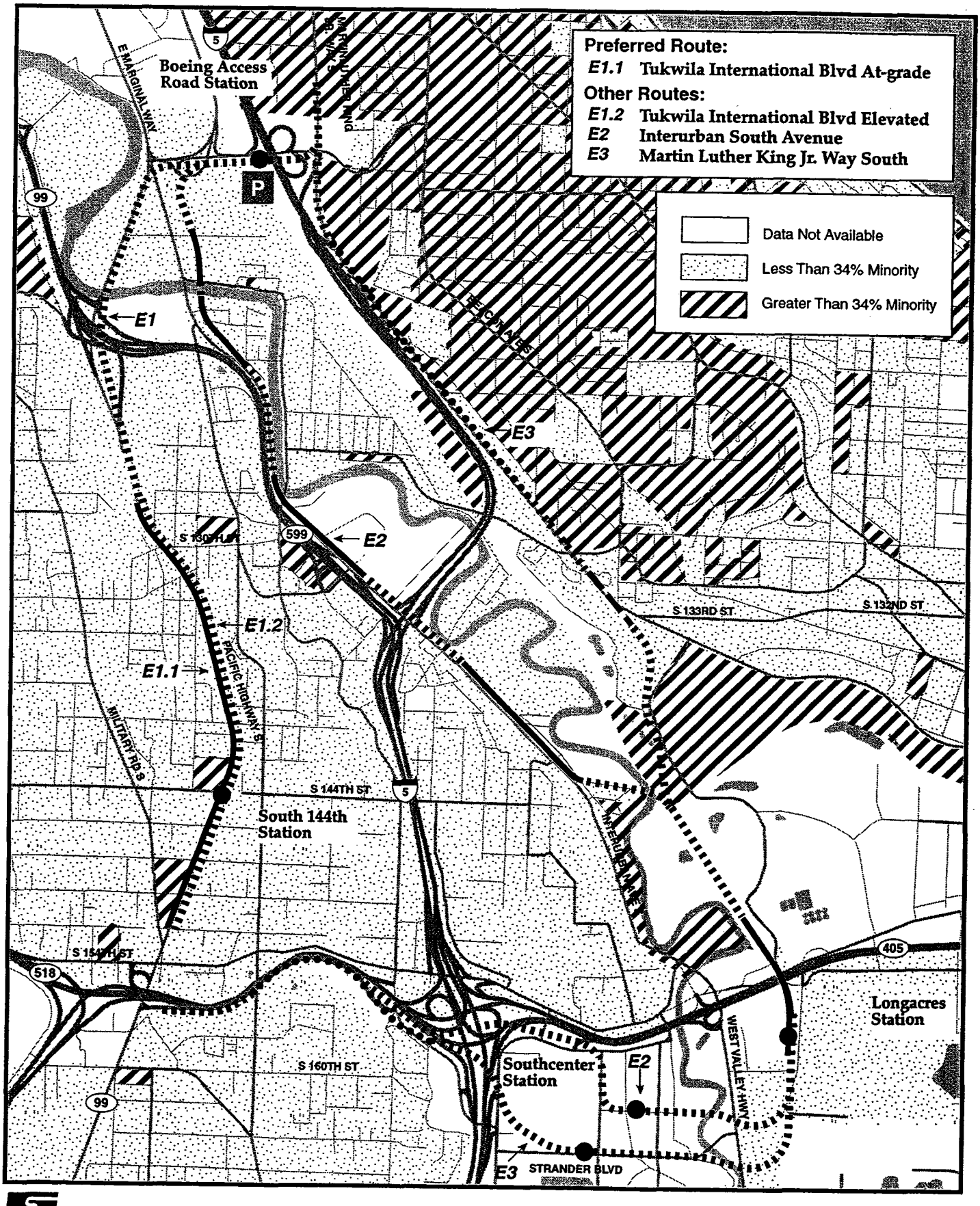


Figure G-4 Segment D: Minority Population



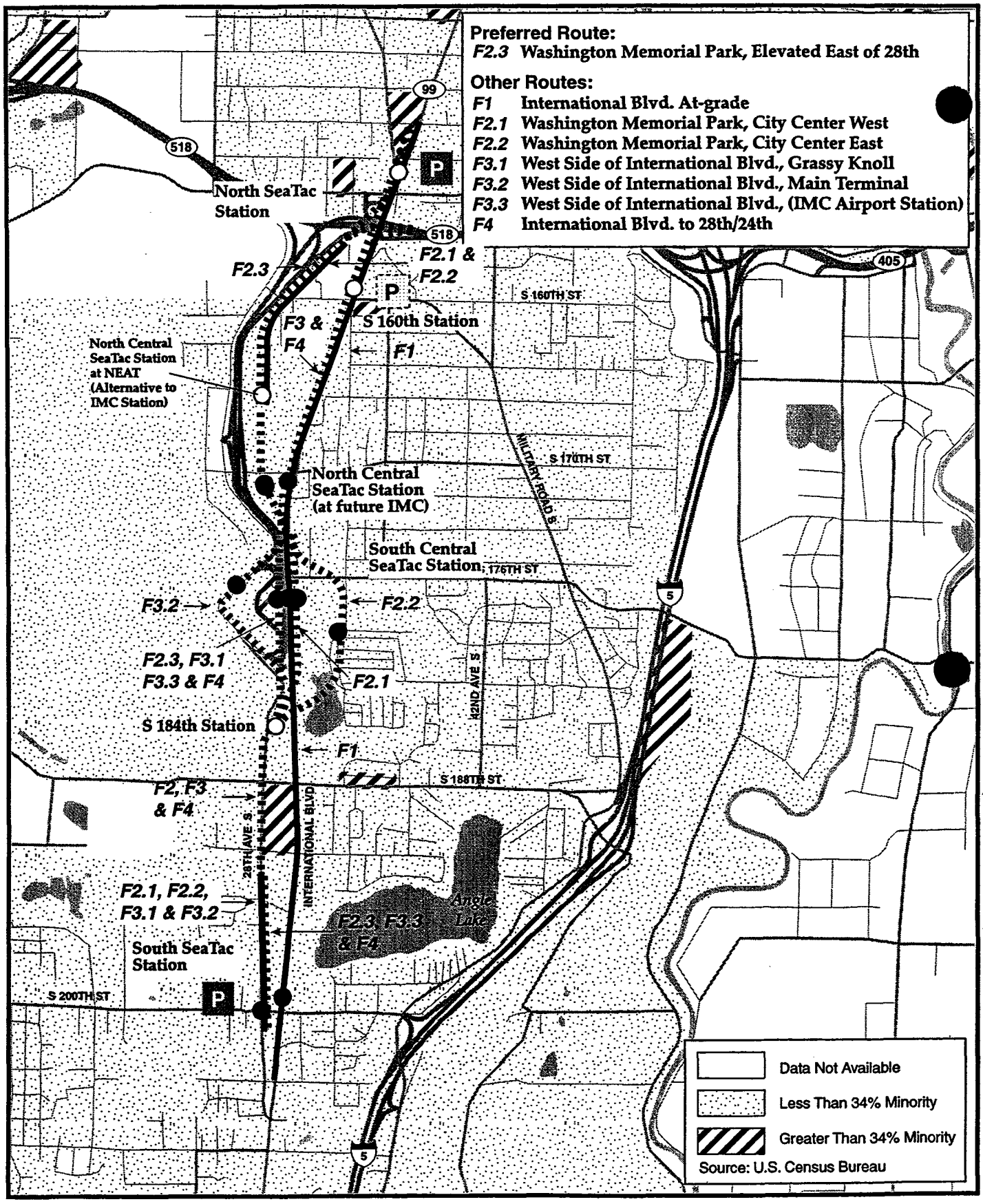
SOUNDTRANSIT

0 1,250 2,500
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
Park and Ride

Figure G-5 Segment E: Minority Population

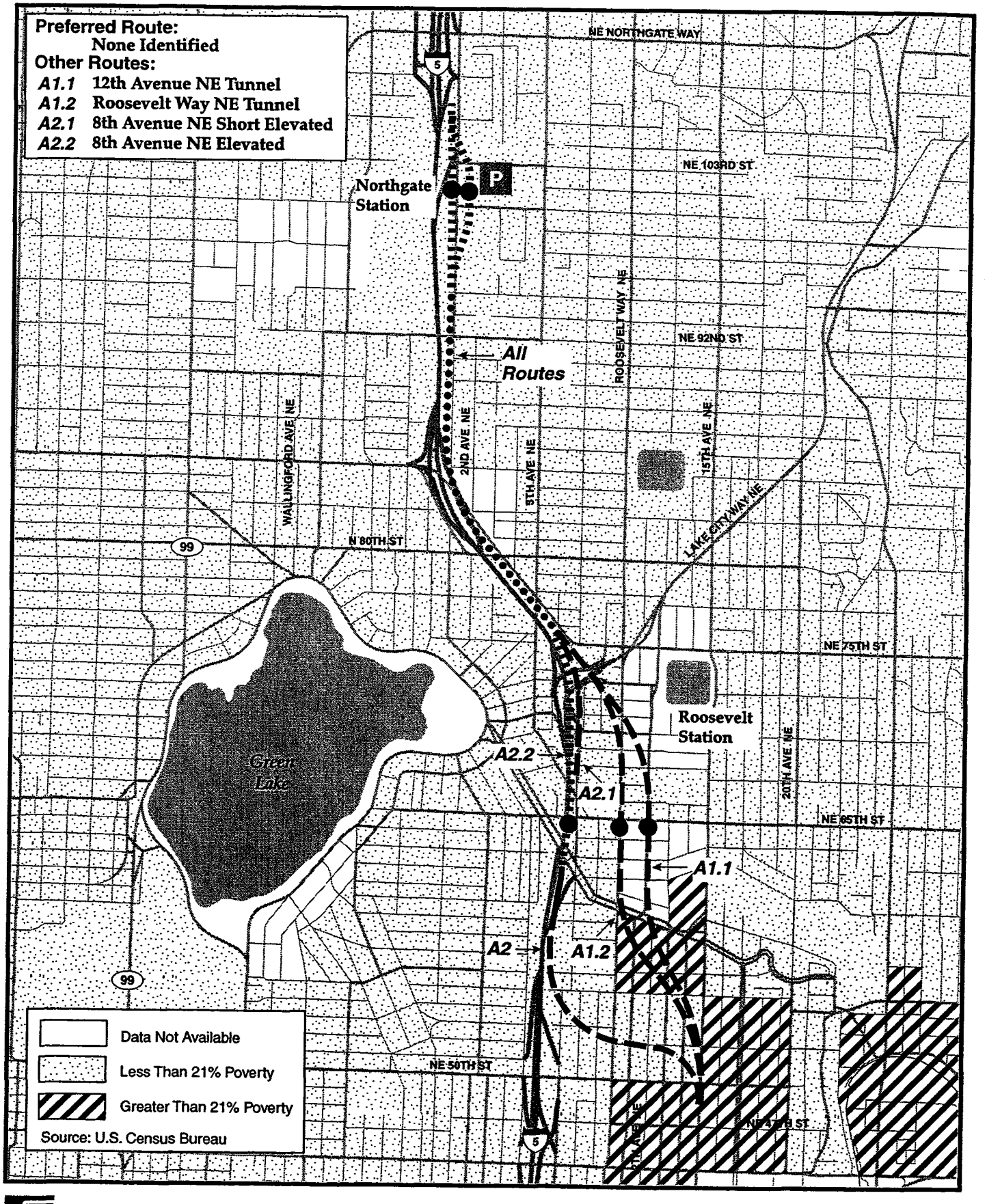


SOUNDTRANSIT

0 1,250 2,500
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill
Station
Potential Station
Optional Park and Ride Sites
Park and Ride

Figure G-6 Segment F: Minority Population



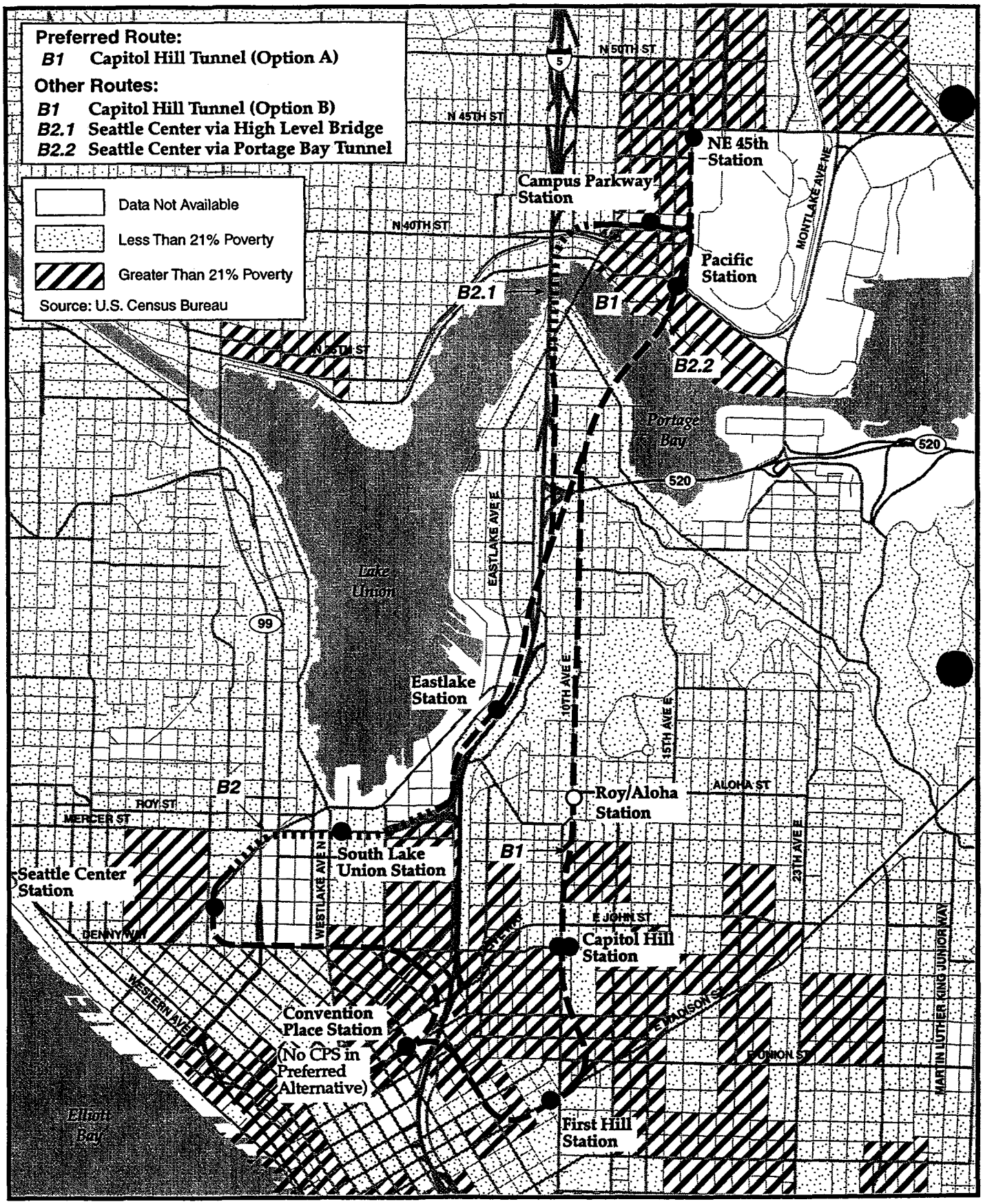
SOUNDTRANSIT

0 1,000 2,000
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
Park & Ride

Figure G-7 Segment A: Population in Poverty



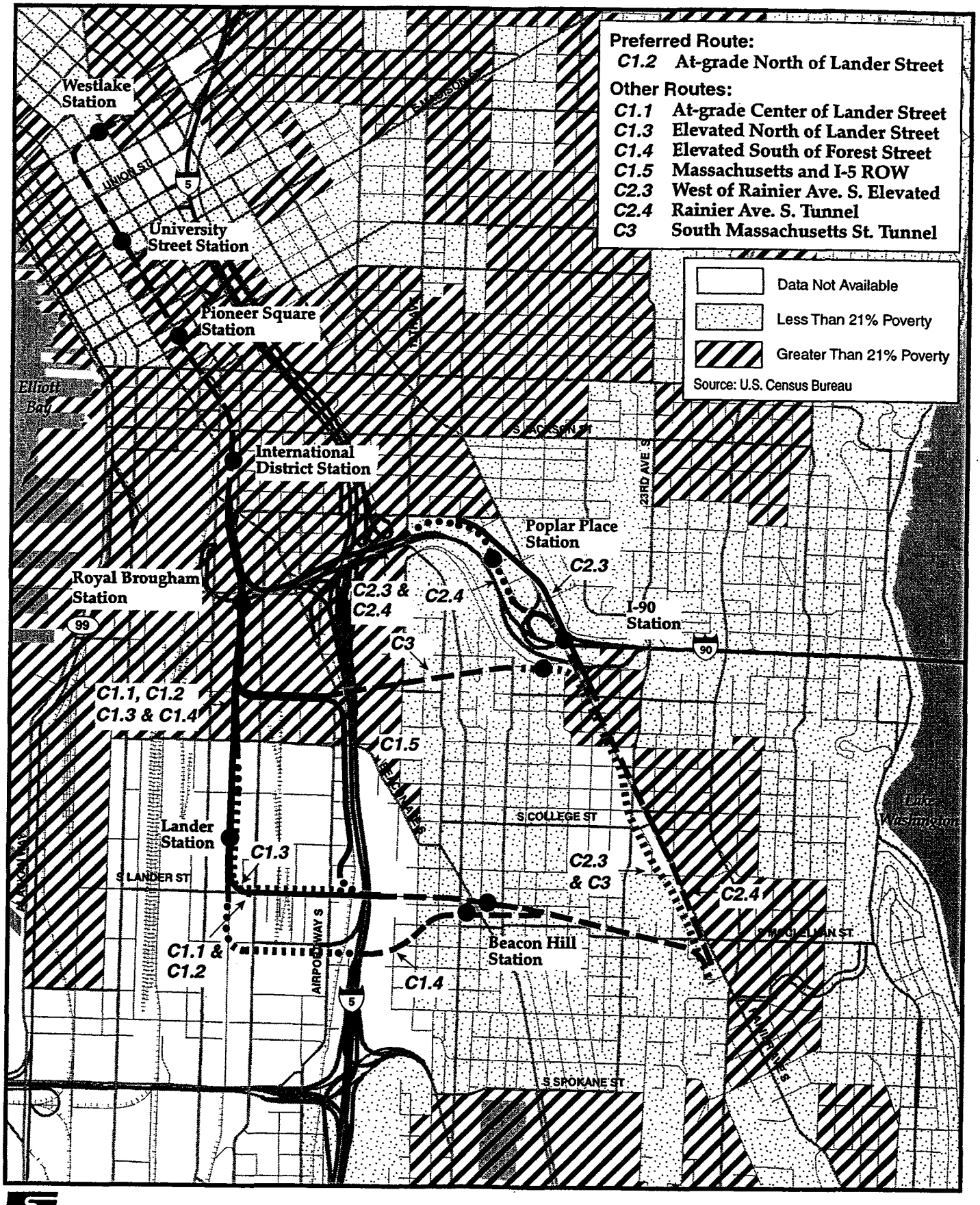
SOUNDTRANSIT

0 1,000 2,000
FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
P Park & Ride

Figure G-8 Segment B: Population in Poverty



SOUNDTRANSIT

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station

0 1,000 2,000
FEET

Figure G-9 Segment C: Population in Poverty

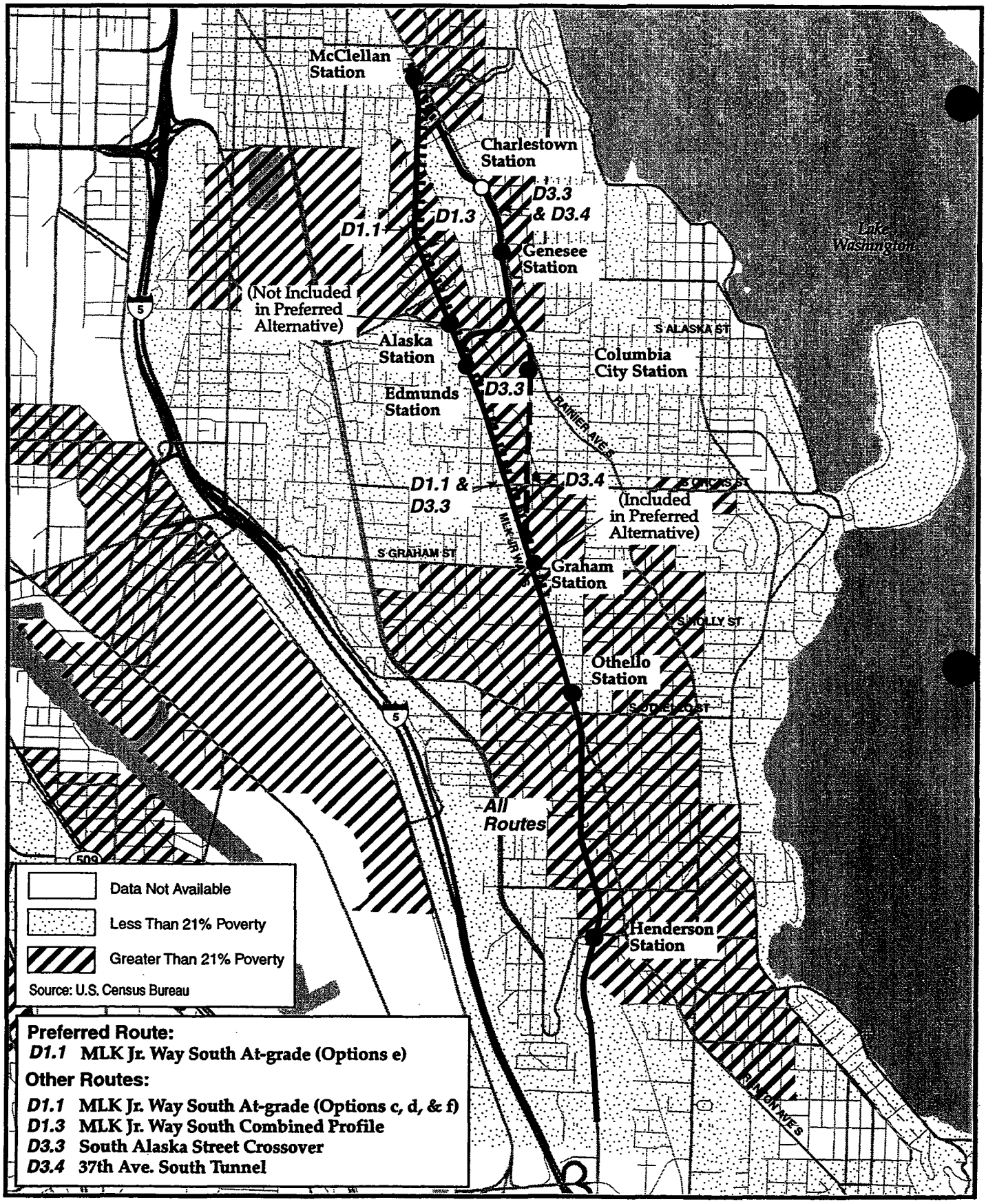
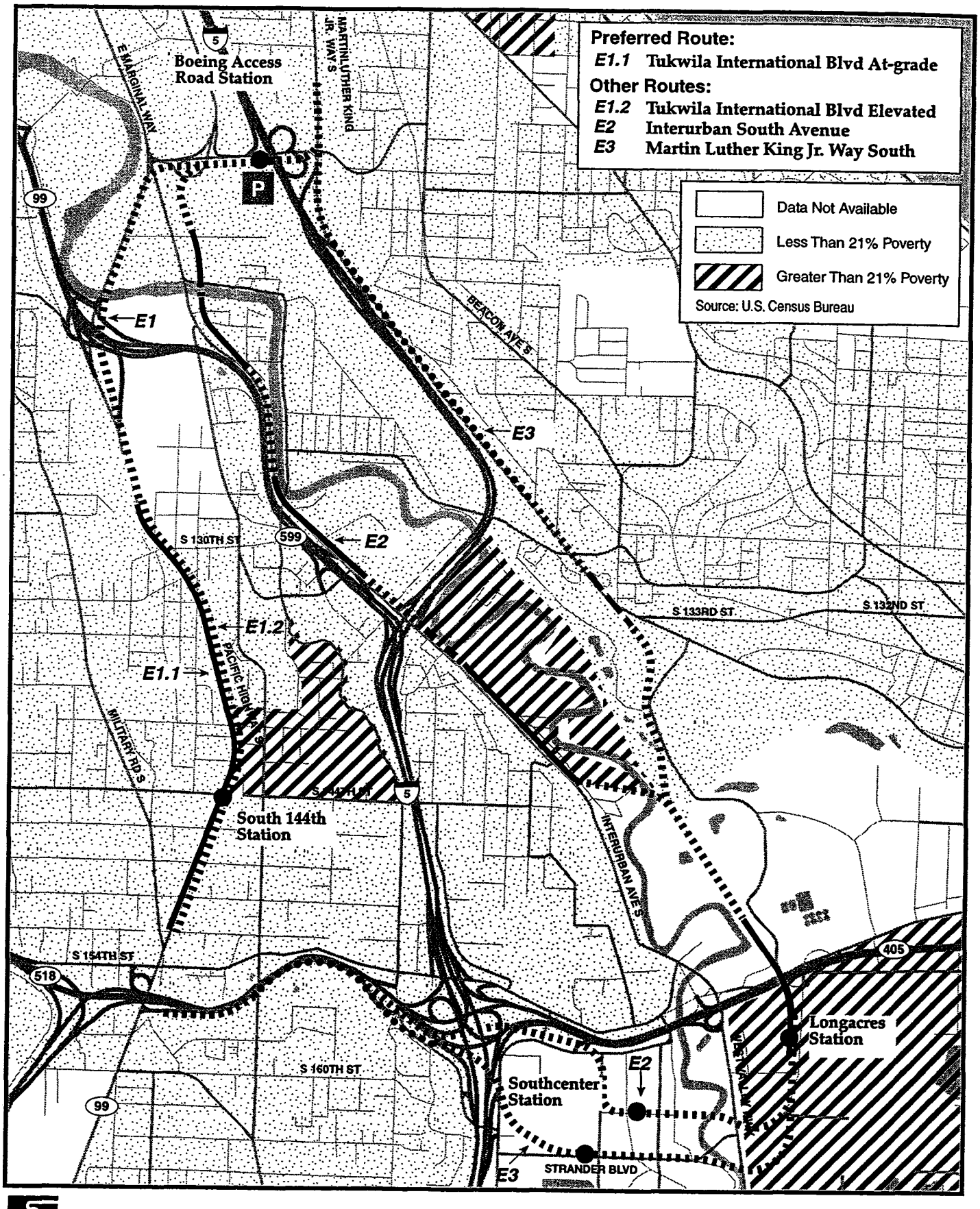


Figure G-10 Segment D: Population in Poverty



SOUNDTRANSIT

N

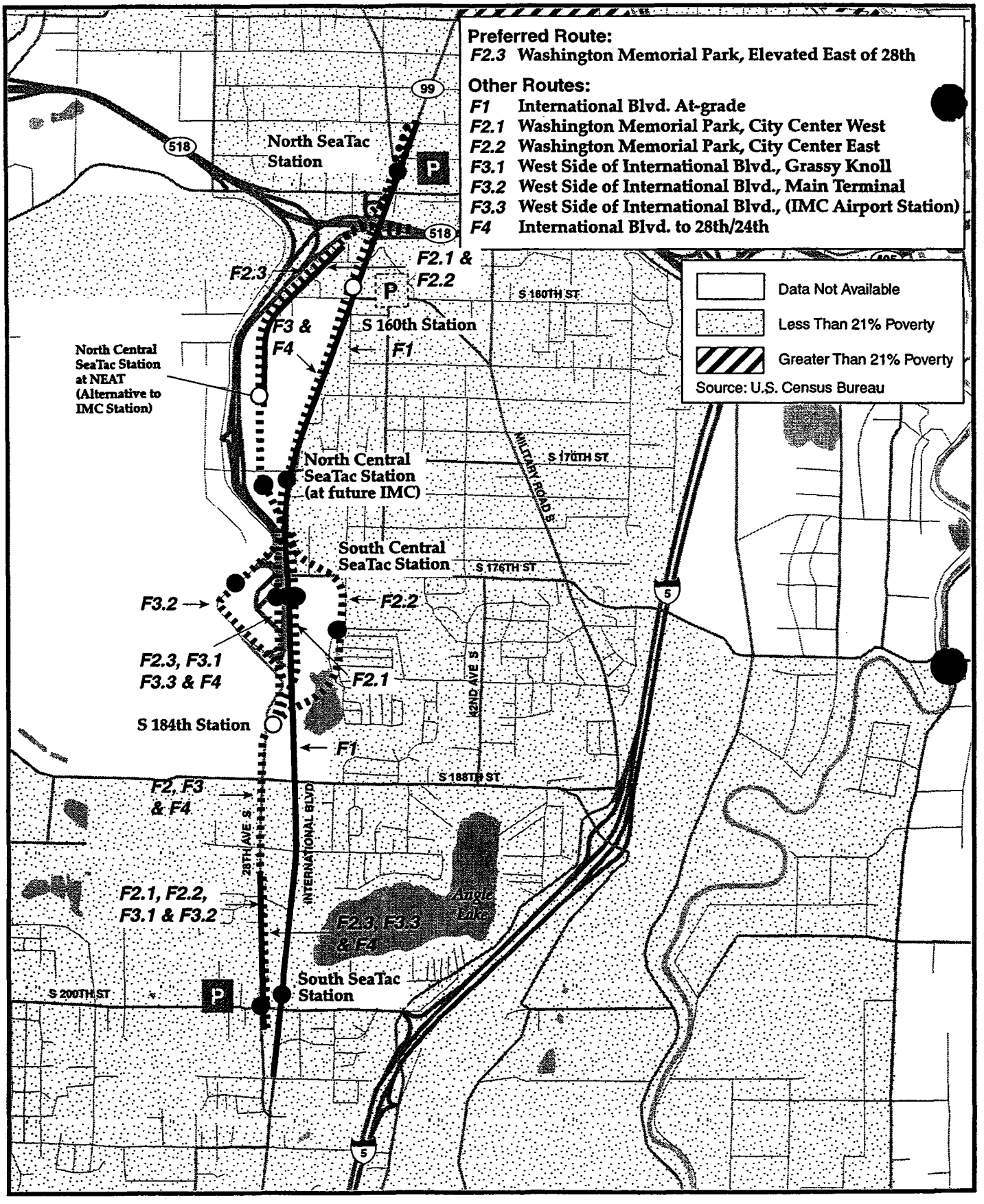
0 1,250 2,500

FEET

Tunnel
Elevated
At Grade
Retained Cut-Fill

Station
Potential Station
P Park and Ride

Figure G-11 Segment E: Population in Poverty



SOUNDTRANSIT

Tunnel
Elevated
At Grade
Retained Cut-Fill
Station
Potential Station
Optional Park and Ride Sites
Park and Ride

0 1,250 2,500
FEET

Figure G-12 Segment F: Population in Poverty

ATTACHMENT B

Table G-B-1. Distribution Of Residential Displacement Impacts Of Alternatives On The Minority And Low-Income Populations Of The Sound Transit District Boundaries[31]

Alternative Alignment	Total Displacement	Probable Minority Displacement	Minority Displacement (%)	Probable Low-Income Displacement	Low-Income Displacement (%)
Preferred Alternative	58	39	67	14	24
RVT alternative	45	26	58	10	22
Scenario 1	57	34	60	13	23
Scenario 3	87	73	84	23	26
MOS A	2	(nd)	(nd)	0	0
MOS B	48	37	77	13	27
MOS C	0	0	0	0	0

(nd) = No Data, Census data unavailable for this impacted population.

Table G-B-2. Distribution Of Visual Impacts Of Alternatives On The Minority And Low-Income Populations Of The Sound Transit District Boundaries[32]

Alternative Alignment	Total Population Impacted	Minority Population Impacted	Minority Impacted (%)	Low-Income Population Impacted	Low-Income Impacted (%)
Scenario 1	1,745	463	27	121	7
Scenario 3	687	292	43	60	9

Table G-B-3. Distribution Of Recreational Impacts Of Alternatives On The Minority And Low-Income Populations Of The Sound Transit District Boundaries[33]

Alternative Alignment	Total Population Impacted	Minority Population Impacted	Minority Impacted (%)	Low-Income Population Impacted	Low-Income Impacted (%)
Scenario 1	3,841	384	10	349	9
Scenario 3	8,318	1,453	17	769	9

[31] The methods used to assess the distribution of residential displacement impacts is described above in regard to the preferred alternative.

[32] The Visual Impact section of the Final EIS discusses visual impacts in detail. Determining specifically the make-up of this impacted population is challenging, as any one impact can potentially affect many individuals, and can be of varying intensity depending on the impacted individual's point of view. For this analysis, the impacted population was set at those individuals residing in and adjacent to a zone of significant impact. This was considered appropriate, as it was concluded that these individuals would experience the visual impact more frequently and for a longer duration than other individuals travelling through (e.g., driving through) the significant impact zone.

[33] The Parklands section of the Final EIS discusses recreational impacts in detail. The impacted population differs for each of these potentially significantly affected recreation facilities. Some of the facilities are regional resources and may be used by people who do not live in close proximity to them. Others are neighborhood parks, used primarily by those who can walk, bike, or drive to them in a short time. Ideally, to review recreation impacts for uneven distribution among minority/non-minority and low-income/non-low-income populations, the race and income characteristics of recreation facility users would have to be known. This information is not readily available, as municipal parks departments do not keep records on the race and income of park patrons. Nevertheless, to evaluate the impact of the proposed light rail system on recreation facilities, proximity to the facility was selected as a proxy. Census data for a ¼-mile radius surrounding individual facilities was used, recognizing that this may unfairly exclude park users travelling longer distances to use a regional facility. No sensitivity analysis was performed to determine whether minority or low-income use of recreation facilities would vary dramatically if users were evaluated using a larger radius or some other measure. To avoid a potential "double counting" problem, moreover, the analysis excludes those recreation facilities that were determined to be adversely impacted due to visual effects (i.e., Rainbow Point Park).

Table G-B-4. Distribution Of Noise And Vibration Impacts Of Alternatives On The Minority And Low-Income Populations Of The Sound Transit District Boundaries[34]

Alternative Alignment	Total Population	Minority Population	Minority Impacted (%)	Low-Income Population	Low-Income Impacted (%)
Scenario 3	353	328	93	105	30
RVT alternative	1,076	750	70	258	24

Table G-B-5. Distribution Of Residential Displacement Impacts Of The Preferred Alternative On The Minority And Low-Income Populations Of The Sound Transit District Boundaries, By Segment Area[35]

Segment Alternative	Total Displacement	Probable Minority Displacement	Minority Displacement (%)	Probable Low-Income Displacement	Low-Income Displacement (%)
B1	0	0	0	0	0
C1.2	2	(nd)	(nd)	0	0
D1.1e	46	37	80	13	28
E1.1	8	2	25	1	13
F2.3	2	0	0	0	0
M1	0	0	0	0	0
TOTAL	58	39	67	14	24

(nd) = No Data, Census data unavailable for this impacted population.

[34] The Noise and Vibration section of the Final EIS discusses traffic noise and light rail vehicle noise and vibration impacts in detail. The Noise and Vibration section reports NEPA significant impact zones as impact polygons on maps of the project alternatives. To determine the race and income characteristics of the impacted population, these impact polygons were overlaid (using a GIS) on top of Census Block and Block Group maps. Race and income data for Census Blocks and Block Groups that intersected with impact polygons were then used to calculate the percentage minority and percentage low-income among the impacted population. This methodology has the potential to over-report the Total Population Impacted (i.e. the actual count), as underlying Census Blocks and Block Groups may be larger than the intersecting impact polygons, and there is no easy way to determine race or income characteristics for a portion of a Census Block or Block Group. However, the percentage minority or low-income in any one Census Block or Block Group is assumed to be the same across the entire Block or Block Group. Therefore, while the reported Total Population Impacted may be higher than the actual population count within the impact polygon, the calculated percentage minority or low-income would be the same as that of the actual population within the impact polygon. As the determination of whether impacts are significant is based on percentages rather than absolute numbers, this methodology was considered appropriate.

[35] The methods used to assess the distribution of residential displacement impacts is described above.

ATTACHMENT C

Table G-C-1. Distribution Of Access To Transit Benefits Of Alternatives For The Minority And Low-Income Populations Of The Sound Transit District Boundaries[36]

Scenario	Total Number of Stations	Total Population w/ Access	Minority Access	Low-Income Access*	Minority (%)	Low-Income* (%)
Preferred Alternative	21	137,102	55,486	23,443	41	20
Baseline**	20	171,376	62,988	26,924	37	19
Baseline with B2**	21	157,140	58,430	23,162	37	17
Baseline with C1	22	166,579	59,564	26,009	36	19
Baseline with E3**	20	163,341	61,644	25,913	38	19
Baseline with RV Tunnel**	20	171,376	62,988	26,924	37	19
MOS A	12	75,776	25,537	13,351	34	24
MOS B	14	82,239	44,687	18,787	54	26
MOS C	10	62,865	15,874	10,934	25	25

* Percentage calculated per non-college adjusted population totals.
** Totals include demographics of three or four stations not on the route due to cluster size, error is 3-7 percent. The number of clusters per route varies. The "RV Tunnel" is the Rainier Valley full-length tunnel.

Table G-C-2. Distribution Of Transit Travel Time Savings Benefits Of Alternatives For The Minority And Low-Income Populations Of The Sound Transit District Boundaries[37]

Scenario	Minority Travel Time Savings***	Low-Income Travel Time Savings***	Total Travel Time Savings***	Minority Savings (%)	Low-Income Savings* (%)
Preferred Alternative	1,294	860	3,373	38	25
Baseline**	1,380	930	4,141	33	22
Baseline with B2**	1,215	776	3,689	33	21
Baseline with C1	1,354	930	4,075	33	23
Baseline with E3**	1,399	934	4,160	34	22
Baseline with RV Tunnel**	1,407	937	4,176	34	22
MOS A	757	615	2,359	32	26
MOS B	886	520	1,884	47	28
MOS C	564	564	2,100	27	27

Note: The number of clusters per route varies. The "RV Tunnel" is the Rainier Valley full-length tunnel.
* Percentage calculated per non-college adjusted population totals.
** Totals include demographics of three or four stations not on the route due to cluster size, error is 3-7 percent.
*** Cumulative hours saved per PM peak period (3 hours) for travel to neighborhoods within close proximity of the stations comprising each scenario.

[36] The methods used to assess the distribution of access to transit benefits is described above for the preferred alternative.
[37] The methods used to assess the distribution of travel time savings benefits is described above for the preferred alternative.

Table G-C-3. Distribution Of Increased Job Access Benefits Of Alternatives For The Minority And Low-Income Populations Of The Sound Transit District Boundaries[38]

Scenario	Total Increased Jobs Accessible (jobs)	Minority Increased Job Access (million jobs*ppl)	Low-Income Increased Job Access (million jobs*ppl)	Total Increased Job Access (million jobs*ppl)	Percentage Increased Job Access (%)	Low-Income Increased Job Access (%)
Preferred Alternative	1,269,885	8,464	3,169	18,112	47	17
Baseline**	1,563,777	10,220	3,758	21,509	48	17
Baseline with B2**	1,041,092	9,418	3,333	19,670	48	17
Baseline with C1	1,452,364	9,096	3,412	20,356	45	17
Baseline with E3**	1,675,823	11,184	4,066	23,119	48	18
Baseline with RV Tunnel**	N/A	N/A	N/A	N/A	N/A	N/A
MOS A	311,794	1,798	758	4,569	39	17
MOS B	293,072	3,628	1,232	5,268	69	23
MOS C	247,558	949	651	3,703	26	18

Note: The number of clusters per route varies. The "RV Tunnel" is the Rainier Valley full-length tunnel in segment D, results not available because the transit travel time savings are not significantly different than the Baseline alternative so employment security data needed for the jobs access index were not separately evaluated.

* Percentage calculated per non-college adjusted population totals.

** Totals include demographics of three or four stations not on the route due to cluster size, error is 3-7 percent.

Table G-C-4. Distribution Of Access To Transit Benefits Of The Preferred Alternative On The Minority And Low-Income Populations Of The Sound Transit District Boundaries, By Segment Area[39]

Station Cluster Name	Total Provided Access	Minority Access	Minority (%)	Low-Income Access*	Low-Income* (%)
Segment B					
University District	23,014	4,844	21	1,865	17
Capitol/First Hill	22,930	5,348	23	4,349	23
Segment C					
Downtown/Pioneer Square	13,470	3,759	28	3,444	32
ID/Duwamish	3,451	1,923	56	1,276	43
I-90	4,797	3,424	71	915	20
Beacon Hill/McClellan	12,911	9,663	75	2,417	20
Segment D					
Rainier Valley	29,477	23,994	81	7,301	25
Segment E					
Boeing Access	2,925	1,560	53	250	9
Foster/Riverton Heights	12,259	2,124	17	1,294	11
Segment F					
Airport/City Center	8,063	1,109	14	652	8
South SeaTac	8,602	1,162	14	595	8

*Percentage calculated per non-college adjusted population totals.

[38] The methods used to assess the distribution of increased job access benefits is described above for the preferred alternative.

[39] The methods used to assess the distribution of access to transit benefits is described above for the preferred alternative.

Table G-C-5. Distribution Of Travel Time Savings Benefits Of The Preferred Alternative By Segment Area[40]

Station Cluster Name	No-build Alternative Average Travel Time*	Average Travel Time With Preferred Alternative*	Travel Time Savings	Savings Relative To No-build Alternative (%)
Segment B				
University District	46	37	9	20
Capitol Hill / First Hill	40	31	9	23
Segment C				
Downtown/Pioneer Square	41	36	5	12
International District/Duwamish	54	46	7	13
Beacon Hill / McClellan	50	33	17	35
Segment D				
Rainier Valley	58	40	18	31
Segment E				
Boeing Access	66	60	6	9
Foster/Riverton Heights	66	61	5	7
Segment F				
Airport/City Center	70	62	8	11
South SeaTac	61	55	6	10

* Average travel time for trips to the station cluster in the PM peak period (3 hours).

Table G-C-6. Distribution Of Increased Job Access Benefits Of The Preferred Alternative By Segment Area[41]

Station Cluster Name	No. of Jobs Accessible with No-build Alternative	No. of Jobs Accessible with preferred alternative	Increase due to the project (# jobs)	Increase Relative to No-build (%)	Total Population	Increased Job Access Overall (million jobs*ppl)
Segment B						
University District	421,174	518,299	97,125	23	23,014	2,235
Capitol Hill/ First Hill	461,345	549,126	87,781	19	22,930	2,013
Segment C						
Downtown/Pioneer Sq	548,631	629,138	80,507	15	13,470	1,084
ID/Duwamish	520,373	614,460	94,087	18	3,451	325
Beacon Hill/McClellan	369,411	535,303	165,892	45	12,911	2,142
Segment D						
Rainier Valley	344,150	539,674	195,524	57	29,477	5,763
Segment E						
Boeing Access	361,889	433,192	71,303	20	2,925	209
Foster/Riverton Hghts.	302,837	397,512	94,675	31	12,259	1,161
Segment F						
Airport/City Center	261,933	473,445	211,512	81	8,063	1,705
South SeaTac	166,659	338,138	171,479	103	8,602	1,475
Total all Areas*	3,758,402	5,028,287	1,269,885	34	137,102	18,112

* Number of job totals are greater than net existing jobs; some jobs are double-counted because they are newly accessible to people in more than one cluster.

[40] Because the methodology for assessing the distribution of travel time savings benefits assumed an even distribution of such savings within each cluster, any segment-area analysis of travel time savings based on clusters would only reflect the demographic composition of the cluster. Instead, this Table presents the results of the Sound Transit Ridership Model for each segment area, which provides a relative measure of how the benefits of the preferred alternative are apportioned to particular minority and low-income communities. This information can be evaluated in conjunction with the demographic composition of each segment area.

[41] Because the methods used to assess the distribution of increased job access benefits assumed an even distribution of such savings within each cluster, any segment-area analysis of increased job access based on clusters would only reflect the demographic composition of the cluster. Instead, this Table presents the results of the Sound Transit Ridership Model as applied to the Puget Sound Regional Council's Employment Security Department database and the population of each segment area, which provides a relative measure of how the benefits of the preferred alternative are apportioned to particular minority and low-income communities. This information can be evaluated in conjunction with the demographic composition of each segment area.

APPENDIX K
Conceptual Design Summary Table Route Alternatives and Station Options by Segment

Table K-1
Station Alternatives Summary by Segment (preferred alternative in bold/italics[1])

	Station	Route Alternative	Location	Configuration	Other
Segment A	Northgate	All Routes	A -- West of 1st Ave. N.E.	Elevated, center platform	1,300 space structure for park-and-ride, 24 space bicycle storage with 1,200 ft^2 expansion, 1st Ave. overpass, 1 off-street bus stop, 18 bus layover zones at existing transit center, 2 paratransit stops
			B -- East of 1st Ave. N.E.	Elevated, center platform	1,300 space structure for park-and-ride, 24 space bicycle storage with 1,200 ft^2 expansion, 1 off-street bus stop, 19 bus layover zones, 1 paratransit stop
			C -- East of 1st Ave. N.E.	Elevated, center platform	1,300 space structure for park-and-ride, 24 space bicycle storage with 1,200 ft^2 expansion, 1 off-street bus stop, 11-bus layover zones, 1 paratransit stop
	Roosevelt	A1.1	Under 12th N.E., south of N.E. 65th	Subway, side platform	20 space bicycle storage with 1,200 ft^2 expansion, 4 bus stops, 4-bus layover zones; 1 paratransit stop
		A1.2	Under Roosevelt Way, south of 65th	Subway, side platform	20 space bicycle storage with 1,200 ft^2 expansion, 4 bus stops, 4-bus layover zones; 1 paratransit stop
		A2.1/A2.2	Between 8th N.E. & I-5, south of N.E. 65th (8th Ave. Station)	Elevated, side platform	20 space bicycle storage with 1,200 ft^2 expansion, 4 bus stops, 4-bus layover zones; 1 paratransit stop
Segment B	N.E. 45th	B1.1/B2.1	A -- Beneath 15th Ave., south of 45th	shallow subway, center platform	48 space bicycle storage with 1,250 ft^2 expansion, 7 on-street bus stops, 1 paratransit stop
		B1.1/B2.2	***B – East of 15th Ave., south of 45th***	Deep subway, center platform	48 space bicycle storage with 1,250 ft^2 expansion, 7 on-street bus stops, 1 paratransit stop
		B1/B2.2	C – West of 15th Ave., south of 45th	Deep subway, center platform	48 space bicycle storage with 1,250 ft^2 expansion, 7 on-street bus stops, 1 paratransit stop
	Pacific	B1/B2.2	A – Beneath 15th Ave., south of Pacific	Subway, center platform	3000 ft^2 of bicycle storage, 4 to 5 bus stops, 11-bus layover zones, 2 paratransit stops
		B1.1/B2.2	***B -- West of 15th Ave., under Pacific***	Subway, center platform	3000 ft^2 of bicycle storage, 8 to 12 bus stops, 15 to 21-bus layover zones, 2 paratransit stops
	Campus Parkway	B2.1	Under Campus Parkway, under 12th & Roosevelt	Cut-and-cover side platform	48 space bicycle storage with 1,150 ft^2 expansion, 7 bus stops, 12 to 13-bus layover zones, 1 paratransit stop
	Roy/Aloha (potential)	B1	Roy-Aloha/10th Ave. East	Subway, center platform	20 space bicycle storage with 1,200 ft^2 expansion, 6 bus stops, 1-bus layover zone, 1 paratransit stop
	Capitol Hill	***B1***	A -- Howell-John/west side of Broadway E.	Deep subway, center platform	20 space bicycle storage with 760 ft^2 expansion, 8 bus stops, 2 paratransit stops
		B1	B -- Howell-John/under Broadway E.	Cut-and-cover subway, center platform	20 space bicycle storage with 760 ft^2 expansion, 8 bus stops, 2 paratransit stops
			C -- Howell-John/under Broadway E.	Cut-and-cover subway, center platform	20 space bicycle storage with 760 ft^2 expansion, 8 bus stops, 2 paratransit stops
			D -- Nagle Place	Cut-and-cover subway, center platform	20 space bicycle storage with 760 ft^2 expansion, 8 bus stops, 2 paratransit stops
	First Hill	B1	A -- Summit-Broadway/Madison	Subway, center platform	20 space bicycle storage with 1,000 ft^2 expansion, 4 bus stops, 2 paratransit stops
		B1	***B -- Summit-Broadway, north of Madison***	Subway, center platform	20 space bicycle storage with 1,000 ft^2 expansion, 4 bus stops, 2 paratransit stops

[1] As defined by ST Board in Motion on 2/25/99. M99-14

Table K-1 continued

	Station	Route Alternative	Location	Configuration	Other
Segment B continued	Eastlake	B2.1/2.2	Under E. Nelson Place, east of Eastlake	Subway, center platform	20 space bicycle storage with 950 ft^2 expansion, 2 bus stops, 1 paratransit stop
	South Lake Union	B2.1/2.2	Westlake-Terry, south of Mercer	Elevated, side platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1-bus layover zone, 1 paratransit stop
	Seattle Center	B2.1/2.2	South of Broad Street, east of 5th	Subway, center platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
	Convention Place	B1	7th to 9th Ave., under Pine St.	Subway, staggered side	With or without joint bus-rail operations, 4 on-street bus stops
		B2.1/B2.2	Between 9th and Boren St., Pine and Pike St.	Subway, side platform	With or without joint bus-rail operations, 4 on-street bus stops
Segment C	Westlake	All Routes	A -- New entrance at 515/519 Pine	Subway, side platform	No change in existing access points or facilities
		All Routes	B -- New entrance at 511 Pine	Subway, side platform	No change in existing access points or facilities
	University Street	All Routes	Existing Station	Subway, side platform	No change in existing access points or facilities
	Pioneer Square	All Routes	Existing Station	Subway, side platform	No change in existing access points or facilities
	International District	All Routes	Existing Station	Subway, side platform	No change in existing access points or facilities
	Royal Brougham	C1.1/C3	A -- E3 Busway at Royal Brougham, in median	At-grade, side platform	40 space bicycle storage with 750 ft^2 expansion, 2 bus stops
		C1.2/C1.3/C1.4/ C1.5	***B -- E3 Busway at Royal Brougham, Eastside***	At-grade, center platform	40 space bicycle storage with 750 ft^2 expansion, bus stops to be determined
	Lander	C1.1	A -- E3 Busway, in median	At-grade, side platform	No bicycle storage provided but potential for future 1,200 ft^2, 2 bus stops in shared right-of-way
		C1.2/C1.4	***B -- E3 Busway, Eastside***	At-grade, side platform	No bicycle storage provided but potential for future 1,200 ft^2, 2 bus stops in shared right-of-way
		C1.3	C -- E3 Busway, Eastside	Elevated, center platform	No bicycle storage provided but potential for future 1,200 ft^2, 2 bus stops in shared right-of-way
	Beacon Hill (potential)	C1.1/***C1.2***/C1.3/C1.5	A -- 15th, north of McClellan and east of 15th	Subway, center platform	20 space bicycle storage with 1,250 ft^2 expansion, 3 bus stops, 1 paratransit stop
		C1.4	B -- 15th and 16th, south of Lander	Subway, center platform	20 space bicycle storage with 1,250 ft^2 expansion, 3 bus stops, 1 paratransit stop
	Poplar Place	C2.4	Poplar Place	Retained cut, center platform	20 space bicycle storage with 1,200 ft^2 expansion, 2 bus stops, 1 paratransit stop
	I-90	C2.3	Under I-90 in Rainier Ave. South	At-grade, center platform	20 space bicycle storage with 1,200 ft^2 expansion, 2 bus stops, 1 paratransit stop
		C3	Vicinity of 17th Ave. S., west of Rainier Ave. S.	Elevated, center platform	20 space bicycle storage with 1,200 ft^2 expansion, 2 bus stops, 1 paratransit stop
Segment D	McClellan	D1.1c/D1.1d/D3.3	A -- South of McClellan, west of Rainier	At-grade, center platform	24 space bicycle storage with 1,200 ft^2 expansion, 1bus stop, 7 bus layover zones, 1 paratransit stop
		D1.1c/D1.1d/ ***D1.1e***/D1.1f/D1.3/D3.4	B -- South of McClellan, west of Rainier	Elevated, center platform	24 space bicycle storage with 1,200 ft^2 expansion, 1bus stop, 7 bus layover zones, 1 paratransit stop
		D1.1c/D1.1d/ ***D1.1e***/D1.1f/D1.3/D3.4	C -- South of McClellan, west of Rainier	Elevated, side platform	24 space bicycle storage with 1,200 ft^2 expansion, 1bus stop, 7 bus layover zones, 1 paratransit stop
	Charlestown (potential)	D3.3/D3.4	Between Charlestown and Andover, west of Rainier Ave. South	At-grade, center platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
	Genesee	D3.3	North of Genesee, west of Rainier	At-grade, center platform	20 space bicycle storage with 950 ft^2 expansion, 5 bus stops, 1 bus layover, 1 paratransit stop
	Edmunds	D3.3	South of Edmunds on MLK	At-grade, side platform	20 space bicycle storage with 1,500 ft^2 expansion, 4 bus stops, 1 paratransit

Table K-1 continued

	Station	Route Alternative	Location	Configuration	Other
Segment D continued		***D1.1e***/D1.1f	***North of Edmunds on MLK***	At-grade, side platform in median	20 space bicycle storage with 1,500 ft^2 expansion, 4 bus stops, 1 paratransit
	Columbia City	D3.4	Beneath 37th at Edmunds	Subway, center platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit
	Alaska	D1.1c/D1.1d	Alaska/MLK	At-grade, staggered	20 space bicycle storage with 950 ft^2 expansion, 5 to 6 bus stops, 1-bus layover zone, 1 paratransit
		D1.3	North of Alaska/MLK	Elevated, side platform	20 space bicycle storage with 950 ft^2 expansion, 5 to 6 bus stops, 1-bus layover zone, 1 paratransit
	Graham	D1.1c/D1.1d/D3.3	A -- Graham/MLK	At-grade, staggered platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
		D1.3	B -- Graham/MLK, north of intersection	Elevated, side platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
		D3.4	C -- Graham/MLK, south of intersection	Retained cut, side platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
		D1.1e/D1.1f	***D -- Graham/MLK, south of intersection***	At-grade, side platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
	Othello	***All Routes***	***Midway Othello/Myrtle on MLK***	At-grade, side platform	20 space bicycle storage with 950 ft^2 expansion, 4 bus stops, 1 paratransit stop
	Henderson	D1.3/D3.3/D3.4	A -- South of Henderson/MLK	At-grade, center platform	24 space bicycle storage with 450 ft^2 expansion, 4 to 6 bus stops, 6 to 9-bus layover zones, 1 paratransit stop
		D1.1	***B -- South of Henderson/MLK***	At-grade, center platform	24 space bicycle storage with 450 ft^2 expansion, 4 to 6 bus stops, 6 to 9-bus layover zones, 1 paratransit stop
Segment E	Boeing Access Road	***E1.1***/E1.2	***South of Boeing Access Road***	Elevated, side platform	300 stall park-and-ride, 20 space bicycle storage, 2 to 4 bus stops, 4 to 6-bus layover zones, 1 paratransit stop, Sounder commuter rail platform
	S. 144th	***E1.1***	***South of 144th/Pacific Hwy***	At-grade, side platform	20 space bicycle storage with 450 ft^2 expansion, 4 bus stops, 1 paratransit stop
		E1.2	South of 144th/Pacific Hwy	Elevated, side platform	Pedestrian overpass, 20 space bicycle storage with 450 ft^2 expansion, 4 bus stops, 1 paratransit stop
	Longacres	E2	Commuter rail station at Longacres Way	Elevated, center platform	Bicycle storage as built by Sounder, up to 3 bus stops, 2-bus layover zones, 1 paratransit stop, Sounder commuter rail platform
		E3	Commuter rail station at Longacres Way	Elevated, center platform	Bicycle storage as built by Sounder, up to 3 bus stops, 2-bus layover zones, 1 paratransit stop, Sounder commuter rail platform
	Southcenter	E2	A -- Baker Blvd.	Elevated, center platform	20 space bicycle storage with 400 ft^2 expansion, 2 to 3 bus stops, 6-bus layover zones, 1 paratransit stop
			B -- Baker Blvd.	Elevated, center platform	20 space bicycle storage with 400 ft^2 expansion, 2 bus stops, 1 paratransit stop
		E3	A -- Strander Blvd.	Elevated, center platform	20 space bicycle storage with 400 ft^2 expansion, 4 bus stops, 6-bus layover zones, 1 paratransit stop
			B -- Strander Blvd.	Elevated, center platform	20 space bicycle storage with 400 ft^2 expansion, 2 bus stops, 2-bus layover zones, 1 paratransit stop

Table K-1 continued

	Station	Route Alternative	Location	Configuration	Other
Segment F	North SeaTac	F1/F4 (with E1.1, potential)	A -- North of S. 154th on International Blvd.	At-grade, center platform	350 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 2-bus layover zones, 1 paratransit stop
		F3.3/F3.2/*F2.3* (with E1.1, potential on F3)	B -- 154th/International Blvd.	Elevated, side platform	670 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 1 paratransit stop
		F1 (with E1.2, potential)	C -- 160th/International Blvd.	At-grade, staggered	350 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 2-bus layover zones, 1 paratransit stop
		F3.2 (with E2/E3, potential)	D -- North of South 160th on International Blvd.	Elevated, center platform	350 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4-5 bus stops, 2-bus layover zones, 1 paratransit stop
		F1 (with E2/E3, potential	E -- South of South 160th on International Blvd.	At-grade, side platform	350 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 2-bus layover zones, 1 paratransit stop
		F2.3	F -- Park-and-ride at 154th, Northeast corner	Elevated, side platform	260 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 2-bus layover zones, 1 paratransit stop
		F2.3	G -- Park-and-ride at 154th, Northwest corner	Elevated, side platform	454 stall park-and-ride, 24 space bicycle storage with 900 ft² expansion, 4 bus stops, 2-bus layover zones, 1 paratransit stop
	North Central SeaTac	F1	A -- 170th/International Blvd.	At-grade, center platform	Pedestrian underpass, 20 space bicycle storage with 400 ft² expansion, 4 bus stops, 2 to 7 bus layover zones, 1 paratransit stop
		F3.1/F3.2/F3.3/F4	B -- 170th/International Blvd.	Elevated, center platform	20 space bicycle storage with 400 ft² expansion, 4 bus stops, 2 to 8-bus layover zones, 1 paratransit stop
		F2.1/F2.2/*F2.3*	C -- Intermodal Center (IMC) (Radisson Site)	Elevated, center platform	Bicycle storage space to be determined, 4 bus stops, 2 to 8-bus layover zones, paratransit stop(s) to be determined
		F2.3	D -- North End Airport Terminal (NEAT)	Elevated, side platform	Pedestrian overpass, connection to future terminal and airport's APM.
	South Central SeaTac	F3.2	A -- Above Main Terminal drives (Airport Station)	Elevated, center platform	Pedestrian overpass, 4 bus stops, pedestrian linkage to SeaTac
		F3.1	B -- Between Terminal & International Blvd. (Grassy Knoll)	Elevated, side platform	Pedestrian overpass, 20 space bicycle storage with 450 ft² 2 expansion, 4 bus stops, 1 paratransit stop, pedestrian linkage to SeaTac & Airport
		F1	C -- Median of International Blvd.	At-grade, center platform	Pedestrian underpass, 20 space bicycle storage with 450 ft² expansion, 5 bus stops, 1-bus layover zone, 1 paratransit stop, pedestrian linkage to airport
		F2.1	D -- East side of International Blvd. (City Center West)	Elevated, center platform	20 space bicycle storage with 450 ft² expansion, 5 bus stops, 1-bus layover zone, 1 paratransit, pedestrian linkage to airport
		F2.2	E -- Near 32nd Ave. (City Center East)	Elevated, side platform	20 space bicycle storage with 450 ft² expansion, bus stops to be determined, 1 paratransit stop, pedestrian linkage to airport
		F2.3 (potential)	F – At S. 184th, West side of International Blvd.	Elevated, side platform	20 space bicycle storage with 450 ft² expansion, 1 paratransit stop
	South SeaTac	F1	A – North of 200th on International Blvd.	At-grade, center platform	400 or 950 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 4 to 6 bus stops, 7 bus layover zones, 1 paratransit stop
		F2.1/F2.2/F3.1/F3.2	B – North of 200th on 28th Ave.	At-grade, center platform	400 or 850 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 4 to 6 bus stops, 7 bus layover zones, 1 paratransit stop
		F4	C -- Surface lot without Thrifty	Elevated, center platform	630 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 4 bus stops, 7 bus layover zones, 1 paratransit stop
			D -- Garage next to 28th/24th	Elevated, center platform	630 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 4 bus stops, 7 bus layover zones, 1 paratransit stop
		F2.3/F3.3	E -- Garage south of 200th, station south	Elevated, center platform	630 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 4 bus stops, 7 bus layover zones, 1 paratransit stop
		F2.3/F3.3	F -- Garage South of 200th, station North	Elevated, center platform	630 stall park-and-ride, 24 space bicycle storage with 450 ft² expansion, 1 bus stop, 9 bus layover zones, 1 paratransit stop

Note: The preferred alternative is indicated in italics.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX M.1
New Developments Included in No-build Alternative

Appendix M.1 New Developments Included in No-build Alternative

TRANSPORTATION SYSTEM CHANGES

The transportation projects and programs included in Puget Sound Regional Council's adopted Metropolitan Transportation Plan (MTP) are assumed to be completed by the 2020 horizon year for the Central Link Light Rail Project. The MTP includes extensive transportation network improvements such as completing an interconnected system of freeway and arterial HOV lanes, constructing missing links for network continuity, expanding transportation capacity to and between centers, widening major roadways where necessary, upgrading highway safety and efficiency, providing better arterial access control, and increasing auto ferry capacity across Puget Sound (PSRC 1999). These projects would add over 1,200 lane miles of new capacity to the metropolitan arterial roadway network. Selected major projects from the MTP are identified below by jurisdiction where they are located within the light rail study area. The following is not intended as a complete list, but rather a partial sample of extensive transportation network change:

Seattle

- Completion of I-5 HOV lanes within municipal boundaries, including direct access HOV ramps to/from the I-5 express lanes at N.E. 50th Street and SR 520.
- I-90 HOV lanes, conversion to 2-way operation and Mercer Island Station.
- D2 roadway closure to carpools (busway only).
- Modification of I-5/Mercer Street interchange
- Rechannelization of I-5 through downtown Seattle
- SR 519 Intermodal Access Project Phases I and II (grade separation of Royal Brougham Way and Atlantic Street reducing rail crossing-related congestion).
- A grade-separated pedestrian bridge along Royal Brougham Way, crossing Fourth Avenue S to Safeco Field (planned by King County).
- Spokane Street Reconstruction, I-5 to Harbor Island.
- SR 99 grade separation over UP/Harbor Island track and new ramp connections between SR 99 and East Marginal Way.

Tukwila/Renton

- Tukwila International Boulevard (formerly Pacific Highway S.) Revitalization Plan, Phases I and II. The proposed cross-section within a 102' right-of-way, includes a restricted median and left turn lanes, bus pullouts, continuous sidewalks, a traffic signal at S.148th Street, and three pedestrian-only signals near S.130th, S. 132nd, and S.142nd streets. Numerous retaining walls will be needed due to side slopes.
- A Major Investment Study (MIS) for the I-405 corridor, underway in 1999, may result in recommendations to add freeway capacity.
- A freeway-to-freeway HOV connection for the I-5/I-405/SR 518 interchange in the NW quadrant.
- The addition of HOV lanes to SR 518 (under study).
- Strander Boulevard extension to Oakesdale Road (Renton).
- Trans Valley Corridor project, 180th Street/SW 43rd Street/Carr Road corridor and SW 27th Street/Strander Boulevard corridor.

- SR 181 (West Valley Highway), widen to 7 lanes, I-405 to Strander Boulevard.
- New S.W. 16th Street and extension of S. 156th Street, providing access to Longacres Station.
- E. Marginal Way, Boeing Access Rd. to S. 112th St. – widen to three lanes.
- S. 144th Street, Tukwila International Blvd. to Military Rd. – widening.
- S. 134th Street, S. 133rd Street to 48th Ave. S. – widening.
- Southcenter Parkway, I-5 off ramp to S. 168th St. – safety and capacity improvements.
- 57th Ave. S., S. 180th St. to south City Limit – widening to four and five lanes.
- S. 180th St. at UP/BN railroad crossing – new separated grade crossing.

SeaTac/DesMoines

- SR 509 Extension, from terminus at S. 188th Street to connection with I-5 at S. 210th Street.
- SR 509/SR 518 interchange modifications
- The South Airport access extension from the airport terminal to S. 188th Street
- The 28th/24th Avenue roadway connecting S. 188th Street to S. 204th Street.
- New freeway system interchange, SR 509 extension to I-5
- International Boulevard Phase 3 (reconstruction)
- SeaTac North End Airport Terminal (NEAT), with associated north access roadways
- SeaTac Airport third runway
- Addition of 3,500 spaces to airport parking garage
- Conceptual Sea-Tac Airport Ground Transportation Center
- SR 99 reconstruction, S. 216th Street to SR 516 (widening to 7 lanes)

Transit Improvements (FTA Letters of No Prejudice)

- Lakewood-Everett Sounder commuter rail service by Sound Transit
- Regional Express bus service by Sound Transit and construction of new transit centers, park-and-ride lots and direct HOV ramps.
- King County Metro's purchase of 177 articulated transit coaches
- Tacoma Dome Intermodal Facility (Second parking garage by Pierce Transit)
- Tacoma Downtown Connector (Tacoma Dome to Downtown bus circulator)
- Pierce Transit's purchase of five transit coaches and replacement/expansion of vanpool fleet
- Personal Rapid Transit System in SeaTac's city center.

LAND USE CHANGES

The Puget Sound Regional Council's forecast land use for the years 2010 and 2020 was assumed for the study area. Examples of planned and permitted major developments near the proposed light rail project are listed below from north to south along the corridor. These developments are only part of the planned land use growth assumed by PSRC's 2010 and 2020 forecast:

- Northgate Mall Area:
  - Mall expansion north of N.E. 103rd Street: 300,000 ft^2 office/retail/restaurant uses, and 3,000 new parking spaces

- Mall expansion south of N.E. 103rd Street: 385,000 ft^2 office/retail/4,000-seat cinema, 216-room hotel, and 150-unit apartments

- University District:
  - New UW campus Master Plan and Final EIS (2001)
  - 200,000 ft^2 Law School Building at N.E. corner of N.E. 45th Street and 15th Avenue N.E.
  - 190,000 ft^2 Burke Museum Expansion and 400 to 600-space parking structure at S.E. corner of N.E. 45th Street and 15th Avenue N.E.
  - New Oceanography and Fisheries Buildings (under construction).
  - Seven planned buildings at Seattle University totaling 593,000 ft^2 and 1,015 parking spaces (MIMP).
- Capitol Hill:
  - Parking garage expansion at Seattle Central Community College 1 block west of Broadway and Learning Resource/Technology Center immediately north of the central campus building.
  - Seven planned buildings at Seattle University totaling 593,000 ft^2 and 1,015 parking spaces (MIMP)
  - 150,000 ft^2 Seattle University Law School Building with 600-space parking structure and 200 apartment units at Broadway/Madison
- First Hill
  - 113,000 ft^2 Benaroya Biomedical Research Facility at Virginia Mason with 279 parking spaces at Ninth Avenue/Seneca Street
  - 630,000 ft^2 medical buildings and 900 parking spaces at Virginia Mason (MIMP)
  - 1,900,000 ft^2 medical buildings and 2,450 parking spaces at Swedish Hospital (MIMP)
- Seattle Center:
  - Experience Music Project, 130,000 ft^2 museum/public gathering space with performance hall/cafe/classrooms at Fifth Avenue N./Thomas Streets
  - Pacific Science Center, 400-seat IMAX Theater, science displays, and classroom space
- Downtown Seattle:
  - 519,000 ft^2 Federal Courthouse with 200-space parking structure at Stewart Street/Seventh Avenue
  - 535,000 ft^2 office building with 55,000 ft^2 retail and 400-space parking at Olive Way/Seventh Avenue (2001)
  - Washington State Convention Center Expansion including 105,000 ft^2 exhibition space with 1,700 parking stalls, a 17-story 300,000 ft^2 office tower at the SE corner of Seventh Avenue and Pike Street, a 20-story 460-room hotel at Seventh Avenue and Pine Street, a 90,000 ft^2 Museum of History and Industry, and 45,000 ft^2 of retail space.
  - A 890,000 ft^2 office tower at Third Avenue/Madison Street (2001)
  - The 426-room Starwood Hotel and 150-seat restaurant at Fourth Avenue/Seneca Street (1999)
  - The 240,000 ft^2 office/residential Millenium Tower with offices, 40 apartment units, 10,000 ft^2 retail and 230 parking spaces at Second Avenue/Columbia Street (2000)
  - World Trade Center, 250,000 ft^2 office and 540-space parking structure at Alaskan Way across from Bell Harbor International Conference Center (1998)

- Union Station Redevelopment, 1.1 million ft^2 offices in 5 buildings including restoration of historic Union Station and 1,600-space parking structure at S. Jackson/Fourth Avenue S. (1998-2002)
- Restoration of historic 60,000 ft^2. King Street Station
- Vulcan Northwest 11-story 300,000 ft^2 office building south of Union Station on Fourth Avenue S.
- A 72,000-seat Seattle Seahawks Football/Soccer Stadium, 325,000 ft^2 exhibition center, and 2,000-space parking garage (2002)
- Approximately 1,290 apartment and condominium units, primarily near Pike Place Market and Beltown (1998-2000)
- Ryerson Base Plus Parking Expansion for 45 buses (2000).
- Central/Atlantic Base Expansion for 185 buses (2003-2009)
- Marriott Hotel 9-story 350-room hotel on Alaskan Way across from Bell Harbor International Conference Center.
- Fourth and Columbia Building, a 22-story 175,000 ft^2 office tower on the northwest corner of Fourth Avenue and Columbia Street
- Downtown Seattle Central Library on the site of the existing library.
- Seattle Aquarium Expansion, a renovation and expansion, tripling the size of the existing waterfront aquarium and reconfiguring the adjacent Waterfront Park.

• Renton
  - Boeing Campus Master Plan at Longacres

• Tukwila:
  - Family Fun Center, amusement park/restaurants/hotel at West Valley Highway and Grady Way
  - Pacific View Office Park on Tukwila International Boulevard
  - CSM Hotel – 130,000 ft^2, 210 rooms
  - Best Western Motel – adding 72 rooms, 72,000 ft^2, 15901 West Valley Highway
  - Segale Business Park – 312,000 ft^2 warehouse, 5801 Segale Park Dr. C

• SeaTac:
  - The 385-room Westin Hotel adjacent to Sea-Tac Airport
  - A 3,500 parking space, 3-floor addition to the 5-story airport parking garage, including exit toll plaza and offices above
  - A 200,000 ft^2 commercial/office/retail building and 3,000 stall parking garage behind Budget Car and Truck Rental at S. 178th St. and International Boulevard
  - New cooling towers for the airport terminal and main terminal seismic upgrade
  - Demolition and reconstruction of the central airport terminal and concourse A, adding an office tower and expanding retail shopping area
  - Construct a new airport control tower and enhance the underground airport transit system.
  - New Aeroground freight warehouse and a new airline hanger
  - SeaTac II Hotel, 173-unit Hawthorn Inn & Suites at 19600 International Boulevard
  - 167th Street Hotel, 160-unit Swiss Inns at 16720 International Boulevard
  - IAC North, a 3-building 260,000 ft^2 warehouse and office development at 18836 Eighth Avenue S. (southwest of the airport)

- Redevelopment of Tac-Sea Motel to hotel/commercial facility with 1,000 parking spaces
- Towne Center Apartments, 506 units at S. 186th Street and 36th Avenue S.
- Hilton Hotel, 4-story building with 399-rooms and conference center over a 2-story 499-space parking garage with restaurant, lounge, banquet and meeting facilities
- A 730,000 ft^2 commercial parking garage at Kilroy Office Center
- City Center Project
- An 800-stall surface parking development at Gateway North

This Final EIS does not specifically evaluate each of the preceding projects; however, the cumulative impact analysis considers these projects as well as projected regional population and employment growth and land use forecasts.

Sources: PSRC Metropolitan Transportation Plan, Adopted 6-year TIP and Regional View; Federal Transit Administration TRO-10, May 26, 1998; Cities of Seattle, Tukwila and SeaTac; and Guide to New Downtown Developments, Downtown Seattle Association, 1998 and 1999.

APPENDIX M.2
Central Link Operating Plan Summary

Appendix M.2 Link Operating Plan Summary

For the year 2010 forecasts, Operating Plan A, which includes peak headways of 4 minutes north and 8 minutes south of the International District Station and 8-minute off-peak headways, was assumed for all technical analysis. Subsequently, that plan was refined to more efficiently serve the forecasted demand. The new plan, Operating Plan B, includes peak headways of 5 minutes north and 10 minutes south of the Henderson Station and off-peak headways of 7.5 minutes north and 15 minutes south of the Henderson Station. Operating Plan B has been used for all 2020 forecasts and analysis, and is what Sound Transit expects to operate on opening day.

The operating plan used in the 2010 ridership modeling work has the following headways:

- Peak periods (6:00-8:30 A.M.; 3:30-6:00 P.M.): trains every 4 minutes between Northgate and International District. Between International District and SeaTac every other train would turn back north, producing an 8-minute service frequency south of International District Station.
- Midday and early evening: trains with 8 minute headways serving the entire line.
- Early morning (5:00 – 6:00 A.M.) and late evening (10:00 P.M. – 1:00 A.M.): trains with 10 minute headways serving the entire line.

The operating plan used in the 2020 ridership modeling work has the following headways:

- Peak periods (6:00-8:30 A.M.; 3:30-6:00 P.M.): 4-car trains every 5 minutes between Northgate and Henderson Station. Between Henderson Station and SeaTac every other train would turn back north, producing a 10-minute service frequency south of Henderson Station.
- Midday and early evening: 2-car trains with 7.5-minute headways north of Henderson Station and 15-minute headways south of Henderson.
- Early morning (5:00 – 6:00 A.M.) and late evening (10:00 P.M. – 1:00 A.M.): 2-car trains with 15 minute headways serving the entire line.

Table A2.1.2 lists the days and hours when each service pattern would operate. Service would be more specifically tailored to the transition periods (for example, between early morning and peak hour).

Table M.2-1
Assumed Link Operating Schedule

	From	To	Number of Hours	Service Type
Weekday	5:00am	6:00am	1.0	Early/late
	6:00am	8:30am	2.5	Peak
	8:30am	3:30pm	7.0	Base
	3:30pm	6:30pm	3.0	Peak
	6:30pm	10:00pm	3.5	Base
	10:00pm	1:00am	3.0	Early/late
Saturday	5:00am	8:00am	3.0	Early/late
	8:00am	6:00pm	10.0	Base
	6:00pm	1:00am	7.0	Early/late
Sunday	5:00am	1:00am	20.0	Early/late

Source: Preliminary Operating Plan for Phase 1; PSTC, June 2, 1998

Following are assumed operating features used to develop light rail travel time and operating characteristics.

- Maximum vehicle load factors (riders per seat) of 1.0 during the base and early/late service periods, and 1.85 during peak periods (72 seats/vehicle)
- Traffic signal priority for the light rail trains where at-grade with general traffic (traffic would be controlled with signals and signing, no crossing gates)
- Trains would operate at 35 mph or the posted speed, whichever is less at all at-grade crossings
- Maximum speed of 55 mph except for non-grade-separated sections where adjacent traffic speed limits would control.
- Left-turns across the light rail tracks would not be allowed except at signalized intersections, and the existing number of lanes at signalized intersections would remain unchanged although the configuration may change with the design
- U-turns would be permitted only at signalized intersections. Where existing signals are spaced one-half mile or more apart, a new signalized intersection may be needed "midblock" to permit U-turn movements and access to unsignalized side streets.
- New traffic signalization associated with each route alternative is included in the operating assumptions.

Sources: Preliminary Operating Plan for Phase I, PSTC, June 2, 1998

APPENDIX N
Cash Flow Tables and Capital Cost Estimates

Table N-1 Operating Statement Scenario; Sound Transit Board Approved Preferred Alternative

NOMINAL $000s	Total thru 2006	Total thru 2021				
ST District Taxes						
Sales & Use Tax	2,021,773	7,711,759	126,033	175,090	184,816	191,821
MVET	543,059	2,236,661	32,882	44,521	47,702	50,664
total	**2,564,832**	**9,948,421**	**158,915**	**219,611**	**232,518**	**242,485**
Fares & Other Operating Income						
Commuter Rail	45,603	185,806	-	-	339	3,452
Regional Express Bus	83,496	331,499	65	210	969	10,761
Light Rail	2,271	536,490	-	-	-	-
total	**131,371**	**1,053,795**	**65**	**210**	**1,308**	**14,212**
Interest Earned (GF, O&M reserve)	83,689	1,010,271	1,747	10,096	12,408	20,996
Federal Operating Grants	-	-	-	-	-	-
total operating revenues	**2,779,892**	**12,012,486**	**160,728**	**229,916**	**246,234**	**277,693**
Operating & Maintenance Costs						
Commuter Rail	162,869	663,591	-	-	1,211	12,328
Regional Express Bus	342,709	1,359,114	370	1,268	3,972	44,101
Light Rail	18,928	1,034,792	-	-	-	-
Regional Fund Operations	126,285	410,024	3,438	6,716	9,673	9,969
total O&M	**650,791**	**3,467,521**	**3,808**	**7,983**	**14,856**	**66,397**
	2,129,101	8,544,965	156,919	221,933	231,378	211,296
Annual principal & interest	343,944	2,094,355	-	-	11,443	17,164
Net Coverage ratio	*6.19*	*4.08*	*na*	*na*	*20.22*	*12.31*
Gross Coverage ratio	*8.08*	*5.74*	*na*	*na*	*21.52*	*16.18*
Net Income	**1,785,157**	**6,450,611**	**156,919**	**221,933**	**219,936**	**194,132**
Distributions of Net Income						
O&M reserve	20,178	37,681	635	696	1,145	8,590
Capital Replacement Reserve	-	625,101	-	-	-	-
Excess Revenues Reserve	-	-	-	-	-	-
General Fund	1,764,978	5,787,829	156,285	221,237	218,790	185,542

Table N-1 (Continued)

NOMINAL $000s						
ST District Taxes						
Sales & Use Tax	198,257	205,631	216,071	228,302	241,086	254,666
MVET	53,442	56,201	59,122	62,488	66,123	69,914
total	**251,699**	**261,832**	**275,193**	**290,790**	**307,209**	**324,580**
Fares & Other Operating Income						
Commuter Rail	6,579	6,656	6,854	7,050	7,237	7,436
Regional Express Bus	10,904	11,225	11,537	11,866	12,806	13,153
Light Rail	350	363	373	385	394	405
total	**17,834**	**18,245**	**18,765**	**19,301**	**20,438**	**20,993**
Interest Earned (GF, O&M reserve)	12,891	12,029	1,515	2,745	3,966	5,297
Federal Operating Grants	-	-	-	-	-	-
total operating revenues	**282,424**	**292,106**	**295,473**	**312,835**	**331,614**	**350,870**
Operating & Maintenance Costs						
Commuter Rail	23,497	23,773	24,479	25,178	25,848	26,555
Regional Express Bus	44,690	46,006	47,282	48,632	52,483	53,904
Light Rail	2,917	3,028	3,112	3,210	3,286	3,375
Regional Fund Operations	10,170	10,567	11,136	11,575	15,806	37,235
total O&M	**81,274**	**83,374**	**86,010**	**88,594**	**97,423**	**121,070**
	201,150	208,731	209,462	224,241	234,190	229,800
Annual principal & interest	20,914	24,664	35,824	58,084	80,284	95,568
Net Coverage ratio	*9.62*	*8.46*	*5.85*	*3.86*	*2.92*	*2.40*
Gross Coverage ratio	*13.50*	*11.84*	*8.25*	*5.39*	*4.13*	*3.67*
Net Income	**180,236**	**184,068**	**173,639**	**166,157**	**153,906**	**134,231**
Distributions of Net Income						
O&M reserve	2,479	350	439	431	1,472	3,941
Capital Replacement Reserve	-	-	-	-	-	-
Excess Revenues Reserve	-	-	-	-	-	-
General Fund	177,756	183,717	173,199	165,727	152,435	130,290

Table N-1 (Continued)

NOMINAL $000s							
ST District Taxes							
Sales & Use Tax	268,767	283,101	297,221	308,414	318,743	330,576	347,339
MVET	73,893	77,950	83,293	88,470	93,327	98,152	103,259
total	**342,659**	**361,051**	**380,513**	**396,885**	**412,070**	**428,728**	**450,598**
Fares & Other Operating Income							
Commuter Rail	7,645	7,866	8,076	8,311	8,546	8,781	9,029
Regional Express Bus	13,523	13,914	14,286	14,701	15,117	15,532	15,971
Light Rail	29,129	29,972	30,774	31,668	32,564	33,458	34,403
total	**50,296**	**51,752**	**53,136**	**54,680**	**56,227**	**57,771**	**59,403**
Interest Earned (GF, O&M reserve)	5,403	9,164	13,791	19,074	24,990	31,708	39,559
Federal Operating Grants	-	-	-	-	-	-	-
total operating revenues	**398,358**	**421,968**	**447,441**	**470,639**	**493,287**	**518,207**	**549,560**
Operating & Maintenance Costs							
Commuter Rail	27,302	28,093	28,844	29,682	30,522	31,360	32,246
Regional Express Bus	55,421	57,025	58,550	60,251	61,956	63,658	65,455
Light Rail	55,391	56,994	58,519	60,219	61,923	63,624	65,420
Regional Fund Operations	15,471	15,919	16,345	16,820	17,296	17,771	18,272
total O&M	**153,585**	**158,030**	**162,257**	**166,971**	**171,697**	**176,412**	**181,394**
	244,773	263,937	285,184	303,668	321,591	341,795	368,166
Annual principal & interest	97,848	97,838	104,588	111,333	118,065	118,055	118,050
Net Coverage ratio	*2.50*	*2.70*	*2.73*	*2.73*	*2.72*	*2.90*	*3.12*
Gross Coverage ratio	*4.07*	*4.31*	*4.28*	*4.23*	*4.18*	*4.39*	*4.66*
Net Income	**146,925**	**166,099**	**180,596**	**192,335**	**203,525**	**223,740**	**250,117**
Distributions of Net Income							
O&M reserve	5,419	741	704	786	788	786	830
Capital Replacement Reserve	55,484	55,484	55,484	53,210	46,637	41,750	38,438
Excess Revenues Reserve	-	-	-	-	-	-	-
General Fund	86,022	109,874	124,407	138,339	156,101	181,204	210,848

Table N-1 (Continued)

NOMINAL $000s

ST District Taxes						
Sales & Use Tax	366,976	387,501	409,303	431,939	454,947	477,607
MVET	109,146	115,502	122,132	129,090	136,188	145,531
total	**476,122**	**503,004**	**531,435**	**561,029**	**591,134**	**623,138**
Fares & Other Operating Income						
Commuter Rail	9,275	9,536	9,811	10,084	10,373	10,658
Regional Express Bus	16,407	16,868	17,355	17,838	18,348	18,852
Light Rail	35,342	36,334	37,384	38,424	39,524	40,609
total	**61,025**	**62,738**	**64,550**	**66,346**	**68,245**	**70,119**
Interest Earned (GF, O&M reserve)	48,749	59,383	71,574	85,449	101,119	118,874
Federal Operating Grants	-	-	-	-	-	-
total operating revenues	**585,895**	**625,124**	**667,558**	**712,824**	**760,498**	**812,130**
Operating & Maintenance Costs						
Commuter Rail	33,126	34,056	35,040	36,015	37,046	38,063
Regional Express Bus	67,242	69,130	71,126	73,106	75,198	77,263
Light Rail	67,206	69,093	71,088	73,067	75,158	77,222
Regional Fund Operations	18,771	19,298	19,856	20,408	20,992	21,569
total O&M	**186,346**	**191,577**	**197,110**	**202,596**	**208,395**	**214,116**
	399,549	433,547	470,448	510,229	552,103	598,014
Annual principal & interest	118,040	118,033	118,022	118,013	118,006	131,537
Net Coverage ratio	*3.38*	*3.67*	*3.99*	*4.32*	*4.68*	*4.55*
Gross Coverage ratio	*4.96*	*5.30*	*5.66*	*6.04*	*6.44*	*6.17*
Net Income	**281,509**	**315,514**	**352,426**	**392,215**	**434,098**	**466,477**
Distributions of Net Income						
O&M reserve	825	872	922	914	967	953
Capital Replacement Reserve	37,811	37,289	36,843	36,843	32,457	32,457
Excess Revenues Reserve	-	-	-	-	-	-
General Fund	242,873	277,353	314,661	354,458	400,674	433,067

Table N-1 (Continued)

NOMINAL $000s		
ST District Taxes		
Sales & Use Tax	495,521	512,032
MVET	154,587	163,083
total	**650,108**	**675,115**
Fares & Other Operating Income		
Commuter Rail	10,958	11,253
Regional Express Bus	19,384	19,906
Light Rail	41,755	42,879
total	**72,098**	**74,038**
Interest Earned (GF, O&M reserve)	138,090	159,656
Federal Operating Grants	-	-
total operating revenues	**860,295**	**908,809**
Operating & Maintenance Costs		
Commuter Rail	39,137	40,190
Regional Express Bus	79,444	81,582
Light Rail	79,401	81,538
Regional Fund Operations	22,177	22,774
total O&M	**220,159**	**226,085**
	640,136	682,725
Annual principal & interest	131,507	131,475
Net Coverage ratio	*4.87*	*5.19*
Gross Coverage ratio	*6.54*	*6.91*
Net Income	**508,629**	**551,250**
Distributions of Net Income		
O&M reserve	1,007	988
Capital Replacement Reserve	32,457	32,457
Excess Revenues Reserve	-	-
General Fund	475,165	517,805

Table N-2 Sources and Uses Statement Scenario

NOMINAL $000s	total thru 2006	total thru 2021				
Cash Flow from Operations	1,764,978	5,787,829	156,285	221,237	218,790	185,542
Long-Term Bonds						
Par Amount	1,587,000	1,587,000	-	-	350,000	-
Less: transfers (to) from Bond Reserve	(89,867)	(89,867)	-	-	-	-
Less: issuance costs	(23,074)	(23,074)	-	-	(4,519)	-
net bond proceeds	**1,474,059**	**1,474,059**	-	-	**345,481**	-
Federal Capital Grants	1,054,531	1,054,531	-	27,011	53,973	125,133
Other Sources	-	194,258	-	-	-	-
total sources	**4,293,568**	**8,510,677**	**156,285**	**248,248**	**618,245**	**310,675**
Capital Program						
Commuter Rail	625,981	625,981	1,262	66,532	269,294	227,915
Bus/HOV	903,698	903,698	485	16,511	74,055	145,799
Light Rail	2,643,937	2,773,959	3	42,227	56,600	115,770
Regional Fund	109,941	264,708	1,472	1,642	28,582	9,900
total capital program	**4,283,557**	**4,568,346**	**3,223**	**126,912**	**428,531**	**499,384**
Transfers to (from) General Fund	10,011	3,942,331	153,062	121,336	189,714	(188,709)
total uses	**4,293,568**	**8,510,677**	**156,285**	**248,248**	**618,245**	**310,675**
O&M Reserve			635	1,331	2,476	11,066
Bond Reserve			-	-	-	-
General Fund			153,062	274,397	464,111	275,402
Excess Revenues			-	-	-	-
total funds balance			**153,696**	**275,728**	**466,587**	**286,468**

Table N-2 (Continued)

NOMINAL $000s						
Cash Flow from Operations	177,756	183,717	173,199	165,727	152,435	130,290
Long-Term Bonds						
Par Amount	125,000	-	372,000	370,000	370,000	-
Less: transfers (to) from Bond Reserve	(9,081)	-	(27,025)	(26,880)	(26,880)	-
Less: issuance costs	(1,875)	-	(5,580)	(5,550)	(5,550)	-
net bond proceeds	**114,044**	-	**339,395**	**337,570**	**337,570**	-
Federal Capital Grants	112,612	148,543	184,088	167,927	173,907	61,337
Other Sources	-	-	-	-	-	-
total sources	**404,412**	**332,261**	**696,682**	**671,223**	**663,911**	**191,627**
Capital Program						
Commuter Rail	58,791	600	381	392	402	413
Bus/HOV	148,852	144,956	170,424	116,984	72,471	13,161
Light Rail	217,574	407,223	512,531	540,503	580,867	170,638
Regional Fund	9,919	13,474	13,483	13,502	8,965	9,001
total capital program	**435,136**	**566,253**	**696,819**	**671,381**	**662,705**	**193,214**
Transfers to (from) General Fund	(30,723)	(233,993)	(136)	(157)	1,206	(1,587)
total uses	**404,412**	**332,261**	**696,682**	**671,223**	**663,911**	**191,627**
O&M Reserve	13,546	13,896	14,335	14,766	16,237	20,178
Bond Reserve	9,081	9,081	36,107	62,987	89,867	89,867
General Fund	244,678	10,685	10,549	10,392	11,598	10,011
Excess Revenues	-	-	-	-	-	-
total funds balance	**267,305**	**33,662**	**60,991**	**88,144**	**117,702**	**120,056**

Table N-2 (Continued)

NOMINAL $000s						
Cash Flow from Operations	86,022	109,874	124,407	138,339	156,101	181,204
Long-Term Bonds						
Par Amount	-	-	-	-	-	-
Less: transfers (to) from Bond Reserve	-	-	-	-	-	-
Less: issuance costs	-	-	-	-	-	-
net bond proceeds	-	-	-	-	-	-
Federal Capital Grants	-	-	-	-	-	-
Other Sources	10,592	10,899	11,190	11,515	11,841	12,166
total sources	**96,614**	**120,773**	**135,598**	**149,854**	**167,942**	**193,371**
Capital Program						
Commuter Rail	-	-	-	-	-	-
Bus/HOV	-	-	-	-	-	-
Light Rail	9,998	10,007	9,994	10,004	10,007	10,001
Regional Fund	8,439	8,683	8,915	9,174	9,434	9,693
total capital program	**18,437**	**18,690**	**18,909**	**19,178**	**19,441**	**19,694**
Transfers to (from) General Fund	78,178	102,083	116,688	130,676	148,501	173,676
total uses	**96,614**	**120,773**	**135,598**	**149,854**	**167,942**	**193,371**
O&M Reserve	25,598	26,338	27,043	27,828	28,616	29,402
Bond Reserve	89,867	89,867	89,867	89,867	89,867	89,867
General Fund	88,189	190,272	306,960	437,635	586,137	759,813
Excess Revenues	-	-	-	-	-	-
total funds balance	**203,653**	**306,477**	**423,869**	**555,331**	**704,620**	**879,082**

Table N-2 (Continued)

NOMINAL $000s						
Cash Flow from Operations	210,848	242,873	277,353	314,661	354,458	400,674
Long-Term Bonds						
Par Amount	-	-	-	-	-	-
Less: transfers (to) from Bond Reserve	-	-	-	-	-	-
Less: issuance costs	-	-	-	-	-	-
net bond proceeds	-	-	-	-	-	-
Federal Capital Grants	-	-	-	-	-	-
Other Sources	12,510	12,852	13,212	13,594	13,972	14,372
total sources	**223,358**	**255,724**	**290,565**	**328,254**	**368,430**	**415,046**
Capital Program						
Commuter Rail	-	-	-	-	-	-
Bus/HOV	-	-	-	-	-	-
Light Rail	10,003	9,996	9,996	10,004	10,002	10,008
Regional Fund	9,967	10,239	10,526	10,830	11,132	11,450
total capital program	**19,970**	**20,235**	**20,522**	**20,835**	**21,134**	**21,458**
Transfers to (from) General Fund	203,389	235,489	270,043	307,420	347,296	393,588
total uses	**223,358**	**255,724**	**290,565**	**328,254**	**368,430**	**415,046**
O&M Reserve	30,232	31,058	31,930	32,852	33,766	34,733
Bond Reserve	89,867	89,867	89,867	89,867	89,867	89,867
General Fund	963,202	1,198,691	1,468,734	1,776,154	2,123,451	2,517,039
Excess Revenues	-	-	-	-	-	-
total funds balance	**1,083,301**	**1,319,616**	**1,590,531**	**1,898,873**	**2,247,083**	**2,641,638**

Table N-2 (Continued)

NOMINAL $000s			
Cash Flow from Operations	433,067	475,165	517,805
Long-Term Bonds			
Par Amount	-	-	-
Less: transfers (to) from Bond Reserve	-	-	-
Less: issuance costs	-	-	-
net bond proceeds	-	-	-
Federal Capital Grants	-	-	-
Other Sources	14,767	15,183	15,592
total sources	**447,833**	**490,348**	**533,397**
Capital Program			
Commuter Rail	-	-	-
Bus/HOV	-	-	-
Light Rail	10,002	-	-
Regional Fund	11,765	12,097	12,422
total capital program	**21,767**	**12,097**	**12,422**
Transfers to (from) General Fund	426,066	478,251	520,975
total uses	**447,833**	**490,348**	**533,397**
O&M Reserve	35,686	36,693	37,681
Bond Reserve	89,867	89,867	89,867
General Fund	2,943,105	3,421,356	3,942,331
Excess Revenues	-	-	-
total funds balance	**3,068,658**	**3,547,916**	**4,069,879**

Table N-3
Capital Cost Estimates and Station Alternatives

#	Alt.	General Description	Station Options	Total
1	A1.1	12th Avenue NE Tunnel	Base: Northgate B	364
			Delta for Northgate A	(13)
			Delta for Northgate C	7
2	A1.2	Roosevelt Way NE Tunnel	Base: Northgate B	391
			Delta for Northgate A	(13)
			Delta for Northgate C	7
3	A2.1	8th Avenue NE Elevated (under Lake City Way)	Base: Northgate B	335
			Delta for Northgate A	(13)
			Delta for Northgate C	7
4	A2.2 - LPA	8th Avenue NE Elevated (over Lake City Way)	Base: Northgate B	303
			Delta for Northgate A	(13)
			Delta for Northgate C	7
5	B1A-LPA	Capitol Hill Tunnel A - No CPS Station or Joint Use (2B)	45th B; Pacific B; Capitol A, First Hill B	862
			Delta for 45th C	2
			Delta for Capitol B	(15)
			Delta for Capitol C	(31)
			Delta for Capitol D	(36)
6	B1B	Capitol Hill Tunnel B - CPS Station & Joint Use (2C) DEIS profile	45th A; Pacific A; Capitol A, First Hill A	962
7	B2.1A	Seattle Ctr. via High-level Bridge A - No CPS but with Joint Use (5)	45th A	794
8	B2.1B	Seattle Ctr via High-level Bridge B - CPS & No Joint Use	45th A	889
9	B2.2A	Seattle Ctr via Portage Bay Tunnel A - No CPS but with Joint Use (5)	Base: 45th B; Pacific A	794
			Delta for Pacific Street B	(18)
10	B2.2B	Seattle Ctr via Portage Bay Tunnel B - CPS & No Joint Use	Base: 45th B; Pacific A	889
			Delta for Pacific Street B	(18)
11	C1.1	So. Lander St Tunnel, in median on E3 busway and on Lander St.	Base: WLS A; R. Brghm. A (Side); Lander A	227
			Delta for WLS B; RB B (Center)	11
12	C1.2-LPA	S. Lander St. Tunnel, east side of E3, north side of Lander at grade	Base: WLS A; R. Brghm. B (Center); Lander B	228
			Delta for WLS B	14
13	C1.3	So. Lander St. Tunnel, east side of E3, north side of Lander elevated	Base: WLS A; R. Brghm. B; Lander C (Aerial)	237
			Delta for WLS B	14
14	C1.4	Forest Street, East side of E3	Base: WLS A; R. Brghm. B; Lander B	235
			Delta for WLS B	14
15	C1.5	So. Lander St. Tunnel, via Mass. and I-5 ROW	Base: WLS A; R. Brghm. B	224
			Delta for WLS B	14
16	C2.3	West of Rainier Avenue S. Elevated	Base: WLS A	149
			Delta for WLS B	14
17	C2.4	Rainier Avenue South Tunnel	Base: WLS A	241
			Delta for WLS B	14
18	C3	South Massachusetts Street Tunnel	Base: WLS A; R. Brghm. A	207
			Delta for WLS B; RB B (Center)	11

Table N-3 (Continued)

19	D1.1C(A)	MLK At-Grade; at-grade trans. to MLK (C2.4); 104' x-sectn.; 4 lns.	McCl. A; Henderson B (Center)	195
20	D1.1C(B)	MLK At-Grade; aerial trans. to MLK (C1.1, C2.3, C3); 104' x-sectn.; 4 lns.	McCl. C; Henderson B	206
			Delta for McCl. B (Center)	(1)
21	D1.1D(A)	MLK At-Grade; at-grade trans. to MLK (C2.4); 90' x-sectn.; 2 lns.	McCl. A; Henderson B	173
22	D1.1D(B)	MLK At-Grade; aerial trans. to MLK (C1.1, C2.3, C3); 90' x-sectn.; 2 lns.	McCl. C; Henderson B	185
			Delta for McCl. B (Center)	(1)
23	D1.1E(B)-	MLK At-Grade; aerial trans. to MLK (C1.1, C2.3, C3); 93' x-sectn.; 4 lns.	McCl. C; Grhm. D; Othl. B; Hndrsn. B	196
			Delta for McCl. B (Center)	(1)
24	D1.1F(B)	MLK At-Grade; aerial trans. to MLK (C1.1, C2.3, C3); 93' x-sectn.; 2 lns.	McCl. C; Grhm. D; Othl. B; Hndrsn. B	191
			Delta for McCl. B (Center)	(1)
25	D1.3B	MLK - Combined Profile B; aerial trans. to MLK (C1.1, C2.3, C3)	McClellan C; Henderson A (Side)	254
			Delta for McCl. B (Center)	(1)
26	D3.3A	South Alaska Street Crossover A - At Grade across MLK (C2.4)	McClellan A; Henderson A	222
27	D3.4B	37th Avenue South Tunnel B - Elevated across MLK (C1.1, C2.3, C3)	McClellan C; Henderson A	356
			Delta for McCl. B (Center)	(1)
28	E1.1-LPA	Pacific Highway South At-grade		174
29	E1.2	Pacific Highway South Elevated		213
30	E2	Interurban Avenue South	Base: Southcenter B	294
			Delta for South Center A	1
31	E3	Martin Luther King Jr. Way South	Base: Southcenter B	322
			Delta for South Center A	(1)
32	F1A	Int'l. Boulevard - At-Grade; SR-99 At-Grade Connct'n. (E1.1)		179
33	F1B	Int'l. Boulevard - At-Grade; SR-99 Elevated Connct'n. (E1.2)		181
34	F1C	Int'l. Boulevard - At-Grade; SR-518 Connct'n. (E2, E3)		172
35	F2.1A	Washington Memorial Park - City Center West; SR-99 Connct'n.		187
36	F2.1B	Washington Memorial Park - City Center West; SR-518 Connct'n.		172
37	F2.2A	Washington Memorial Park - City Center East; SR-99 Connct'n.		211
38	F2.2B	Washington Memorial Park - City Center East; SR-518 Connct'n.		197
39	F2.3A-LPA	Washington Memorial Park - Elevated East of 28th; SR-99 Connct'n.	Base: North B (350); North Cntrl. C; South F	218
			Delta for North F (Aerial Side w/ 260)	3
			Delta for North G (Aerial Side w/ 454)	9
			Delta for South E (longer, across 200th)	6
40	F3.1A	West Side of Int'l. Blvd - Grassy Knoll; SR-99 Connct'n.	North Cntrl. B; South B	190
41	F3.1B	West Side of Int'l. Blvd - Grassy Knoll; SR-518 Connct'n.	North Cntrl. B; South B	179
42	F3.2A	West Side of Int'l. Blvd - Main Term.; SR-99 Elevated Connct'n. (E1.2)	North Cntrl. B; South B	198
43	F3.2B	West Side of Int'l. Blvd - Main Term.; SR-518 Connct'n. (E2, E3)	North Cntrl. B; South B	188
44	F3.3	West Side of Int'l. Blvd - IMC Airport Station (E1.1)	Base: North B; North Cntrl. B, South F	204
			Delta for South E (longer, across 200th)	6
45	F4	Int'l. Blvd. to 28th/24th	Base: North A; North Cntrl. B; South C	210

APPENDIX O
Preferred Alternative Mitigation Plan

Introduction

This mitigation plan describes Sound Transit's preliminary mitigation commitments. These commitments include all the mitigation measures Sound Transit proposes to implement to avoid or minimize impacts from the preferred alternative identified in the EIS, and mitigation for elements of the project for which the Sound Transit Board has not yet identified a preferred alternative, such as the maintenance base sites. In addition, although the Board identified preferred stations, some of the stations have multiple design options. This plan identifies mitigation for these various station options. If the Sound Transit Board selects an alternative to be built that differs from the preferred alternative, these mitigation commitments will be modified accordingly. Many of the mitigation measures that are described below as common to all segments, will apply to all of the alternatives, not just the preferred.

The mitigation commitments identified below are based on the potential mitigation measures identified in the Final EIS. Mitigation measures associated with the operation of the light rail system are described first. Mitigation measures associated with the construction of the system are described second.

Operational mitigation measures are divided into two broad categories in the text below: 1) those measures that have already been incorporated into the project design for the preferred alternative; and 2) additional mitigation commitments to avoid or minimize impacts. The first category reflects those measures that have been integrated into the project as a result of on-going effort to optimize the design of the preferred alternative. The measures integrated to the project are commitments by Sound Transit and will be implementing as part of the project. Sound Transit anticipates that the additional mitigation commitments to avoid or minimize impacts will be incorporated into the Record of Decision (ROD) to be issued by the Federal Transit Administration (FTA) following issuance of the NEPA Final EIS.

Both categories of mitigation measures are designed to avoid or minimize potential impacts. And both reflect and respond to comments received since the issuance of the Draft EIS. As these commitments reflect, Sound Transit will continue to work to solve problems and reduce the impact of the project through good design and other measures as the project proceeds.

1. Operational / Long-Term Mitigation

1.1 TRANSPORTATION

1.1.1 Common to all segments

Mitigation Features of the Preferred Alternative

To improve non-motorized access, Sound Transit will work with local public transportation agencies, communities and local governments to place and design transit facilities that fit with local community plans. These facilities will include improvements within one-half mile of each station for safe, easy pedestrian and bicycle access, consistent with existing Sound Transit policy recommendations. Sidewalks on or immediately adjacent to light rail station property will be provided. At a minimum, existing sidewalk widths will be maintained and any improvements will be sufficiently wide to accommodate pedestrian volumes from light rail and will be designed to conform to City standards. With respect to bicycles at all new stations/facilities, Sound Transit will:

- Design facilities at new stations to provide ample space for maneuvering bicycles in and through stations and on to vehicles.
- Provide a mix of storage lockers and racks.

- Provide storage areas open to circulation, on direct paths from access points, but not impeding pedestrian and vehicular traffic flows.
- Designate areas, where possible, for storage expansion to accommodate bicycle ridership increases.

In addition to the non-motorized facility improvements at stations, the following location-specific trail facility improvements are included in the preferred alternative design:

- Channelization and/or signing physical improvements, if necessary, to separate pedestrian and bicycle flows between the Burke-Gilman Trail and Pacific Station.
- Development of a Class I trail facility adjacent to the E-3 Busway and light rail alignment in the North Duwamish area.
- Development of Chief Sealth Trail crossings of MLK Jr. Way S. and Henderson Street in the vicinity of Henderson Station.
- Development of a bicycle facility through the Rainier Valley parallel to the light rail corridor.
- Improved signage for an existing on-street bicycle route through the Rainier Valley.

Hide-and-ride parking impacts and mitigation refer to the potential for some light rail users to use unrestricted on-street parking in neighborhoods to access light rail stations. Hide-and-ride parking impacts could be mitigated through a number of measures including new or expanded residential parking zones (RPZs), hourly and day of week parking restrictions, parking meters, monitoring of use, enforcement and public education campaigns. RPZs are generally applicable on residential streets with greater than 75 percent parking utilization, while parking restriction signs and meters are more applicable in commercial business areas.

The potential for hide-and-ride and the best ways to mitigate the impact are unique to each individual station area. Sound Transit will commit to conducting additional parking surveys of on-street unrestricted parking supply within ¼-mile to 2,000 ft radius of most proposed station locations approximately six months or less prior to light rail system opening. All stations will be surveyed on two consecutive weekdays. The average of these two days will be used for the before/after parking survey comparison. Table 1.1-1 summarizes parking survey parameters by station.

Approximately six months after light rail system opening, Sound Transit will repeat the surveys described above for all locations and times. In cases where on-street parking utilization is greater than 90 percent, the surveys after system opening will focus on whether utilization is increasing in areas greater than ¼-mile from that station. Parking surveys will be collected on two consecutive weekdays similar to the surveys conducted before the light rail system opens. The results of all surveys will be used to identify mitigation measures.

Mitigation measures will be identified on a case-by-case basis for all locations where parking surveys show that 50 percent or more of unutilized parking spaces prior to light rail implementation are utilized after light rail begins operation. For example, if a block face shows a parking utilization rate of 60 percent before light rail implementation and a utilization of 80 percent or greater after light rail implementation, Sound Transit will identify potential mitigation measures.

This increase threshold will be used for each block face to assess whether mitigation should be considered. For locations exceeding the parking utilization threshold, Sound Transit will work with the local jurisdictional staff to determine the appropriate mitigation for each block face, if any.

For locations where the mitigation is accepted and approved by City staff and local community or neighborhood groups, Sound Transit will provide proportional funding for direct start-up costs of mitigation. In the case of residential parking zones, Sound Transit expects the affected city to recoup on-going monitoring, enforcement, education, and other operating costs from parking fines and permit fees.

The light rail system will include the following design features to enhance safety and minimize any risk or exposure to traffic accidents:

- Signs and pavement markings to advise vehicle drivers not to encroach on to the trackway area;
- Lighting along all at-grade routes;
- Street lighting on all corners of signalized intersections (auto and pedestrian signals);
- Clear delineation between the adjacent street and trackway that will be visual and tactile;
- Operating trains at speeds within the speed limit of the adjacent street on at-grade segments;
- Safe pedestrian crossing locations;
- Operating a high-intensity light on the train during all operating times;
- An active traffic control system that may consist of gates, signals, and audio warning devices to notify pedestrians and motorists of an oncoming train; and
- An intensive public information program to create awareness and discuss possible safety features.

1.1.2 Segment B (University District to Westlake Station)

Mitigation Features of the Preferred Alternative

There are no mitigation features of the preferred alternative for Segment B beyond those previously identified as common to all segments.

Additional Mitigation Commitments

In 2020, the pedestrian volumes crossing both Broadway Avenue and E. John Street at the E. John Street/Broadway Avenue E. intersection would result in LOS F conditions compared to LOS D for the No-build Alternative. The intersection would operate at LOS C with the addition of eastbound and westbound left-turn lanes on E. John Street. These left-turn lanes could be added by removing on-street parking on E. John Street. This improvement will likely require some additional signal hardware (for the eastbound and westbound left-turns) and some signal controller revisions.

Table 1.1-1. Summary of Preferred Alternative Parking Survey Parameters

Station	Time of Day	Survey Radius[3]
N.E. 45th Street[1]	7:00 A.M. – 9:30 A.M.	0.38 mi (2,000 ft)
N.E. 45th Street[1]	9:30 A.M. – 3:30 P.M.	0.38 mi (2,000 ft)
N.E. 45th Street[1]	6:00 P.M. – 9:00 P.M.	0.38 mi (2,000 ft)
Pacific Street[1]	7:00 A.M. – 9:30 A.M.	0.38 mi (2,000 ft)
Pacific Street[1]	9:30 A.M. – 3:30 P.M.	0.38 mi (2,000 ft)
Capitol Hill[1]	7:00 A.M. – 9:30 A.M.	0.38 mi (2,000 ft)
Capitol Hill[1]	9:30 A.M. – 3:30 P.M.	0.38 mi (2,000 ft)
Capitol Hill[1]	6:00 P.M. – 9:00 P.M.	0.38 mi (2,000 ft)
First Hill[1]	7:00 A.M. – 9:30 A.M.	0.38 mi (2,000 ft)
First Hill[1]	9:30 A.M. – 3:30 P.M.	0.38 mi (2,000 ft)
Royal Brougham[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
S. Lander[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Beacon Hill[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
McClellan[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Edmunds[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Graham[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Othello[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Henderson[2]	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
Boeing Access Road	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
S. 144th	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
North SeaTac (S. 154th) (Option B, F, D)	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
North Central SeaTac (IMC Option)	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)
South SeaTac (S. 200th Street)	9:30 A.M. – 3:30 P.M.	0.25 mi (1,320 ft)

Note: Station list may change with the Sound Transit Board decision in November 1999.

[1] Surveys at these stations will be conducted for either the early morning or midday time period, but not both.

[2] Early morning surveys will be conducted at these stations if the midday utilization is greater than 90 percent.

[3] Survey radii will be 0.25 miles except in locations where parking utilization prior to Link implementation is 90 percent or greater.

1.1.3 Segment C (Westlake Station to S. McClellan Street)

Mitigation Features of the Preferred Alternative

Operational Improvements on North/South Streets. Bus routes that currently use the Downtown Seattle Transit Tunnel (DSTT) will be reassigned to Second, Third, and Fourth avenues to group routes that serve similar rider markets, provide higher service frequency, and simplify bus routes through downtown. A monitoring program and strategies will be developed that can be used to modify and change the downtown street operations if needed during construction. Some or all of these street modifications will continue to exist after light rail begins operation. Sound Transit will also work with the Downtown Seattle Association and other interested parties to develop a campaign to promote the downtown area during both the two-year construction period and after light rail is in operation. During the construction period, it is

recommended that buses that currently use the DSTT be concentrated on Third Avenue based on the following assumptions:

- Restrict Third Avenue between Stewart Street and Yesler Street to public transit buses charter buses, and emergency vehicles on weekdays from 6 to 9 A.M. and 3 to 6 P.M. It may be possible to reduce the hours of restricted operation.
- Allow traffic circulation on Third Avenue by permitting right turns onto and off Third Avenue to provide opportunities for passenger pick-up, deliveries and circulation for vehicles entering and exiting side-street parking garages.
- Some bus stops will be modified or closed or new ones added. Buses will operate in a skip stop pattern.
- When the modifications are first put in place, allow autos on Third Avenue to make left turns during the midday. However, if the monitoring program finds that this movement results in impacts to transit travel time and reliability, midday turn restrictions may be required.

Connections to I-5 in North Downtown. Providing transit priorities in the north downtown area provides significant challenges. The current access to I-5 on Olive Way is unreliable from a transit travel time perspective, which affects reliability and increases travel times. To respond to these problems, the following improvements are recommended:

- Split the buses bound for I-5 in the afternoon between Pike Street, Olive Way and Virginia Street.
- Route Community Transit and Sound Transit buses on Pike Street. (Currently only trolley service operates on Pike Street.) Add a second bus stop and shelter on the eastside of Sixth Avenue adjacent to the Sheraton Hotel.
- Add a transit-only contra-flow lane on Ninth Avenue between Olive Way and Stewart Street for buses exiting Convention Place Station (access for the I-5 reversible lanes) to reach Stewart Street.
- Add a peak period transit-only lane on Olive Way between Fourth Avenue and Boren Avenue (eliminate westbound auto lane between Boren Avenue and Howell Street). Using the transit lane on Olive Way, operate buses in a skip-stop pattern.
- Add transit signal priority to the signal at the intersection of Boren Ave and Olive Way.

Connections in South Downtown. To accommodate the volume of buses entering downtown from the south and I-90; it is recommended that bus volumes be split between Fourth and Fifth avenues. In addition the following changes are recommended:

- Prefontaine Place will be a transit-only street at all times.
- Restrict Third Avenue south of Yesler Street to public transit buses, charter buses and emergency vehicles on weekdays from 6 to 9 A.M. and 3 to 6 P.M.
- Establish a contraflow lane on Fifth Avenue S. between Jackson Street and Washington Street. Allow auto use of the Fifth Avenue S. contraflow lane between Jackson Street and Washington Street, but require autos to turn right at either Main Street or Washington Street. Monitor transit travel time and reliability to determine if the transit only contraflow lane should be extended north from Washington Street to Terrace Street, and if autos should continued to be allowed to use the contraflow lane between Jackson Street and Washington Street.
- Provide transit priority on Royal Brougham Way, Sixth Avenue S., and Airport Way between the E-3 Busway and S. Jackson Street.

The preferred alternative in Segment C is C1.2; however, the location and impacts from this alignment vary with the different maintenance base site alternatives in Segment C. The impacts and potential mitigation for each of the maintenance base site alternatives are presented in Section 1.1.7.

A new traffic signal is proposed at the Lander Street/Beacon Avenue S. intersection near the Beacon Hill Station, if the station is implemented. This new signal will provide a protected pedestrian crossing to the station and allow buses to safely cross as well.

Sound Transit is working with King County Metro to mitigate for the loss of parking at Ryerson Base. The two options include: providing temporary parking using WSDOT right-of-way with long-term parking being accommodated in new structured parking at Central Base; or constructing a new parking lot south of Ryerson Base to accommodate displaced employee parking.

1.1.4 Segment D (S. McClellan Street to Boeing Access)

Mitigation Features of the Preferred Alternative

The recommended light rail signal priority system for the preferred alternative in Segment D is a progression-based system on MLK Jr. Way S. This system (included in the project cost estimate) relies on the predictability of light rail vehicles arrivals, eliminating the need for light rail vehicles to fully preempt traffic signals. This type of system minimizes or eliminates impacts to eastbound/westbound movements and northbound/southbound left-turn movements compared to a light rail signal preemption system. All existing and new signalized intersections will require timing and phasing revisions. Most of the LOS impacts at intersections from at-grade light rail system are eliminated with the progression-based signal system. However, there are six intersections where improvements have been included in the project design to improve LOS to better than No-build conditions and fully mitigate project impacts. These locations include:

- S. Columbian Way – add eastbound left-turn lane
- S. Graham Street – add eastbound right-turn lane
- S. Myrtle Street – add eastbound and westbound left-turn lanes
- S. Othello Street – add eastbound and westbound left-turn lanes and restripe the eastbound curb lane to an exclusive right-turn lane
- Renton Avenue S. – add westbound left-turn lane
- S. Cloverdale Street – add eastbound right-turn lane

All signalized intersections will require timing and phasing revisions. To mitigate impacts of eliminating left-turn access at unsignalized locations, additional signals with northbound and/or southbound left-turn lanes were included in the preliminary project design at the following intersections:

- S. Dakota Street
- S. Edmunds Street
- S. Dawson Street
- S. Holly Street

Passenger vehicles will be allowed to make U-turns at these locations. Protected pedestrian crosswalks across MLK Jr. Way S. will also be provided. The following intersections will also be signalized; however, left-turn lanes will not be provided on MLK Jr. Way S. at these locations:

- S. Hanford Street
- S. Andover Street
- S. Brandon Street/35th Avenue S.

New traffic signals will also be added at three intersections to improve vehicular and pedestrian access to the McClellan and Henderson stations.

- Rainier Avenue S./S. Forest Street (McClellan Station)

- Rainier Avenue S./S. Hanford Street (McClellan Station)
- S. Henderson Street near Yukon Avenue S. (Henderson Station)

For additional crossing opportunities for pedestrians, pedestrian-only signals will be included with the preferred alternative at the following intersections:

- S. Tamarack Drive (existing and proposed)
- S. Hanford Street
- S. Brandon Street/35th Avenue S.
- S. Hudson Street
- S. Raymond Street
- S. Morgan Street
- S. Willow Street
- S. Holden Street
- S. Elmgrove Street
- S. Thistle Street
- Merton Way S.

These added pedestrian signals will minimize the walking distance required to reach a protected crossing of MLK Jr. Way S. They will also enhance pedestrian safety compared to the No-build Alternative by providing additional protected pedestrian crossing opportunities of MLK Jr. Way S.

Final design of the at-grade sections will consider safety measures such as a visual element in the center of the tracks to discourage crossing the tracks except at legal crosswalks. The visual element may consist of a 42-inch high decorative fence, bollards and chain, or other similar feature. Another potential measure being considered would provide an area for pedestrians to stand on one or both sides of the rail tracks at legal crossing locations.

The preferred alternative also includes a 6-ft sidewalk with 4.5-ft planting strip on MLK Jr. Way S. throughout the corridor. At station locations, the sidewalk width will be increased to ten feet.

Additional Mitigation Commitments

Business/property owners will be directly compensated when a portion of their property is acquired by Sound Transit. If a portion of the area purchased was used for parking, Sound Transit will work with the property owner on a case-by-case basis to replace lost parking.

1.1.5 Segment E (Tukwila)

Mitigation Features of the Preferred Alternative

The recommended light rail traffic signal system for the preferred alternative in Segment E is a progression-based system on Tukwila International Boulevard similar to Segment D. All existing and new signalized intersections will require timing and phasing revisions.

Most of the LOS impacts at intersections from the at-grade light rail system are eliminated with the signal priority system, with the exception of the Tukwila International Boulevard/S. 144th Street intersection. At this location, an eastbound right-turn lane has been included in the project design to improve LOS to better than No-build conditions and fully mitigate project impacts.

To mitigate the impacts of eliminating left-turn access at unsignalized locations, additional signals were included in the project design on Tukwila International Boulevard at S. 140th and S. 148th Streets. Passenger vehicles will be allowed to make U-turns at these locations.

Channelization and traffic signal modifications will be needed at the planned Boeing Access Road/I-5 southbound ramps intersection to add the new south leg accessing the Boeing Access Road Station and park-and-ride lot. These improvements are included in the preliminary project design.

Signal-protected pedestrian-only crosswalks across Tukwila International Boulevard would also be provided in three locations. These added protected pedestrian crossing locations and signalized intersections at S. 140th and S. 148th Streets would minimize the walking distance required to reach a protected crossing of Tukwila International Boulevard. The project would also include new pedestrian-only signals near S. 130th, S. 132nd, and S. 142nd Streets.

The preferred alternative includes 12 ft for sidewalks and landscaping on Tukwila International Boulevard throughout the corridor. Many locations in this corridor currently do not have sidewalks. The widened sidewalks will also improve pedestrian safety and enhance the overall pedestrian environment in the corridor. Street lighting will also be provided along the at-grade portion of the Tukwila International Boulevard alignment and on all corners of signalized intersections.

Additional safety measures to be considered during final design for at-grade sections are: a visual element in the center of the tracks to discourage pedestrian crossings except at legal crosswalks; and area for pedestrians to stand on one or both sides of the tracks at legal crossing locations. The visual element may consist of a decorative fence or similar feature.

Additional Mitigation Commitments

Business/property owners will be directly compensated when a portion of their property is acquired by Sound Transit. If a portion of the area purchased was used for parking, Sound Transit will work with each property owner on a case-by-case basis to replace lost parking. Sound Transit would also work with businesses/property owners on Tukwila International Boulevard to replace lost parking in situations where a portion of the property is not acquired but a substantial amount of the parking serving the business is displaced.

1.1.6 Segment F (SeaTac)

Mitigation Features of the Preferred Alternative

The design of the preferred alternative includes a grade-separated crossing at S. 200th Street. This would mitigate project impacts of an at-grade light rail alignment at the S. 200th Street/28th Avenue S. intersection.

Additional Mitigation Commitments

Traffic generated from some of the light rail station options would impact LOS at the following intersections:

- International Boulevard/S. 154th Street intersection will require the addition of a westbound right-turn lane and signal phasing adjustments to improve operations to LOS D (the impact and mitigation does not apply to station Option A).
- International Boulevard/ S. 160th Street will require restriping of the eastbound leg of the intersection to provide an exclusive left-turn lane and shared through/right-turn lane to improve the v/c ratio to better than No-build conditions.
- International Boulevard/S. 170th Street intersection will require restriping of the westbound approach to provide exclusive left, through, and right turn lanes to improve operations to LOS E.
- 32nd Avenue S./S. 176th Street intersection will require signal timing adjustments to improve traffic operations to LOS D or better.
- International Boulevard/S. 200th Street intersection will require the addition of eastbound and westbound right-turn lanes to improve the v/c ratio to better than No-build conditions.

At all of these intersections, Sound Transit could be responsible for contributing to the intersection improvements.

Link park-and-ride facilities within the City of SeaTac are not intended to replace paid parking for airport passengers, and special enforcement policies will be developed in conjunction with the City and Port to allow SeaTac park-and-ride facilities to remain available for transit users. Enforcement policies could include time restrictions or permit requirements for park-and-ride users.

1.1.7 Maintenance Base Sites

Although a preferred maintenance base site has not been identified, the following mitigations are proposed for the maintenance sites. Maintenance base alternative M1-E may require relocating some of the traffic signal equipment at the S. Forest Street/Airport Way intersection. If Sixth Avenue S. is vacated to accommodate the M1-C base option, LOS at the Fourth Avenue S./S. Holgate Street intersection could include removing existing parking and striping northbound and southbound right-turn lanes. Mitigation at the Fourth Avenue S./S. Lander Street intersection could include removing existing parking and striping a southbound right-turn lane. These measures will improve the LOS at both intersections to the conditions that will exist without the project.

If Airport Way S. is relocated to accommodate base alternative M1-E, Sound Transit will maintain at least one travel lane in each direction during the construction period. This could be accomplished by maintaining part of the existing roadway segment throughout construction, using part of the M1-E site for a detour route, performing some of the construction at night when traffic volumes are lowest, or through other measures agreed to by SEATRANS.

Transit

To minimize the effect of closing Sixth Avenue S. for the M1-C base alternative, a direct connection between the E-3 Busway and S. Massachusetts Street east of the busway could be constructed. This will reduce the out-of-direction travel required by transit buses currently using Sixth Avenue S. to begin and end routes at the King County/Metro Transit Base.

Non-Motorized Facilities

Signals, gates, or other traffic control measures could be considered where the light rail line will cross the bicycle path when turning at-grade from the E-3 Busway on to either S. Lander Street or Massachusetts Street. Signalized crossings or other traffic control treatments will be provided where lead tracks between the light rail mainline and the maintenance base cross street traffic or a sidewalk.

Local Access

For any of the maintenance base alternatives that vacate portions of public streets and create a dead-end street, turn-arounds will be constructed, where required to accommodate large trucks and fire apparatus.

Freight Rail

Approximately 3,500 lineal feet of rail storage track removed by Site M1-A will be replaced along an existing BNSF rail lead south of Industrial Way or a portion of the rail could be replaced along Eighth Avenue S. adjacent to the maintenance base.

1.2 LAND USE AND ECONOMICS

1.2.1 Common to all Segments

Mitigation Features of the Preferred Alternative

The Central Link Light Rail project is being planned and designed to recognize problems associated with residential and business displacement, to develop solutions, and to minimize the adverse impacts of

displacements. Where displacements are unavoidable, Sound Transit will provide relocation services and benefit payments. Potential access impacts associated with at-grade light rail sections will be minimized through project design and implementation of measures such as adding new signalized intersections and turn lanes, adjusting signal timing, and providing additional or altered pedestrian crossing features. These are described for each segment as applicable. Specific measures are described in other sections of this mitigation plan.

At each station area the Station Area Planning process will actively involve local businesses, neighborhood organizations, and local residents to plan for development of facilities that effectively serve and support the unique characteristics and needs of each area.

The Sound Transit Board has adopted Guiding Principles for Employment and Contracting, which identify four key objectives to engage the region in the implementation of *Sound Move* as follows:

- Workforce diversity reflective of the region,
- Maximum use of local businesses,
- Maximum use of small businesses, and
- Maximum use of minority, women and disadvantaged businesses.

Sound Transit has adopted a policy for the use of project labor agreements (PLA) on Link light rail construction. The PLA policy includes a strong commitment to diversity in employment and apprenticeship training.

1.3 ACQUISITIONS, DISPLACEMENTS AND RELOCATIONS

1.3.1 Common to all Segments

Mitigation Features of the Preferred Alternative

Sound Transit will contact all property owners whose property would be directly affected to answer questions and provide additional information about relocation assistance services, payments, and reimbursement eligibility. Sound Transit's relocation assistance advisory services would include, but not be limited to, measures, facilities, or services that may be necessary or appropriate to determine the relocation needs and preferences of each household, business, and nonprofit organization to be displaced. Sound Transit would provide current information on the availability, purchase prices, and rental costs of comparable replacement dwellings.

Sound Transit is committed to working closely and proactively with families and businesses to help them plan ahead for relocation, assist them to find new homes or sites, and help solve problems as they may occur. Sound Transit has also developed a Small Business Assistance Program that offers additional means of helping businesses that are affected by the light rail project. Interpreters will be used to assist those who do not feel comfortable speaking English to ensure understanding of their choices and options. The City of Seattle and Seattle Housing Authority have committed to work with Sound Transit to help investigate a variety of housing and business choices and opportunities. While the ultimate choice of relocation site will be up to the affected family or business, Sound Transit will help with detailed investigation of possible locations. Every attempt will be made to assist those who wish to remain in their neighborhood in finding a new location close to their current site.

Owners are not required to surrender possession of property until they have been paid the agreed purchase price or an amount equal to Sound Transit's established estimate of just compensation has been deposited with the court. Owners and tenants will not be required to move their businesses without first being given at least 90 days written notice by Sound Transit.

Regarding needed improvements, it is generally recommended that property owners proceed with planned improvements to their properties or facilities as they deem necessary.

Sound Transit will compensate affected property owners according to the provisions specified in Sound Transit's adopted Real Estate Property Acquisition and Relocation Policy, Procedures, and Guidelines. These provisions are largely based on the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and Uniform Relocation Act Amendments of 1987 and on the State of Washington's relocation and property acquisition regulations (468-100 WAC). These benefits vary depending on the level of impact, available options, and other factors.

Property owners whose entire or partial property would be acquired by Sound Transit will receive just compensation for their land and improvements. Just compensation is an amount paid to a property owner for property acquired for public purposes which is not less than the market value of the property acquired, including damages or benefits to the remaining property. Compensation would include any measurable loss in value to the remaining property as a result of a partial acquisition.

Sound Transit would pay for all normal expenses of sale, including escrow fees, title insurance, pre-payment penalties, mortgage release fees, recording fees, and all typical costs incurred incident to conveying title. The sale, however would be exempt from real estate excise tax and no real estate commissions are involved. All funds remaining at the end of sale closing would be released to the seller.

Other benefits and compensation may include payment of residential moving expenses and replacement housing payments, nonresidential moving expenses, and reestablishment expenses. Sound Transit's Business Acquisition and Relocation Handbook and Residential Acquisition and Relocation Handbook outlines compensation and acquisition procedures in detail.

The application of regulations and statutes to individual cases will be by the spirit and intent of the law, not by the letter. Special circumstances will be recognized, and pro-active help to solve problems will be the standard required, not the exception. The timing and magnitude of purchase payments and relocation assistance payments will be adjusted to fit circumstances and fundamental concepts of fairness. The parameters required to protect the use of public funds are broad enough to allow creative solutions for real problems.

1.4 NEIGHBORHOODS

Specific mitigation for impacts to neighborhood quality of life, social interaction, safety and security, and social equity are described in detail in other sections of this mitigation plan (transportation, land use, displacements, visual resources, air quality, and noise).

1.5 VISUAL RESOURCES

1.5.1 Segment B (University District to Westlake Station)

Mitigation Features of the Preferred Alternative

For the N.E. 45th Station, Option B would require entrance and vent structures on the east side of 15th Avenue N.E. These structures may be located in the wooded edge of the University of Washington campus, potentially requiring the removal of large mature trees at two of the main pedestrian entries to the campus. These impacts could be mitigated by site planning, to minimize the tree removal and replanting new trees. For the N.E. 45th Station Option C, visual impacts will be mitigated by station-area redevelopment and replanting any street trees that will be removed.

1.5.2 Segment D (S. McClellan Street to Boeing Access Road)

Mitigation Features of the Preferred Alternative

The elevated portion of guideway south of S. McClellan Station (options B and C) will cross S. Winthrop Street, part of the Olmsted-planned Cheasty Boulevard system. The project will include landscaping, tree plantings and other streetscape improvements of Cheasty Boulevard along S. Winthrop Street that will enhance its visual quality.

The preferred alternative will require the removal of mature street trees and specimen trees along the east frontage of the Rainier Vista housing development, a public landscape with high design quality that constitutes an important community visual resource. The associated visual impacts will be partially mitigated by replacement of the trees with new trees.

Streetscape improvements along MLK Jr. Way S. and S. Edmunds and S. Henderson streets will include new trees and new or repaired curb, gutter and sidewalks that will improve the visual quality of the area.

To prevent possible land dereliction associated with the creation of remainder parcels difficult to redevelop, the project will replant such parcels with grass or simple landscaping after project construction, and pursue their redevelopment for land uses (including public open space) that are feasible and consistent with neighborhood plans.

1.5.3 Segment E (Tukwila)

Mitigation Features of the Preferred Alternative

The presence of the elevated trackway running along the hill on the south side of Boeing Access Road and resultant removal of naturalized vegetation will have a low visual impact on an area which has traditional cultural value to local Indian Tribes. Restoration of affected areas with native plant species originally found on the site will reduce this impact.

Proposed streetscape improvements along Tukwila International Boulevard will enhance the visual character of the roadway and offset visual impacts of the light rail. These improvements will be consistent with the City of Tukwila's Pacific Highway Revitalization Plan and could include new street paving, curbs and gutters, and sidewalks and planting strips/street trees.

1.6 AIR QUALITY

No significant impacts have been identified during operation and no mitigation is necessary.

1.7 NOISE AND VIBRATION

1.7.1 Common to All Segments

The following sections describe the mitigation measures that could be used throughout the project. Utilizing the recommended noise and vibration mitigation measures, light rail and traffic noise impacts and light rail vibration impacts could be attenuated.

Mitigation Features of the Preferred Alternative

There are several operational measures that can be taken to assure that noise and vibration levels related to light rail operation remain at the levels projected in the analysis. Table 1.7-1 provides a list of measures that Sound Transit will perform on a regular basis and the benefit that each of the measures will provide. In addition to the measures listed, Sound Transit will continue to research methods of maintaining low project-related noise and vibration levels during normal system operation. Purchasing a quiet vehicle is an important step in minimizing noise impacts. Sound Transit will use low-noise, current state-of-the-art vehicles.

Table 1.7-1
Summary of Link Light Rail System-Wide Operational Mitigation Measures

Operational Measure	System Benefit
Rail Grinding and Replacement	As rails wear, both noise levels from light rail by-passes and vibration levels can increase. By grinding down or replacing worn rail noise and vibration levels will remain at the projected levels. Rail grinding or replacement is normally performed every three to five years
Wheel Truing and Replacement	Wheel truing is a method of grinding down flat spots (commonly called "wheel flats") on the light rail's wheels. Flat spots occur primarily because of hard braking. When flat spots occur they can cause increases in both the noise and vibration levels produced by the light rail vehicles.
Vehicle Maintenance	Vehicle maintenance includes performing scheduled and general maintenance on items such as air conditioning units, bearings, wheel skirts, and other mechanical units on the light rail vehicles. Keeping the mechanical system on the light rail vehicles in top condition will also help to maintain the projected levels of noise and vibration.
Operator Training	Operators will be trained to maintain light rail travel speeds at those speeds given in the operation plan that was used for the analysis and to avoid "hard-braking" whenever possible. As stated, "hard-braking" can cause wheel flats and may also damage track. Furthermore, by training operators to identify potential wheel flats and other mechanical problems with the trains, proper maintenance can be performed in a more timely manner.

Wheel squeal can occur when rail vehicles traverse tight radius curves. The basic mechanism causing the squeal is slip-stick between the wheels and rail caused by the inside wheels traversing a smaller radius curve than the outside wheels. Without maintenance and treatment, wheel squeal is likely to occur on any curve with a radius less than about 400 ft.

Approaches to controlling wheel squeal include:

- Use lubrication and friction modification. Apply lubrication on the flange side of the rail and friction modifiers on the running surface of the rail.
- Optimize rail and wheel profiles. It is often possible to reduce levels of wheel squeal through modifications to the rail and wheel profiles.
- Minimize contact with restraining rails.

For the noise impact assessment, it has been assumed that steps will be taken during design and operation of the transit facility to minimize the potential for wheel squeal.

Additional Mitigation Commitments

Noise mitigation measures

Following is a summary of the types of noise mitigation measures that are recommended. Some combination of these will be used to eliminate all identified light rail and traffic noise impacts:

- *Install sound walls.* Sound walls are considered the most effective noise control measure, and are widely used to control traffic noise. In order to be effective, the walls must block the direct view of the noise source and must be solid with minimal openings. Sound walls will be used to mitigate any light rail noise impacts when the alignment is elevated on a structure. For the at-grade segments, a combination of sound walls and sound insulation (described below) can eliminate all noise impacts.
- *Provide sound insulation.* Insulating affected structures can reduce noise levels inside those structures, thereby eliminating any interior noise impact. This technique does not, however reduce exterior noise levels and is normally used for structures that have little or no outdoor use at the facility.

Sound walls were evaluated as the primary type of mitigation for light rail noise impacts in areas where the light rail alignment was elevated. The installation of four-foot sound walls on elevated trackway would eliminate all noise impacts for elevated sections. Six to eight foot sound walls adjacent to at-grade trackway, when not located in a roadway, or near receivers locations were also evaluated as mitigation measures, however the sound walls were not appropriate in all areas. When located along to at-grade sections of the project, sound walls could adversely impact neighborhood character and urban design, reduce auto accessibility and restrict emergency vehicle access. Also, short sections of sound walls interspersed with openings for driveways and other access are typically not effective. Because of these limitations, sound walls for noise mitigation are considered feasible in only a few locations adjacent to receivers and would be constructed at the property owners' discretion. No sound walls are proposed adjacent to in-street trackway. Sound walls would be designed such that the noise level at the affected structure would meet the appropriate criteria, either FTA, FHWA, or in some cases both criteria. All at-grade sound walls would be coordinated with the affected property owner.

For those areas where sound walls are not a feasible and reasonable form of noise mitigation, building insulation would be used to eliminate remaining light rail noise impacts. The sound insulation would use the Housing and Urban Development (HUD) interior 45 dBA L_{dn} as the reference value for noise reduction for light rail noise impacts, and the WSDOT 51 dBA peak hour L_{eq} criteria for traffic noise impacts. For those locations where both light rail and traffic noise impacts are identified, the interior levels would be required to meet whichever criteria required the greatest level of noise reduction.

Finally, new development and redevelopment along the alignment can incorporate sound considerations into site planning and building design. The planned redevelopment of two large public housing projects in Segment D – Rainier Vista and Holly Park – provide opportunities to design these facilities so as to reduce noise impacts and still enhance community character and access. Redevelopment could include creating a buffer zone between the road and new residences, incorporating a sound barrier or constructing new homes so that interior noise levels meet HUD criteria. This process will eliminate all noise impacts at both of these developments. Also, Sound Transit will work with local jurisdictions and communities during the final design phase to further evaluate and develop appropriate mitigation.

Vibration mitigation measures

All of the projected 27 vibration impacts are mitigated using one of the mitigation measures described below. The actual form of mitigation will be selected during final design.

- Ballast mat on top of a concrete pad in ballast and tie track;
- High resilience direct fixation fasteners on elevated structures;
- Resiliently supported ties in tunnels;
- Spring-loaded switch frogs or ballast mats for areas where impacts may be caused by cross-overs and switches; and
- Alternating stiffness fasteners.

1.7.2 Segment B

Additional Mitigation Commitments

Because of the unique sensitivity to vibration that some research experiments at the UW Physics and Astronomy Building may have, an additional analysis was conducted to evaluate impacts of light rail operations and the research activities. Sound Transit is continuing to work with representatives from the Physics Department to help determine the appropriate mitigation for potential project effects.

1.7.3 Segment D

Additional Mitigation Commitments

The preferred alternative through the Rainier Valley is an at-grade alignment in the center of MLK Jr. Way S. To accommodate the light rail, traffic lanes were moved outward, toward existing structures, resulting in a significant number of potential traffic noise impacts.

The preferred alternative is projected to have 52 moderate light rail noise impacts. The potential noise impacts would be primarily at front-line residences bordering MLK Jr. Way S. There would also be the potential for 231 traffic-related noise impacts. All of the 52 receptors with potential light rail noise impacts would also have traffic noise impacts, because the roadway would be moved to accommodate the light rail. Most of the front-line receivers along MLK Jr. Way S. currently have existing noise levels that meet or exceed the traffic noise abatement criteria.

No potential vibration impacts are projected along MLK Jr. Way S.

Noise Mitigation: Noise mitigation analysis in this segment was performed using a combination of RSIP and sound walls. Where proposed, sound walls would be located adjacent to the affected property. Noise impacts in this segment are divided into five separate sections for the purpose of performing the mitigation analysis. The five sections are as follows:

- McClellan Street Station to S. Alaska Street;
- S. Alaska Street (including Edmunds Station) to S. Graham Street;
- S. Graham Street to S. Kenyon Street (includes all of Holly Park);
- S. Kenyon Street to S. Henderson Street; and
- S. Henderson Street (including Henderson Station) to Boeing Access Road.

McClellan Station to S. Alaska Street (including Edmunds Station): There is one light rail and 40 traffic noise impacts projected in this section of Segment D. Approximately 24 will use RSIP, although four of the impacts could be mitigated with sound walls. The remaining 16 impacts are all in the Rainier Vista residential housing complex which is planned for redevelopment. Mitigation of the remaining 16 impacts at Rainier Vista will be performed during the redevelopment by 2006. If the redevelopment is not completed prior to implementation of the light rail project, the noise-impacted units would be mitigated using RSIP.

S. Alaska Street to S. Graham Street (including Graham Station): This section of Segment D has 90 traffic noise impacts, 29 of which also have noise impacts related to light rail operations. All of these impacts could be mitigated using some form of RSIP. Fifteen of the impacts could be mitigated using sound walls. The walls would have a combined length of just over 850 ft and have a height of approximately 6 ft.

S. Graham Street to S. Kenyon Street (includes all of Holly Park): There are 42 projected traffic noise impacts, with 18 of these impacts also having noise impacts due to light rail operations. All but six of the impacts could be eliminated using some form of RSIP. The other six impacts are located in Holly Park, and will be mitigated as part of the planned redevelopment of this area by 2003. If the redevelopment does not occur prior to light rail implementation, the six units would be mitigated using RSIP.

S. Kenyon Street to S. Henderson Street: This section is projected to have 50 traffic noise impacts, with seven of these impacts also having noise impacts due to light rail operations. All of these impacts could have some form of RSIP applied to mitigate the impact. Three sound walls totaling approximately 1220 ft could be used to mitigate both the traffic noise and light rail noise impacts at 13 of these receivers.

S. Henderson Street (including Henderson Station) to Boeing Access Road: There are 25 traffic noise and 13 light rail noise impacts in this section of Segment D. These impacts could be mitigated using

RSIP. All Noise impacts in this section of Segment D can be mitigated. Thirteen of the impacts, that both have light rail and traffic noise impacts, could be mitigated with a sound wall.

1.7.4 Segment E

Additional Mitigation Commitments

The preferred alignment in Segment E uses the Boeing Access Road to Tukwila International Boulevard. The alignment is at-grade, in the center of the roadway, along Tukwila International Boulevard. As with Segment D, the roadway will be widened to accommodate the light rail resulting in a high number of traffic noise impacts.

Fifty-six potential light rail-related noise impacts were projected in this segment. Two of the potential impacts would be considered severe under FTA guidelines. In addition to the potential light rail impacts, up to 99 potential traffic-related noise impacts were also identified. The traffic impacts will result from the travel lanes being relocated closer to the front-line receptors to accommodate the light rail tracks. All of the identified light rail impacts also have traffic noise impacts.

There are also 23 projected vibration impacts in the segment.

Noise Mitigation: Noise mitigation will consist of RSIP or RSIP in combination with sound walls. Where proposed, sound walls would be located adjacent to the affected property. The impacts in this segment were divided into three separate sections for mitigation analysis. The three sections are as follows:

- Boeing Access Road to S. 133rd Street
- S. 133rd Street to S. 140th Street
- S. 140th Street to SR 518

Boeing Access Road to S. 133rd Street: This section of Segment E had a total of 24 light rail noise impacts and 33 traffic noise impacts. Each of the affected structures could receive some form of sound insulation. Mitigation measures could include two sound walls totaling approximately 590 ft to mitigate five of the impacts, and up to 28 structures that may receive some form of sound insulation.

S. 133rd Street to S 140th Street: This section of Segment E had a total of nine light rail noise impacts and 32 traffic noise impacts. Mitigation measures could include two noise walls totaling approximately 1,370 ft to mitigate 21 of the impacts or each of these structures could receive some form of sound insulation.

S. 140th Street to SR 518: This section of Segment E had a total of 23 light rail noise impacts and 34 traffic noise impacts. Mitigation measures could include two noise walls totaling approximately 750 ft to mitigate 11 of the impacts, and up to 23 structures that may receive some form of sound insulation.

Vibration Mitigation: All of the projected 23 vibration impacts could be mitigated using methods described in Section 1.7.1. The actual method will be determined during final design.

1.8 ECOSYSTEMS

Increased impervious surfaces could result in increased stormwater runoff and decreases in water quality. This impact can be mitigated with detention and treatment of stormwater runoff from new impervious surfaces, as discussed in Water Resources.

1.8.1 Segment B (University District to Westlake Station)

Additional Mitigation Commitments

For the N.E. 45th Station, Option B, several mature trees will be removed on the U.W. Campus. To minimize this impact, trees to be saved will be clearly marked and disturbed sites will be landscaped with similar trees and shrubs. If trees do not survive construction, new trees will be planted.

1.8.2 Segment C (Westlake Station to S. McClellan Street)

Additional Mitigation Commitments

The project will result in the loss of approximately 10,150 ft^2 of deciduous forest within city of Seattle designated greenbelts. Tree removal within a city greenbelt will require replacement planting. Portions of the greenbelts disturbed by construction will be required to be replanted at a ratio of 100 trees per acre and 1,600 shrubs per acre. A three-year maintenance plan is also required to provide survival of the plantings.

1.8.3 Segment D (S. McClellan Street to Boeing Access Road)

Additional Mitigation Commitments

The project will fill approximately 5,000 ft^2 of wetland (AR-3) and remove approximately 1,500 ft^2 of wetland buffer. The compensation/restoration ratio for these wetland impacts is 2:1, therefore approximately 10,000 ft^2 of wetland mitigation is required. Also, the compensation/restoration ratio for wetland buffer impacts is 1:1, therefore 1,500 ft^2 of buffer mitigation is required. Mitigation could be accomplished either on or offsite. Wetland AR-3 is located on Seattle City Light powerline right-of-way and private property. On-site opportunities to conduct wetland creation or restoration at this site may be limited by the requirements of Seattle City Light. The wetland currently consists primarily of mowed wetland grasses. With permission from Seattle City Light, this wetland could be enhanced by removing invasive shrubs and grasses and replanting the site with native wetland species. Potential for wetland restoration exists on privately owned land adjacent to wetland AR-3. Fill material could be removed to connect wetland AR-3 with another wetland located outside of the project limits. Dense blackberry thickets could be removed and replaced with native wetland tree species. Blackberries in the buffer area could also be removed and planted with native upland species to meet the buffer mitigation requirements.

Several mature trees will be removed at the edges of deciduous forest patches. To minimize this impact, trees to be saved will be clearly marked and disturbed sites will be landscaped with native trees and shrubs.

1.8.4 Segment E (Tukwila)

Additional Mitigation Commitments

Alternative E1.1 will result in filling approximately 2 acres of wetland (AR-7, AR-8, AR-14, and AR-18), and will remove approximately 1.6 acres of wetland buffer. The compensation/restoration ratio for these wetland impacts is 1.5:1, therefore approximately 3 acres of wetland mitigation is required. Also, the compensation/restoration ratio for wetland buffer impacts is 1:1, therefore approximately 1.6 acres of buffer mitigation is required. Mitigation could be accomplished on- and/or off-site. On-site mitigation options include:

1. Minimizing the footprint of the new construction through design modification, as practical, will minimize the total wetland impact.
2. Restoring and enhancing AR-7 could provide a portion of the 3.0-acre wetland mitigation requirement. Wetland is AR-7 is situated on three parcels of land that are owned by Burlington Northern Santa Fe railroad, Union Pacific railroad and WSDOT. Fill material adjacent to AR-7

could be excavated to create additional wetland area. Garbage (e.g. building structure, appliances, tires, bed frame) throughout the wetland could be removed and exotic invasive species could be replaced with native wetland species to enhance wetland functions.

Off-site mitigation may be necessary to achieve the 3.0-acre required mitigation ratios. One potential off-site mitigation is AR-41, the headwaters of North Gilliam Creek. The site is located adjacent to the Lewis and Clark Theater in sub-basin 14 in the Gilliam Creek drainage basin (KCM 1986.) Stormwater runoff from the nearly impervious sub-basin flows through vacant land owned by Sterling Realty Organization toward SR-518. This upper reach of the N. Gilliam Creek is incised and colonized by invasive shrub species. The incised slopes could be graded to increase wetland acreage and to detain overland flow. The wetland could be planted with native wetland species that remove pollutants in runoff to improve water quality in N. Gilliam Creek. Additional off-site mitigation could occur in conjunction with fisheries habitat restoration. Off-site, additional mitigation could be accomplished at a different location within the Duwamish River drainage basin. Locations will be selected in coordination with permitting agencies and/or the Watershed Restoration Group.

Several portions of the project in Segment E have potential impacts to fisheries. These include:

1. One long bridge span over the Duwamish River and elevated structure over the Riverton Creek Side Channel project (a separately planned fish habitat improvement/restoration project with a support pier near the Creek channel).
2. Culvert extensions at the headwaters of Riverton Creek and at two locations on Southgate Creek.

The final fisheries mitigation options will be commensurate with the level of the project's residual impacts. Designing and constructing the light rail project in cooperation with the Riverton Side Channel project could minimize or avoid most impacts. If additional mitigation is required, options under consideration would include any one of the following:

1. To compensate for fisheries impacts resulting from the operation of the light rail in Segment E, Sound Transit could help fund a part of the Riverton Side Channel fish habitat restoration project or re-vegetate a segment of the Duwamish River bank.
2. Sound Transit could work with the City of Tukwila regarding restoration projects within the Riverton and Southgate creek drainage basins.
3. The U.S. Army Corps of Engineers, in cooperation with other federal, state, and local agencies has developed a list of priority restoration projects in the Duwamish/Green River drainage basin. These projects include wetland mitigation, off-channel rearing habitat creation, riparian plantings, slope stabilization, water quality enhancement, and fish habitat improvements. Funding for one (or more) of these projects could provide a suitable mitigation option.
4. The Watershed Restoration Group, made up of members of King County, the Army Corps of Engineers, City of Tukwila, and the Muckleshoot Tribe, has published a list of 16 projects in The Green/Duwamish Early Action Habitat Projects report aimed at restoring fish habitat in the Green/Duwamish watershed. Funding (one) of these projects could provide a suitable mitigation option.

1.8.5 Segment F (SeaTac)

The South SeaTac Station Park-and-Ride (options E and F) would result in the loss of up to 4.0 acres of scattered forest and shrub cover on vacant lots. Vegetation removal within vacant lots would not require mitigation because of its low value as habitat or other functions. The park-and-ride lot will be landscaped.

1.9 WATER RESOURCES

1.9.1 Common to all Segments

Stormwater control techniques can mitigate the effects of long- and short-term hydrologic changes. State and local regulations establish standards for detention, retention, and other methods of stormwater control. In general, post-development runoff rates are required to match existing discharge rates which can range from the 2-year up to the 100-yr design storm event, dependent upon the point of discharge. Mitigation is usually accomplished by reducing or attenuating peak runoff rates from a developed site, by either detention (store and release to surface waters) or retention (store and infiltrate or evapotranspirate runoff).

Stormwater detention can provide some water quality benefits through settlement of suspended sediments and other pollutants. Detention facilities do not necessarily require a water quality component to function; however, they are typically combined with water quality facilities when treating runoff from pollution generating surfaces.

Water quality impacts are generally regulated by federal and state guidelines, usually through standards for receiving water quality and limitations on the generation and release of pollutants. Washington State's Department of Ecology (Ecology) has established regulations to protect water quality from point and non-point source pollution. A National Pollution Discharge Elimination System (NPDES) permit will be required for construction and operation of this project. If a general permit is obtained, specific discharge treatments, monitoring, and reporting requirements applicable to individual project sites would be included for park-and-ride and maintenance facilities and stations.

Source controls will be used on developed sites to prevent pollutants from entering stormwater. Source control BMPs are intended to mitigate pollutants generated through normal operation and use of buildings, roadways, park-and-rides, and other urban facilities. Specific source control strategies have been developed for individual contaminants of concern and/or polluting activities. They include the following:

- Preserve natural vegetation
- Establish buffer zones
- Contain wash water or discharge to sewer system
- Maintain permanent seeding or planting on exposed soil
- Maintain spill and fume control at paint facilities
- Maintain oil/water separators

Non-point source pollutants are removed from stormwater when suspended sediments are deposited or trapped when plants uptake dissolved materials in stormwater. As most conventional pollutants sorb to particulates, a significant degree of metals, oil, grease, and nutrients from non-point sources are removed in conjunction with suspended solids. This can be accomplished by using wet ponds, constructed wetlands, or wet vaults. Nutrient pollutants (including phosphorus, nitrogen, and organics) and metals can also be removed through filtration and biological uptake facilities, such as constructed wetlands and biofiltration swales.

Additional mitigation or treatment can be used on a site-by-site basis to remove pollutants. In general, estimates of pollutant loading and treatment system removal efficiencies indicate that mitigation could reduce the concentrations of pollutants (total suspended solids, chemical oxygen demand, metals, and nutrients) expected in runoff, relative to existing levels, on a long-term basis. However, their effectiveness at specific sites should be determined using water quality models.

Additional stormwater detention and treatment is not necessary in Segments B and C because new impervious surfaces in these areas are served by storm drains with adequate capacity.

1.9.2 Segment D (S. McClellan Street to Boeing Access Road)

Mitigation Features of the Preferred Alternative

Stormwater facilities such as detention ponds or vaults could be constructed at the Henderson Street bus layover to mitigate potential hydrologic impacts. The capacity required to meet City of Seattle regulations at this location is approximately 3,300 ft^3, and will require approximately 3,600 ft^2 of treatment.

Widening MLK Jr. Way S. between the tunnel portal and S. Norfolk Street will create new impervious surfaces. Runoff from this area generally drains to the City of Seattle's storm drainage system, except for areas between S. Hanford Street and S. Columbian Way, which drains to a combined sewer and between S. Trenton Street and Barton Avenue S, where it then drains to a CSO. A new storm water collection system will be constructed on MLK Jr. Way S. This collection system will convey storm runoff from the project area to the existing storm drain system (except at S. Henderson Street). Stormwater runoff along MLK Jr. Way S. will be separated from the existing CSO for approximately 4,000 ft between Hanford Street and Columbian Way, which will reduce CSO events and reduce existing impacts to receiving waters. The City of Seattle has indicated that the existing storm drainage conveyance system at the south end of MLK Jr. Way has inadequate capacity. The City has hired a consultant to complete an analysis of the Norfolk basin. The preliminary findings are expected to be issued in the first quarter of the year 2000.

The light rail project will require rebuilding MLK Jr. Way S. to include installation of a new storm drainage collection system. This system will be sized to accommodate the design flows established in the hydraulic study.

Construction of the light rail along MLK Jr. Way S. south of Beacon Avenue will result in a negligible increase in impervious surface area because most of the area adjacent to the existing roadway is either asphalt parking/shoulder or compacted gravel. At the time that the City hydraulic report is completed, Sound Transit will establish the level of its participation in the recommended program of storm drainage improvements, including detention and water quality facilities in the Norfolk basin.

1.9.3 Segment E (Tukwila)

Mitigation Features of the Preferred Alternative

The Boeing Access Road park-and-ride will add approximately 211,000 ft^2 of impervious surface area. Stormwater detention will be provided for the additional impervious area and created by the project. Widening of Tukwila International Boulevard and elevated structures will create an additional 217,000 ft^2 of impervious area. Stormwater facilities such as detention ponds or vaults could be constructed at the Boeing Access Road park-and-ride or parking garage, to mitigate for potential hydrologic impacts. The detention facility will be designed according to the King County Stormwater Manual (1998) and will provide approximately 77,000 ft^3 of storage volume. King County Level 3 standards will be used for the preliminary volume estimates at the Boeing Access Rd. facility because it will discharge to a wetland. Level 3 facilities are designed to protect wetlands by matching both the peaks and duration of storm events up to the 100-yr storm for pre-developed conditions. According to Tukwila's Sensitive Areas Ordinance, stormwater discharge to this wetland will be allowed after a site review.

Water quality treatment such as oil/water separators and/or bioswales will also be provided at the Boeing Access Road park-and-ride facilities to remove conventional pollutants associated with automobile use. Bioswales were designed for each of these sites based on preliminary drawings. Bioswale calculations were made using the method recommended in the King County Surface Water Design Manual (1998), which will treat the 2-year storm event. Bioswales are assumed for water quality treatment because they will require the most surface area, and represent a worst-case scenario for feasibility evaluation. A total area of 3,000 ft^2 (including Boeing Access Road) will be required for the bioswales. Detention will also be provided for sections of track that create new impervious surface area. The specific locations of detention facilities will be determined during final design.

1.9.4 Segment F (SeaTac)

Mitigation Features of the Preferred Alternative

Compared to existing conditions the park-and-ride facility at S. 154th Street (all options) will decrease total impervious surface area and runoff by adding landscaped areas. However, this site will increase total pollutant generating impervious surface and a bioswale (approximately 6,000 ft^2) or other treatment Best Management Practices (BMPs) will be constructed at this site to treat runoff in accordance with the King County Stormwater Design Manual.

Treatment and detention will also be required at the S. 200th Street park-and-ride facility (Options E and F). The detention facility at this site will provide approximately 77,000 ft^3 of volume to meet King County Level 2 standards. The bioswale at this site will be approximately 9,600 ft^2. Final stormwater mitigation will be determined during final design; bioswales were used because they will require the most surface area, and represent a worst-case scenario.

1.9.5 Maintenance Base Sites

Maintenance base sites will reduce existing impervious surfaces at each site. For all maintenance base sites, stormwater runoff will be collected and conveyed to storm sewers. On-site water quality mitigation will include: bioswales or other treatment for runoff from parking lots, treating and recycling wash water, using filters and oil/water separators prior to discharge, requiring spill control in paint shops, and recycling grease.

1.10 ENERGY

1.10.1 Common to all Segments

Mitigation Features of the Preferred Alternative

Sound Transit will incorporate relevant City, County, and Washington State energy code requirements into all design aspects of the system, stations, maintenance facility, and parking areas. Sound Transit will also work with Seattle City Light and Puget Sound Energy to design facilities to conserve electricity.

1.11 GEOLOGY AND SOILS

1.11.1 Common to all Segments

Mitigation Features of the Preferred Alternative

Using the appropriate seismic parameters in the design of the system will reduce the impact of earthquake shaking on the proposed light rail system. Damage due to soil liquefaction will be reduced or eliminated by a number of methods. For at-grade alignments, the ground could be improved by densifying or replacing potentially liquefiable materials that may be present beneath the alignments. The liquefaction prone soils could be designed for by placing the light rail on a raft of non-liquefiable soils, by founding the rails on piles, and/or by planning a maintenance schedule to re-level or repair system components if settlement occurs. Elevated and tunnel alignments generally mitigate liquefaction potential by the design of the structure. The appropriate level of mitigation will depend upon the severity of the liquefaction hazard and the specific light rail components in those areas.

For existing steep slopes along the corridor, mitigation will be accomplished through the application of proper engineering and design.

1.12 HAZARDOUS MATERIALS

1.12.1 Common to all Segments

Mitigation Features of the Preferred Alternative

The project will implement standard operating procedures at the maintenance facility to address management of hazardous materials as part of system operation. These procedures involve development of a programmatic health and safety plan, worker training, materials use planning and tracking, documentation, and a waste management program, in compliance with local and state regulations and permitting requirements.

1.13 ELECTROMAGNETIC FIELDS

1.13.1 Segment B

Additional Mitigation Commitments

Sound Transit, with input from the University of Washington Physics Department, has analyzed several mitigation alternatives, with the goal of developing measures that will reduce the magnitude of the expected magnetic field strength below 0.5 milligauss at the outer wall of the Physics and Astronomy Building. The mitigation measure proposed for implementation involves a specific configuration of the light rail catenary-power feed system in the vicinity of the University of Washington Physics and Astronomy Building.

The catenary system would feed electric power from DC power cables running parallel to and approximately at the level of the northbound and southbound tracks. Both the northbound and southbound catenary systems would be divided into looped segments approximately 72 ft in length. Each looped segment would consist of two tap wires extending from the DC power cables to the ends of the catenary cable segment. The catenary cable would have an electrical resistance approximately 3 to 5 times that of the tap wires. Contact of a train car's pantograph with a segment's catenary cable would create two partial loops, with current flowing clockwise in one partial loop and counterclockwise in the other. The current flow in each partial loop would create a magnetic field, resulting in two fields of opposing directions. As the pantograph moves along the segment with the train's forward motion, one partial loop becomes smaller as the other becomes proportionately larger. The varying length of the partial loops, together with the higher electrical resistance of the catenary cable compared to the tap wires, results in the two opposing magnetic fields partially canceling each other, regardless of where along the segment the pantograph contacts the catenary cable.

Calculations of expected magnetic field strengths with the rails 180 ft below ground level, the near northbound track 105 ft west of the outer wall, and the catenary-power system configured as described above, demonstrate that field strengths would be well below 0.5 milligauss at the outer wall of the University of Washington Physics and Astronomy Building. The specific segment of track over which this mitigation is needed would be refined by Sound Transit during future design phases in collaboration with the University of Washington Physics Department.

1.14 PUBLIC SERVICES

1.14.1 Common to all Segments

Mitigation Features of the Preferred Alternative

Sound Transit will incorporate the following mitigation measures to help ensure system safety and minimize the potential impacts of light rail operation on public services:

- Develop a system safety and security program that defines activities and management controls, plans, and monitoring processes to prevent patrons, personnel, and property from being exposed to hazards or unsafe conditions during light rail operation. The program will be developed in close coordination with local fire, police, and other public service agencies as part of Sound Transit's emergency management plan. The program will also:
    - Incorporate safety considerations, compatible with other system requirements into light rail facilities, equipment, plans, and procedures to minimize the potential for accidents during operation.
    - Identify and eliminate or minimize hazards associated with light rail and eliminate or minimize to ensure acceptable safety levels.
    - Implement a safety certification program that requires all elements of a safe transit system are present before revenue service begins.
    - Maintain a proactive safety philosophy that emphasizes preventive measures over corrective measures to eliminate unsafe conditions.
    - Analyze and use historical data generated by the newer transit properties with characteristics similar to light rail to support the system safety program.
    - Coordinate safety and fire/life safety considerations with reliability, maintainability, and identified testing activities.
- Design and operate stations to provide patron safety and station security through architectural configuration and station design; electronic monitoring, sensing, and communications; and manned surveillance, including the following: (Many of these concepts are designed for deep tunnel stations, but where feasible or deemed necessary will be applied to other stations.)
    - Design stations to be open and spacious, well-lit, and uncluttered with open access and high ceilings.
    - Minimize turns in public circulation areas, avoid or minimize interior columns, and avoid blind corners or nooks that are beyond a patron's or a security camera's field of vision.
    - Provide clear and direct access from a station entry to a station platform by limiting the number of entry points and avoiding long corridors or walkways.
    - Provide uniform lighting throughout the station area and place fare machines in one location per entrance.
    - Install closed circuit television (CCTV) surveillance cameras at strategic locations to effectively cover public areas. CCTV will be located to provide adequate coverage of all entry points; fare machines, money changers, and bank machines; paths from entry to platform, including corridors, stairs, escalators, and entry points to elevators; in elevators of deep tunnel stations; platform areas; emergency telephone locations; and any vending and other self-service areas.

- Install a public address system to provide information to transit passengers. This system will be used in conjunction with CCTVs to address emergencies or antisocial behavior and will provide adequate coverage of all public areas in stations.
- Install passenger assistance telephones that provide direct contact with the central control and monitoring facilities. These phones will likely be located in fare collection and platform areas, near a CCTV camera, and will be prominently identified.
- Provide security personnel to rove between stations. These personnel will likely be contracted with local law enforcement or private agencies, but could also be provided directly by Sound Transit. More precise needs for manned surveillance will be determined as the safety and security program advances.

- Implement system security criteria at and around station sites that enhance patron security through: ensuring maximum visibility of the entrances and the facility from adjacent areas; planting vegetation that does not hinder fields of vision; providing adequate lighting and site accessibility; and provide clear lines of sight of parking lots, adequate illumination, and ease of access for surveillance.
- Provide radio communication capabilities for emergency train operations and police and fire emergencies; provide two-way communication capability from within elevator cabs between the patron and the light rail operations.
- Install and maintain an intrusion and alarm system to protect against unauthorized entry into security sensitive areas of the system such as fare vending machines, traction power substations, and money counting and storage rooms; lock or otherwise prevent access to tunnel and elevated sections when the light rail system is closed wherever possible.
- Develop an emergency management plan in close coordination with Seattle, Tukwila, SeaTac, King County, and Port of Seattle police and fire departments, transportation divisions, and others through Sound Transit's Fire-Life Safety Committee during preliminary and final design, and construction, and operation of the proposed facilities. This plan will provide that reliable emergency access is maintained, alternate plans or routes are developed to avoid delays in response times, and general emergency services are not compromised.
- Work with local police departments to implement crime prevention through environmental design (CPTED) principles when feasible. This could include design elements such as installing appropriate lighting around the station areas, tunnels, parking facilities, and other system facilities, and incorporating other design features to help deter crime.
- Work with local fire and police departments to address training necessary to teach personnel about the light rail system facilities (tunnels, elevated sections, at-grade crossings) and operations.
- Work with local school districts to educate school officials and children about the light rail system and safe street-crossing procedures, especially on at-grade sections.
- To reduce effects on response times, design at-grade tracks and curbs that will physically allow crossing by emergency vehicles if determined appropriate.

1.15 UTILITIES

1.15.1 Common to all Segments

Mitigation Features of the Preferred Alternative

Based on design measures and coordination with utility service providers, impacts to utilities during light rail operation will be minimal. Sound Transit will continue to work with utility providers to minimize

any potential service interruptions and to conserve resources. The light rail project will include the following measures to prevent or minimize potential operational impacts for any proposed alternative on utilities:

- Coordinate with both municipal and private utilities to ensure acceptable and safe relocation of manholes and other access points for ongoing utility maintenance once light rail is in operation; adopt design standards for providing access for repair and maintenance of utilities.
- Design the system to reduce the effect of stray current, install devices to reduce the impact of stray current between the traction system and the utilities facilities, or replace particularly susceptible metallic utility infrastructure with nonmetallic materials.
- Coordinate with affected water utilities and local fire departments to ensure that access to fire hydrants and water use, especially at the maintenance facility, does not compromise flow required for fire protection.

1.16 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Mitigation measures for historic and archeological resources are described in the draft Programmatic Agreement between the FTA, SHPO, and ACHP (see Appendix R).

1.17 PARKLANDS

1.17.1 Segment D (S. McClellan Street to Boeing Access Road)

Mitigation Features of the Preferred Alternative

Improvements to Cheasty Boulevard will be prepared in consultation with the Seattle Parks Department. Improvements will include:

- New sidewalks, landscaping, lighting, and street trees along Cheasty Boulevard in the light rail station area in a manner compatible with the documented Olmsted design concepts for Seattle's boulevards.
- Reconnecting the Olmsted-designed Cheasty Boulevard and Mt. Baker Boulevard by providing at-grade pedestrian and bicycle access across Rainier Avenue S. and MLK Jr. Way S.
- Minimizing to the extent practicable the physical encroachment into the right-of-way of Cheasty Boulevard.
- Minimizing to the extent practicable the obstruction of views from Cheasty Boulevard toward Mt. Baker Boulevard.

2. Construction / Short Term Mitigation

2.1 TRANSPORTATION

2.1.1 Common To All Segments

All mitigation measures will comply with local regulations governing construction traffic control and construction truck routing. Sound Transit will finalize detailed construction mitigation plans in close coordination with local jurisdictions, King County Metro, and other affected agencies and organizations. Mitigation measures for traffic and freight impacts due to light rail construction will include the following practices:

- Follow standard construction safety measures, such as installation of advance warning signs, highly visible construction barriers, and the use of flaggers.
- Post advance notice signs prior to construction in areas where surface construction activities will affect access to surrounding businesses.
- Provide regular updates to assist public school officials in providing advance and ongoing notice to students and parents concerning construction activity near schools.
- Coordinate street sweeping services in construction areas with construction activity, particularly areas with surrounding residential and retail development.
- Use lighted or reflective signage to direct drivers to truck haul routes, to provide visibility during nighttime work hours.
- As possible, schedule traffic lane closures during off-peak hours to minimize delays during periods of higher traffic volumes.
- Cover potholes and open trenches during non-construction hours where possible, and use temporary concrete or other protective barriers to protect drivers from trenches remaining open.
- Post advance warning and install temporary traffic cones and markings to provide that peripheral surface activities do not adversely affect pedestrian and bicycle traffic.
- Develop a multi-media public information program (e.g. print, radio, posted signs and electronic web page) to provide information regarding street closures, hours of construction, business access, and parking impacts.
- Provide temporary parking to mitigate loss due to construction staging or work activities, where practical.
- Work with King County Metro to post informative signage well before construction at existing transit stops that will be affected by construction activities, and to identify ways to relocate and/or close affected transit stops.
- Work with King County Metro to identify ways to relocate or modify trolley wires in coordination with in-street excavation and construction, to allow electric trolley buses to continue operating during construction.

These mitigation measures apply to all segments in the light rail corridor and all maintenance base options. Segment-specific construction mitigation measures have been identified for Segments B and C only, as described in the following sections.

2.1.2 Segment B (University District to Westlake Station)

To minimize the impact of high truck volumes in the Pacific Station area, tunnel spoils will be barged from Portage Bay for removal and disposal during the construction period if permits can be obtained.

2.1.3 Segment C (Westlake Station to S. McClellan Street)

Closure of the Downtown Seattle Transit Tunnel (DSTT) will be required for a period of up to 26 months, during which time downtown streets will need to accommodate the buses that currently operate in the DSTT. Surface street modifications necessary to maintain acceptable operating levels will be completed before closing the DSTT. Construction of the pre-closure surface street improvements may require up to 12 months.

Impacts of the DSTT closure and improvements to mitigate the impacts on both transit riders and automobile users are summarized in section 1.1.3 (Segment C – Mitigation Features of the Preferred Alternative) and discussed in more detail in the Final EIS and the Transportation Technical Report.

Based on the Downtown Seattle Surface Report, published on April 14, 1999, bus routes that currently use the DSTT will be reassigned to Second, Third, and Fourth avenues to group routes serving similar rider markets, provide higher service frequency, and simplify bus routes through downtown. A monitoring program and strategies will be developed that can be used to modify and change the downtown street operations if needed during construction. Sound Transit will work with the Downtown Seattle Association and other interested parties to develop a campaign to promote the downtown area during the construction period.

Construction activities in Segment C will impact BNSF railroad activity, especially north of Lander Street. Coordination with the railroad will be necessary to minimize impacts during construction.

2.2 LAND USE AND ECONOMICS

2.2.1 Common To All Segments

Mitigation measures that will reduce impacts to local businesses during project construction include:

- Establishing effective communication with residents and businesses; develop and implement a public relations plan that will provide that local residents and businesses are fully informed about potentially significant disruptions, such as temporary street closures, changes in transit service, and parking availability. Sound Transit will work with community and neighborhood groups prior to and through the construction process to identify types of impacts that would occur and to work on ways to reduce those impacts.
- Provide a community ombudsman.
- Minimizing construction-related noise, vibration, dust and dirt impacts through appropriate construction methods to minimize impacts during periods of increased sensitivity. Maintain access to businesses during construction activities.
- Clearly identify and make accessible paths to and from major transportation facilities, such as designated pedestrian routes, bicycle lanes, bus routes and stops, designated truck routes, and tunnel entrances.
- Working with affected business owners, chambers of commerce, merchants associations and others to develop a business marketing program to minimize business losses during construction. The program could include a shuttle bus and/or increased transit service to affected areas, additional signage, advertising and promotion, and incentives to attract and retain customers.

- Requesting the assistance of local ethnic community organizations to help tailor business marketing programs to the specific needs of ethnic business owners whose customers are mainly from a single ethnic group.
- Providing business cleaning services on a case-by-case basis.
- Working with Community Capital Development and/or similar organizations to assist affected businesses in gaining access to technical assistance and small business loans or grants.
- Developing a 24-hour monitoring center that provides telephone access for the public to get construction information and to make complaint and incident reports.
- Developing a mitigation commitment tracking system that would provide a computerized record of all mitigation commitments and a means to track progress toward meeting those commitments.

2.3 ACQUISITIONS, DISPLACEMENTS AND RELOCATIONS

Mitigation for acquisitions, displacements and relocations is described in Section 1.3.1.

2.4 NEIGHBORHOODS

2.4.1 Common To All Segments

Noise, vibration, visual, aesthetic, and traffic impacts during construction could temporarily affect neighborhood quality. Physical barriers to isolate construction sites from traffic lanes would likely restrict access across arterials on elevated and especially at-grade sections during construction. Although signed detour routes will be provided, access to community facilities (e.g., Swedish Hospital, Franklin High School, the Columbia Library, the Southeast Neighborhood Service Center, and the Seattle School District Head Start Program; and Highline Community Hospital, Foster High School and Library) could become more circuitous. Some delays could occur along school bus routes in Tukwila and along or off of MLK Jr. Way S. Mitigation for these impacts is described in other sections of this chapter.

2.5 VISUAL RESOURCES

2.5.1 Common To All Segments

Temporary lighting will be necessary for nighttime construction of certain project elements or at tunnel portals and along surface or elevated alternatives in existing road or highway rights-of-way (to minimize disruption of daytime traffic). This temporary lighting could impact residential areas by exposing residents to uncomfortable glare from unshielded light sources, or by increasing ambient nighttime light levels. Temporary lighting impacts will be reduced by shielding light sources to block direct views from residential areas, and by aiming and shielding to reduce spillover lighting in such areas.

2.6 AIR QUALITY

2.6.1 Common To All Segments

Construction activities primarily generate particulate matter (PM_{10} and $PM_{2.5}$), as well as small amounts of CO and NO_X from construction machinery exhaust and vehicular traffic delayed in construction zones. Specific sources of particulate would be dust from earth moving-excavation activities (termed fugitive dust) and diesel smoke and odors created during paving of station areas, parking lots, and roads.

The Puget Sound Clean Air Agency enforces air quality regulations in King County, including those for controlling fugitive dust (Regulation 1, Section 9.15). Contractors engaged in construction activities must comply with this regulation, which requires the use of best available control technology to control fugitive dust emissions. Controls used to meet this standard may require the following actions:

- Use water spray as necessary to prevent visible dust emissions—particularly during demolition of brick or concrete buildings by mechanical or explosive methods.
- Minimize dust emissions during transport of fill material or soil by wetting down or by ensuring adequate freeboard on trucks.
- Promptly clean up spills of transported material on public roads by frequent use of a street sweeper machine.
- Cover loads of hot asphalt to minimize odors.
- Schedule work tasks to minimize disruption of the existing vehicle traffic on streets.
- Keep all construction machinery engines in good mechanical condition to minimize exhaust emissions.

2.7 NOISE AND VIBRATION

2.7.1 Common To All Segments

Noise Mitigation

Several methods of noise mitigation are available for the contractor to use that will help keep noise level increases and impacts to a minimum. Operation of construction equipment can be limited within 1,000 ft. of any occupied dwelling unit at night (10:00 P.M. to 7:00 A.M.) or on Sundays or legal holidays, when noise and vibration will have the most severe effect. All engine-powered equipment will be required to have mufflers installed according to the manufacturer's specifications and all equipment will be required to comply with pertinent equipment noise standards of the U.S. EPA. Whenever feasible, noise barriers will be built between the construction site and nearby noise sensitive receiver locations. During nighttime work, either smart backup alarms or spotters will be used to reduce noise from equipment operating in reverse gears. Sound Transit will limit activities that produce the highest noise levels, such as hauling, jack hammering and the use of other demolition equipment to daytime hours of 8:00 A.M. to 5:00 P.M. As stated, maximum noise levels associated with pile driving could reach 105 dBA at distances of 50 ft. Mitigation of the noise associated with pile driving could include auguring, rather than driving piles, or limiting the time during which the activity can take place.

Sound Transit will work with the each of the cities along the alignment and the State of Washington to establish variances to noise control regulations where necessary to address conditions specific to the project.

Vibration Mitigation

The construction contract specifications will contain a section specific to vibration, and include, at a minimum, vibration monitoring of all activities that may produce vibration levels near the U.S. DOT maximum recommended vibration level whenever there are structures located near the construction activity. This would include pile driving, vibratory sheet installation, soil compacting, and other construction activities that have the potential to cause high levels of vibration.

Vibration mitigation could include limiting the hours when the vibration producing equipment can be used near sensitive receivers. Mitigation for the tunnel-boring machine may not be necessary due to the geologic conditions and type of machine expected to be used for the project. Elimination of vibration

related to pile driving is not feasible, however, the use of an augur to install piles instead of a pile driver will greatly reduce the noise and vibration levels. By restricting and monitoring vibration-producing activities, vibration impacts from construction will be kept to a minimum.

During high vibration-producing activities such as pile driving and shoring installation, there is a potential for settlement and small movements of nearby structures. Design and installation of suitable shoring systems and other mitigations will reduce the potential of settlement related damage. Other mitigation includes underpinning adjacent structures, installing recharge wells to reduce dewatering induced settlement, and/or re-leveling and repairing impacted areas following construction. In addition, pre-construction condition surveys and during-construction monitoring programs for neighboring structures will be conducted and repairs made as necessary.

2.7.2 Segment B

Construction Noise

Since the alignment in this segment is wholly in tunnel, noise and vibration impacts are expected primarily at station locations, where construction staging for tunnel and station construction will occur. Major noise sources associated with the construction of Segment B include the haul trucks, loaders, cranes, excavators, and tunnel locomotives. Other noise producing sources such as compressors, conveyors, back-hoes, generators, fans and blowers, and light duty vehicles will also be required. The tunnel boring machine is also a major source of noise, however the noise should not be audible at the surface once the machine is underground. Current plans call for major construction staging areas to be located near the entrance to the existing bus tunnel at the existing Convention Place Station and at the Pacific Station on Portage Bay. Additional staging areas will also be placed at the three station locations, N.E. 45th Station (options B and C), Capitol Hill Station (Options A, B, or C), and First Hill Station. An additional staging area will also be needed at the SR 520 vent shaft. Mitigation for construction noise at these locations is the same given in Section 2.7.1, with the following additions:

Pacific Staging Area: The Pacific Station staging area is proposed as a major construction staging area. There are several noise sensitive land uses in the vicinity, including the University of Washington and residential buildings. Major noise producing construction activities that are expected to take place here that were not discussed in Section 2.7.1 include operation of tunnel boring machine(s), major loading and hauling of tunnel spoils, the use of locomotives to transport workers and supplies in and out of the tunnel, stock piling of spoils, tunnel ventilation using large vanaxial fans and support for general tunneling activities.

Convention Place Staging Area: The Convention Place staging area is proposed as a major construction staging area. There are several noise sensitive land uses in the vicinity, including the Camlin Hotel and the Tower 801. Other sensitive uses include the Washington State Convention Center, the Paramount Theatre and miscellaneous retail and commercial use structures. Major noise producing construction activities that are expected to take place here that were not discussed in Section 2.7.1 include operation of tunnel boring machine(s), major loading and hauling of tunnel spoils, the use of locomotives to transport workers and supplies in and out of the tunnel, stock piling of spoils, tunnel ventilation using large vanaxial fans and support for general tunneling activities. Because of the close proximity of noise sensitive land use at this location some more creative forms of construction noise mitigation may be necessary. Additional mitigation may include portable noise barriers and enclosures, low pressure fan silencers, vulcanized belts on all conveyors, and restrictions on haul truck speed.

Construction Vibration

Major vibration producing activities and equipment that could be used in Segment B include tunnel excavation using a boring machine, tunnel and shaft excavation by conventional methods, and soil compacting. Other vibration producing construction activities such as pile driving and vibratory support

and sheet installation are not expected in this segment. Other less notable vibration producing sources include haul trucks, loaders, cranes, excavators, and tunnel locomotives. As stated, mitigation of vibration is not always possible, and in many cases vibration monitoring and restriction of specific activities during those time when they would be most disturbing is the only recourse. For the majority of the Segment B alignment, the tunnel is deep enough to allow for 24 hour, 7-day a week boring with minimal impacts. The three locations may have potential for vibration impacts due to tunneling are the N.E. 45th Station staging area, the Capitol Hill Station, and the Pacific staging area. Mitigation and monitoring of vibration producing activities, as described in Section 2.7.1 and above should be sufficient for vibration control in these areas with the following additions:

Pacific Station: Vibration sensitive receivers near the Pacific Station include the University of Washington facilities and residential uses. Because of the close proximity of some of the uses to activities such as construction of the elevator shafts, the potential for temporary vibration impacts could be high in this area. Sound Transit will establish a dialog with the nearby sensitive receivers, and monitor vibration producing activities. This along with the mitigation measures described previously, will help to limit impacts and disruptions due to construction vibration.

First Hill Station: Vibration sensitive receivers near the First Hill Station include the Swedish Hospital, the Virginia Mason Hospital, the Fred Hutchinson Cancer Center and some nearby commercial and residential land uses. Because of the close proximity of some of the hospitals and activities such as construction of the elevator shafts, the potential for vibration impacts is high in this area. Sound Transit will establish a dialog with the nearby hospitals and any other sensitive use identified, and monitor vibration producing activities. This along with the mitigation measures described previously, will help to limit impacts and disruptions due to construction vibration.

Convention Place Staging Area: Vibration sensitive land use near the Convention Place staging area include residential and hotel, and potentially some theaters. Mitigation and monitoring of vibration producing activities, as described in Section 2.7.1 and above should be sufficient for vibration control in this area. If specific complaints are received, mitigation could include restricting some vibration producing activities during nighttime hours when the impacts would have the greatest affect on the nearby sensitive land uses.

2.7.3 Segment C

Construction Noise

Major noise sources associated with the construction of Segment C include the tunnel boring machine, haul trucks, loaders, cranes, excavators, and tunnel locomotives. Other noise producing sources such as compressors, conveyors, back-hoes, generators, fans and blowers, and light duty vehicles would also be required. Current plans call for a major construction staging areas to be located west of I-5 at the west portal, and at the Rainier Valley Portal. An additional staging area will also be placed at the Beacon Hill Station. Mitigation for construction noise at these locations is the same given in Section 2.7.1 with the following addition:

Beacon Hill Section and Beacon Hill Station and Rainier Valley Tunnel Portal: Land use around the Beacon Hill Station includes residents, churches and schools, and is considered an area with a high potential for construction noise impacts. Having 24-hour shifts at this location may not be possible without constructing permanent barriers and limiting nighttime activities. Land use at the Rainier Valley tunnel portal includes residential to the west, and commercial and retail to the south and east. Because the residential area to the west is up hill from the portals and construction staging areas, mitigation of noise from the staging areas may be difficult. Until the existing environment at these locations are established through field measurement, it should be assumed that construction activities at this location should be limited to 7:00 A.M. to 10:00 P.M., on weekdays, and 9:00 A.M. to 10:00 P.M. on weekends, meeting the local noise control ordinance. With the assistance of field measurements, and necessary noise mitigation

measures, it may be possible to extend the working hours. Also, because the roadways are lined with residential land use, no spoils hauling will be performed after 7:00 P.M. These mitigation measures, along with those given in Section 2.7.1, should keep noise impacts to a minimum

Construction Vibration

Major vibration producing activities and equipment likely to be used in Segment C include tunnel excavation using a boring machine, tunnel and shaft excavation by conventional methods, and possible soil compacting or pile driving. Other less notable vibration producing sources include haul trucks, loaders, cranes, excavators, and tunnel locomotives. A construction vibration monitoring program along with public meetings and the vibration mitigation measures given in Section 2.1.2 are recommended in this area.

2.7.4 Segment D

Construction Noise

Because the alignment is at-grade through this segment, construction noise levels are not expected to be as high as projected for the tunnel construction staging areas. As sections of track are finished, the construction activity will move away and begin working on other sections.

Because of the levels of existing traffic on MLK Jr. Way S., nighttime construction activities are likely. By performing existing conditions noise level monitoring and applying the appropriate noise mitigation measures, nighttime construction activities could be performed. Mitigation measures could include temporary noise barriers and restriction of certain types of activities, such as excavation and demolition. The mitigation measures provided in Section 2.7.1, along with information provided here, should be sufficient to mitigate construction noise levels along Segment D.

Construction Vibration

The only major vibration producing activities expected in this segment are pavement demolition and soil compacting the track bed prior to track installation. The vibration mitigation measures provided in Section 2.7.1 should be keep any vibration impacts to a minimum.

2.7.5 Segment E

Construction Noise

Construction noise, and the potential for noise impacts, are the same as given under Segment D construction noise. Construction of the elevated section of the alignment could involve the use of pile driving, which can cause noise levels in excess of 100 dBA at nearby noise sensitive receivers. Therefore, pile driving, if used, will be performed only during daytime hours. Otherwise, the mitigation measures provided in Section 2.7.1 should be sufficient to mitigate construction noise levels along Segment E.

Construction Vibration

The vibration mitigation measures provided in Section 2.7.1 should keep any vibration impacts to a minimum.

2.7.6 Segment F

Construction Noise

No significant construction noise impacts are projected in this segment due to the high existing noise levels and commercial land use boarding most of the alignment. For those areas where either residential or hotel/motel land use exist, mitigation measures provided in Section 2.7.1 and under Segment D will help to reduce noise impacts.

Construction of the elevated section of the alignment could involve the use of pile driving. As previously stated, pile driving can cause noise levels in excess of 100 dBA at nearby noise sensitive

receivers. Therefore, pile driving, if used, will be performed only during daytime hours. The mitigation measures provided in Section 2.7.1, along with information provided here, should be sufficient to mitigate construction noise levels along Segment F.

Construction Vibration

Construction activities and vibration levels for the at-grade tracks are the same as given under Segment D and in Section 2.7.1. No significant construction vibration impacts are projected in this segment. For the elevated section of trackway, vibration from pile driving may result in vibration impacts at nearby receivers. Limiting the hour of pile driving along with the other vibration mitigation measures given in Section 2.7.1 should be sufficient to minimize vibration impacts from project construction in this segment.

2.7.7 Maintenance Base Site

No construction noise or vibrations impacts are expected at any maintenance base site.

2.8 ECOSYSTEMS

2.8.1 Common To All Segments

Mitigation for short-term ecosystem impacts will be based on a hierarchy of avoiding and minimizing impacts and compensating for unavoidable adverse impacts. The implementation of best management practices (BMPs) such as silt fencing, stabilizing exposed soils, landscaping with native plants, marking the limits of clearing, and collecting runoff during construction would minimize impacts on wetlands, wildlife, and fish. Additional mitigation measures are described below.

In many instances, construction timing can reduce or eliminate impacts on wetlands, fish habitat, and threatened and endangered species. Restricting construction in wetland areas to the drier summer months minimizes the impact on those wetlands that flood only during winter and early spring months and reduces wetland impacts caused by stormwater runoff. Staging areas should be located outside of wetlands or potential wildlife habitat.

Impacts on some fish species may be avoided by constructing bridges using methods to avoid in-water work. If in-water work is required, it should be conducted while anadromous fish species are not migrating though the project area. Construction windows would be established by the appropriate regulatory agencies. The hydraulic project approval permit will specify construction periods. To avoid sediment runoff to the Duwamish River and its tributaries and adverse effects on salmonids and other fish species, a temporary erosion and sedimentation control plan and BMPs would be implemented (see Water Resources). At construction sites over or near the river and its tributaries, water quality could be measured regularly throughout the construction period to ensure control measures are in place and functioning properly.

2.8.2 Segment B (University District to Westlake Station)

The removal of tunnel spoils through trucking and/or barging could result in decreases in water quality from increased truck traffic and run-off from sediment stockpiles.

Impacts resulting from barging the tunnel spoils could include: potential increases in predation on juvenile salmonids in the vicinity of proposed mooring dolphins for spoils barges; shading and noise disturbance of near shore habitat due to placement of barge facility; placement and removal of dolphins could result in decreased water quality and a disturbance of bottom sediments and habitat; and decreased water quality in the vicinity of the barge due to sediment runoff from the site and/or the barge.

Potential impacts from barging tunnel spoils can be mitigated by using a closed conveyor system over open-water portions to load spoils onto barges. The barge loading facility will be located as far off shore as possible to minimize impacts to nearshore juvenile salmon migration routes. Newly constructed dolphins

will be removed upon completion of construction. In all cases adherence to in-water timing restrictions for placement and removal of pilings would be required. Modifications could be made to barges to control runoff including watertight walls. Walls on the barges could be raised, lengthened, or otherwise modified to contain material. Curbs could be added at access openings to better control standing water on the deck. Appropriate barge modifications and adherence to BMPs would minimize water quality impacts. A silt curtain could be placed around the barge while it is at the terminal to limit the area affected by accidental loss of material into the water. Any compensatory mitigation that may be required would be provided at level commensurate with the residual impacts. This mitigation may include funding studies to evaluate the effectiveness of strategies to eliminate populations of bass in the Ship Canal.

Potential impacts from trucking tunnel spoils can be mitigated by implementation and strict enforcement of BMPs to control sediment runoff along the truck route and at the stockpile site.

2.8.3 Segment E (Tukwila)

Wetland impacts that may occur during construction in this segment include increased sediment runoff from exposed soils and placement of temporary access roads through wetlands. Mitigation for these impacts include the best management practices and timing restrictions identified at the beginning of this section. Additional mitigation for impacts at wetland AR-17 could include wetland enhancement. This could be achieved by removing fill that was previously placed in the wetland and planting the site with native species.

Potential impacts on fisheries resulting from the construction of the preferred alternative in this segment in the vicinity of the Duwamish River and Riverton Creek side channel include: increased sediment runoff from exposed soils, disturbance of fish in the vicinity of over-water work, and removal of riparian vegetation. Construction at the headwaters of Riverton and Southgate creeks could cause increased sediment runoff from exposed soils, riparian vegetation removal and disturbance of fish. Measures to minimize temporary impacts on fisheries are described as common to all segments (see Section 2.8.1). These measures would be particularly important in this segment due to the proximity of the Duwamish River and its tributaries to the proposed project. Mitigation for impacts resulting from construction of the light rail in this segment would be included in the mitigation plan for long-term fisheries impacts. Coordination for construction and design of the Riverton Creek Restoration Project and light rail project will reduce impacts.

2.9 WATER RESOURCES

2.9.1 Common To All Segments

Water quality degradation resulting from erosion and sedimentation and the release of pollutants during construction will be minimized through the use of BMPs. An NPDES permit will be required for construction activities associated with this project. The NPDES permit requires development of a Storm Water Pollution Prevention Plan (SWPPP) for erosion and sedimentation control and for control of pollutants other than sediment. The SWPPP documents all of the BMPs recommended for specific construction sites. Table 2.9-1 summarizes general BMPs that are recommended for construction sites.

Further requirements that would apply to specific construction sites would limit in-water construction to designated construction periods. A variety of special BMPs are also available to mitigate construction impacts at crossings or adjacent to streams or watercourses. In addition, temporary creek bypasses should be constructed to route creek water around work sites during pipe replacement or extension. Bypasses would be designed to handle high flows during storm events.

Table 2.9-1 Temporary Erosion and Sediment Control Best Management Practices

Category	Applicable BMPs
Preventative practices	Preservation of existing vegetation
	Identification and delineation of sensitive areas
	Buffers
Temporary cover practices	Temporary seeding
	Straw mulch
	Bonded fiber matrices
	Clear plastic covering
Structural erosion control BMPs	Stabilize construction entrance
	Tire wash
	Construction road stabilization
	Dust control
	Interceptor dike and swale
	Check dams
Sediment retention	Filter fence
	Storm drain inlet protection
	Sedimentation basins

2.9.2 Segment B (University District to Westlake Station)

The preferred alternative could impact Portage Bay and Lake Union water quality during construction of the tunnel. During construction, tunnel spoils would be trucked or barged off-site. Spills associated with this process, and spoils will be taken to an approved and permitted facility. That site will have all the BMPs. If they occur, impacts are expected to be minor and temporary and will be mitigated by applying BMPs as described above.

Dewatering of the tunnels could impact water quality at the discharge points. Construction water will be pre-treated prior to discharge in either the storm or sanitary sewer systems in accordance with permits and regulations.

2.9.3 Segment E (Tukwila)

Several proposed actions within this segment could cause short-term impacts to water quality unless mitigated. The preferred alternative will require construction of a bridge over the Duwamish River; this will take approximately 12 to 18 months to complete. Potential spills could impact Duwamish River water quality. On Riverton Creek vegetation removal, soil compaction, and potential spills could increase water temperatures and turbidity. Construction of a retaining wall north of S. 139th Street along Tukwila International Boulevard could generate sediments from bank erosion and remove vegetation that blocks downstream culverts or be the source of spills that impacts the water quality of the stream. BMPs for in-stream work and sediment and erosion control will be implemented during construction and fill activities near river and creek crossings and those activities associated with culvert extensions (see BMPs in Section 2.9.1).

2.9.4 Maintenance Base Sites

With construction practices described in section 2.9.1 maintenance facility construction is not expected to have any significant impacts to water resources.

2.10 GEOLOGY AND SOILS

2.10.1 Common To All Segments

To control erosion during construction, contractors will employ BMPs within the construction limits. These BMPs would be consistent with Subsection K of Section 80 of the King County Sensitive Area Ordinance (King County, 1990), as amended, and other local ordinances, and should include the following:

- Minimize areas of exposure.
- Retain vegetation where possible, especially on steeper slopes.
- Seed or plant vegetation that is appropriate on exposed areas as soon as work is completed.
- Route surface water through temporary drainage channels around and away from disturbed soils or exposed slopes.
- Use silt fences, temporary sedimentation ponds or other suitable sedimentation control devices to collect and retain possible eroded material.
- Cover exposed soil stockpiles and exposed slopes with plastic sheeting, as appropriate.
- Use straw mulch and erosion control matting to stabilize graded areas and reduce erosion and runoff impacts to slopes.
- Intercept and drain water from any surface seeps if they are encountered.
- Incorporate contract provisions allowing temporary cessation of work under certain, limited circumstances, if weather conditions warrant.
- Install final retaining walls in front of cut-and-fill slopes as soon as scheduling permits.

Underground construction will generate large volumes of spoils. Potential impacts include erosion at stockpile and disposal sites. Erosion mitigation is discussed above.

For tunneling and mined stations, standard mitigation measures will minimize the erosion potential of the spoils and stockpiles. Using barges to remove spoils near Portage Bay will reduce upland stockpile volumes and thus the potential for construction-related erosion. A closed-face, positive pressure TBM could reduce the need for dewatering during tunneling. Using the mitigations discussed for construction-induced vibrations and settlement will help to alleviate settlement-related impacts.

2.11 HAZARDOUS MATERIALS

2.11.1 Common To All Segments

A formalized health and safety plan and a contaminated soil and groundwater management plan will be required before construction work begins. Public health and safety measures will be implemented to minimize exposure through both airborne and direct contact routes. Increased setbacks, additional barriers to public access, and expeditious removal of contaminated materials may be required to limit contact by the public. The health and safety plan will also identify measure to ensure construction worker safety, outline emergency medical procedures, and specify reporting requirements.

The soil and groundwater management plan will specify methods and procedures for stockpiling, transportation, disposal, and treatment of contaminated soil, as well as groundwater removal, storage, treatment, discharge (to sewer), transportation, and disposal. Most encounters with hazardous materials are expected to involve petroleum products that can be managed using relatively standardized approaches.

Throughout the construction process, encounters with hazardous materials will be documented and reported appropriately. Project planning will accommodate regulatory agency requirements as well as disposal or treatment facility requirements.

2.11.2 Segment B (University District to Westlake)

Soil borings indicate contaminated ground and groundwater at several locations along the underground alignment. Handling of contaminated material encountered during tunnel and station excavation and contaminated groundwater pumped during dewatering will be handled per techniques described in Section 2.11.1.

2.11.3 Segment E (Tukwila)

The preferred alternative will be elevated over two soil petroleum release sites and one groundwater petroleum release site, and at-grade over three contaminated soil sites. Impacts will be mitigated using techniques described in Section 2.11.1.

2.11.4 Maintenance Base Sites

Based on reported conditions at each site, the M1-A s. Lander Street site appears to have the lowest potential for construction impacts associated with existing hazardous materials releases. Site M1-A has a small amount of petroleum-contaminated soil. The M1-B S. Lander Street site includes three groundwater and two soil petroleum release sites. The M1-C Atlantic /Central A site has had one petroleum release to groundwater. The M1-D and M1-E Rainier Brewery sites have had two petroleum releases to soil. Both alternatives are situated on top of a historic landfill with reported releases to groundwater. The N.E. Boeing Access Road (M2) site has had one release of gasoline and diesel oil to groundwater with some floating product noted, and one release of heating oil, which has reportedly been cleaned up. The S.W. Boeing Access Road (M3) site has reported gasoline releases to soil, but groundwater has not been investigated. A firing range was located on the site and there is potential for lead contamination (no characterization data are available). Based on reported conditions, the M1 S. Lander Street site appears to have the lowest potential for construction impacts to hazardous materials. All impacts will be mitigated using techniques described in Section 2.11.1

2.12 ELECTROMAGNETIC FIELDS

There will be no electromagnetic impacts or mitigation during construction.

2.13 PUBLIC SERVICES

2.13.1 Common To All Segments

Sound Transit will continue to work with the cities of Seattle, Tukwila, SeaTac, King County, University of Washington, and Port of Seattle police and fire departments, transportation divisions, and others through Sound Transit's Fire-Life Safety Committee during project construction to ensure that reliable emergency access is maintained and that alternate plans or routes are developed to avoid significant delays in response times. Sound Transit will coordinate with local police departments to ensure adequate staffing during construction for traffic and pedestrian movement control and other necessary policing efforts. Additional staffing requirements and financial responsibilities for police services required during construction will be determined in collaboration with the local police departments. Sound Transit will coordinate with fire departments and hospitals during water utility relocations (see Utilities) to prevent water supply disruptions to these facilities, and it will notify school districts of major construction activities

that may affect bus routing during the upcoming school year. Alternative solid waste collection locations, modified collection times, or other elements to minimize potential impacts to solid waste collection operations will be developed in coordination with solid waste haulers. Mitigation for construction of a maintenance base will be similar to that described above.

2.14 UTILITIES

2.14.1 Common To All Segments

Primary measures to mitigate impacts to utilities during construction include identifying affected utilities, developing technical solutions to relocate or protect them, identifying funding sources, developing a work plan that minimizes impacts on both utility service and light rail construction, and minimizing potential interference between light rail and utility operation and maintenance functions. These measures include the following:

- Sound Transit will seek to establish formal agreements with local jurisdictions, including requesting enforcement of applicable provisions of existing franchise, license, and other utility agreements to allow light rail implementation.
- Sound Transit will provide utility relocation benefits associated with relocation of existing city-owned utilities in accordance with city code or charter provisions. Incremental costs of upgrades will be funded by the city.
- Compensation for relocation of private utilities in public rights-of-way will be funded by the utility, unless Sound Transit finds the relocation costs constitute an "extraordinary expense." This would unfairly burden the utility, in accordance with the agency's Real Property Acquisition and Relocation Policy, Procedures, and Guidelines and applicable state and federal law.
- If construction disrupts private utilities within the private utility's easement or on private property, Sound Transit will provide utility relocation benefits.
- General utility relocation and protection methods for crossings parallel and installations have been established.
- Sound Transit will use utility company base maps as the primary source of the utility information and conduct a limited program of field surveys and reconnaissance to check accuracy of utility locations before final design and construction. The agency will request that utility companies review the accuracy of the base maps.
- Sound Transit may complete design of private utility relocations in public rights-of-way in accordance with the utility's criteria and Sound Transit guidelines. If conflicts arise, the more restrictive provisions will govern.
- Utilities relocated or protected in conjunction with light rail will be turned over to the utility company to own, operate, and maintain.

In addition, the following measures are proposed:

- Continue to meet with and coordinate closely with both municipal and private utilities to ensure minimal impact to utilities during construction, including acceptable and safe relocation of manholes and other maintenance access points.
- Work with Seattle City Light and Puget Sound Energy to maintain energized electrical lines to provide continuous service to their customers during construction; and maintain clearances of temporary and permanent overhead lines and poles according to Washington Administrative Code safety standards.
- Develop a contingency plan to address any potential utility service disruptions during construction and notify utility customers of planned disruptions, if any.

- Comply with city requirements and procedures for utility construction, inspection, and operation; coordinate relocations and large service connections with Seattle's Utility Coordinating Committee and similar entities.
- Use temporary pipe support, trench sheeting and shoring, and other precautionary measures during construction to minimize the potential for damage to exposed utilities.

Mitigation for construction of a maintenance base would be similar to that described above.

2.15 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Mitigation measures for historic and archaeological resources are described in the draft Programmatic Agreement between the FTA, State Historic Preservation Officer, and Advisory Council on Historic Preservation. See Final EIS Appendix R.

2.16 PARKLANDS

Mitigation for the loss of vegetation in parks and greenbelts is discussed in Section 1.8.

2.16.1 Segment B (University District to Westlake Station)

Construction activities around staging areas may temporarily restrict access to parklands. Where feasible, alternative access will be provided. Construction activities would also generate noise, dust, and truck traffic that could have an adverse effect on the Burke-Gilman Trail and around Nagle Place. Mitigation measures for these impacts are discussed in other sections.

2.16.2 Segment D

Construction of the elevated structure across Cheasty Boulevard, and the McClellan Station (options B and C) immediately north of the boulevard, may require temporary street closures and impede access to the boulevard. To the extent feasible, closures will be minimized and temporary access will be provided. Construction activities would also generate noise, dust, and truck traffic that could have an adverse affect on the boulevard. Mitigation measures for these impacts are discussed in Section 2.1, 2.6, and 2.7.

Sound Transit
Central Link Light Rail Final EIS

APPENDIX R
Draft Programmatic Agreement

DRAFT

PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL TRANSIT ADMINISTRATION,
WASHINGTON STATE HISTORIC PRESERVATION OFFICER,
AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING DEVELOPMENT OF
THE CENTRAL LINK LIGHT RAIL TRANSIT PROJECT
IN THE STATE OF WASHINGTON

WHEREAS, the Central Puget Sound Regional Transit Authority (Sound Transit) proposes to construct the Central Link Light Rail Transit Project (Project) within the cities of Seattle, Tukwila and SeaTac, and the Project is requesting funding from the Federal Transit Administration (FTA); and

WHEREAS, FTA has consulted with the Washington State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (Council) pursuant to Section 106 of the National Historic Preservation Act (NHPA) and Council's implementing regulations; and

WHEREAS, FTA has determined that this project may have an adverse effect on historic properties included in or eligible for inclusion in the National Register of Historic Places (NRHP); and

WHEREAS, the United States Army Corps of Engineers (USACE) and the United States Coast Guard (USCG) concur in this Programmatic Agreement and re have designated FTA as lead Federal agency and FTA agrees to serve as the Agency Official who shall act on their behalf; and

WHEREAS, the Suquamish Tribe, the Muckleshoot Tribe, the Duwamish tribal organization (Tribal Governments), the City of Seattle, and the Friends of Seattle's Olmsted Parks have participated in the consultation; and

WHEREAS, the City of Seattle will conduct its own review of the project design under provisions of the Seattle Municipal Code regulating city landmarks and special review districts; and

WHEREAS, the consulting parties have considered the applicable requirements of the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.) (NAGPRA) and Washington's Indian Graves and Records (Chapter 27.44 RCW) in the course of consultation and, to the best knowledge and belief of the consulting parties, no human remains, associated or unassociated funerary objects or sacred objects, or objects of cultural patrimony as defined in NAGPRA are expected to be encountered in any archaeological work undertaken; and

WHEREAS, FTA has completed a traditional cultural properties archival inventory of the area of potential effects using secondary sources and information available in the public domain, has identified a single property of cultural interest to the Tribal Governments, located in the vicinity of the South Boeing Access Road, and is finalizing consultation with the Tribal Governments to determine eligibility of this property for NRHP listing and, if determined to be eligible, to assess effects on this property and to develop applicable stipulations; and

NOW, THEREFORE, FTA, SHPO and Council agree that in the event FTA decides to fund the undertaking, the Project will be administered and developed in accordance with the following stipulations to satisfy FTA's Section 106 responsibilities for all

individual components of the Project, and that FTA shall require that the following terms and conditions, including the appended Archaeological Resources Treatment and Monitoring Plan, will be implemented in a timely manner and with adequate resources in compliance with (NHPA), as amended.

STIPULATIONS

FTA, as lead federal agency, shall require that the following measures and stipulations are carried out.

I. Archaeological Resource and Traditional Cultural Properties

A. Treatment and Monitoring Plans

An Archaeological Resources Treatment and Monitoring Plan will be prepared and concurred in by FTA and SHPO, after consultation with Tribal Governments.

The Treatment and/or Monitoring Plan will be consistent with the Secretary of the Interior's *Standards for Archaeological Documentation* (48 FR 44734-44737), Council's *Treatment of Archaeological Properties* (Advisory Council on Historic Preservation, draft 1980), applicable Washington regulations, and responsive to contemporary professional standards.

FTA, in consultation with SHPO, shall require that the Treatment and/or Monitoring Plan for the mitigation of anticipated effects on eligible properties are implemented.

B. Supplemental Treatment Plans

FTA will prepare Supplemental Treatment Plans (Supplements) for archaeological resources and/or traditional cultural properties identified during inventories for construction phases subsequent to approval of the Treatment and/or Monitoring Plan and for such properties or resources discovered during construction. Supplements will be approved as stipulated below by SHPO. Each Supplement will modify the existing Treatment and/or Monitoring Plan to be site and property specific. Additional information shall include:

1. The archaeological resources or traditional cultural properties discovered or to be affected in the specified Project segment and the nature of those effects.
2. Proposed measures to mitigate or avoid adverse effects to identified archaeological resources, or traditional cultural properties.
3. Where data recovery is proposed to mitigate an affected eligible property, the Supplement will contain:
   a. Specific research questions and an explanation of their relevance to the overall research goals as established in the Treatment Plan.
   b. Site-specific fieldwork and analytical strategies that will be employed in data recovery.
   c. Methods for securing the site against vandalism, if not already protected.
   d. Schedule for submission of progress, summary and other reports to FTA, SHPO, and Council and Tribal Governments.

C. Comments and Concurrence on Supplemental Treatment Plans

1. Within two working days of FTA's determination of effect on an eligible property, FTA will submit any Supplements to SHPO and Tribal Governments for review. FTA and SHPO will consult with Tribal Governments to elicit comments and/or suggestions. SHPO will have a maximum of six working days upon receipt to review and provide comments and/or objections to FTA. If SHPO does not submit comments and/or

objections within these six working days, FTA shall take such non-responsiveness as concurrence.

2. If any party has an objection to the Supplements, the objection must be specifically identified and the reasons for objection documented in writing to FTA. Objections will be resolved according to the procedures in Stipulation IX, Dispute Resolution, of this Agreement.
3. If revisions to the Supplement are needed, SHPO will have two working days to review the revisions. If no comments or objections are received within this time frame, FTA will assume concurrence.
4. All Supplements will be deemed finalized when all revisions are made and concurred with by the reviewing parties, or any disputes have been resolved through Stipulation IX, Dispute Resolution. Once finalized, Supplements will be provided to SHPO, Council and Tribal Governments. FTA may then issue authorization to proceed with implementation of the Treatment Plans and Supplements.
5. Upon written approval from SHPO, FTA may issue authorization to proceed with construction in those segments of the Project that contain archaeological properties once agreed upon fieldwork/treatment specified in the Treatment Plans and Supplements have been completed.

If FTA and SHPO agree that any segment(s) of the Project will have no effect on any NRHP listed or eligible properties, FTA may provide authorization to proceed with construction in such area(s), subject to the conditions of the Treatment and Monitoring Plan (Attachment 1) and Stipulation III – Changes in Construction Corridors and Ancillary Areas.

II. Historic Resources

During the environmental review for this Project, conceptual engineering plans and conceptual station designs were reviewed for potential impacts on identified historic resources. These conceptual plans and designs, and related potential impacts, are included in the Central Link Light Rail Transit Project Draft and Final Environmental Impact Statements and the Cultural Resources Technical Report. The following stipulations will govern future design activity concerning stations, trackways, guideways, and all related features of the Project.

A. Project Design

FTA shall require that the design of the Project is compatible with the historic and architectural qualities of the following historic properties:

1. Columbia City Historic District The design of all street improvement and landscape plans associated with the pedestrian corridor linking the Edmunds Street Station and Rainier Avenue South shall be prepared in consultation with SHPO and approved by the Seattle Landmarks Preservation Board. Such plans shall be developed with the objective of enhancing the pedestrian connection between the Columbia City commercial district and the station. The design shall be compatible with the historic and architectural qualities of the historic district

and consistent with approaches and guidelines set forth in *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (US Department of the Interior, National Park Service, 1995) and those guidelines formally adopted by the Seattle Landmarks Preservation Board.

2. Cheasty Boulevard All station components, street improvements, and landscape plans associated with the design of the McClellan Street Station and guideway overpass at Cheasty Boulevard (S. Winthrop Street) shall be prepared in consultation with the Seattle Landmarks Preservation Board and SHPO. Such plans shall be developed with the objective of:

   a) Improving Cheasty Boulevard in the light rail station area in a manner compatible with the documented Olmsted design concepts for Seattle's boulevards.

   b) Minimizing to the extent practicable the physical encroachment into the right-of-way of Cheasty Boulevard.

   c) Minimizing to the extent practicable the obstruction of views from Cheasty Boulevard toward Mt. Baker Boulevard.

3. Lincoln Reservoir and Bobby Morris Playfield If the Nagle Place option for the Capitol Hill Station is selected, all street improvement and landscape plans associated with the design of the station that may result in an adverse effect on any portion of this historic property shall be prepared in consultation with SHPO and approved by the Seattle Landmarks Preservation Board. Such plans shall be developed with the objective of preserving to the greatest extent feasible the character-defining features of this Olmsted-designed park and reservoir site. The design shall be compatible with the historic landscape qualities of this property and be consistent with approaches and guidelines set forth in *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (US Department of the Interior, National Park Service, 1995).

4. Pioneer Square Preservation District All street improvement plans associated with changes to surface transportation systems within the historic district shall be prepared in consultation with SHPO and approved by the Pioneer Square Preservation Board. The design of street improvements shall be compatible with the historic and architectural qualities of the historic district and consistent with approaches and guidelines set forth in *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (US Department of the Interior, National Park Service, 1995).

B. Station Design

In order to avoid any potential adverse effect on the historic resources in the vicinity of station development, FTA shall require that the designs of the following stations are developed in consultation with SHPO. In addition, FTA shall require that

the design of the Westlake Station entrance be prepared in consultation with and approved by the Seattle Landmarks Preservation Board. Such designs shall be developed with the objective of ensuring that station designs are responsive to the approaches and guidelines set forth in *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (US Department of the Interior, National Park Service, 1995).

1. N.E. 45th Street Station
2. First Hill Station
3. Westlake Station
4. Royal Brougham Station
5. Beacon Hill Station

C. Design Review and Approval Process

1. Sound Transit shall provide plans and specifications for all station, street improvement or landscape designs cited in Stipulations II. A and II. B at both the 30% and 90% design stages. SHPO will review such plans and specifications and provide comments within thirty (30) days. Failure to respond within thirty days will constitute SHPO review of such plans and specifications.

2. Sound Transit shall coordinate with the Seattle Historic Preservation Officer (HPO) regarding the local review and approval process and meeting schedules of the local review boards. Sound Transit shall not proceed with any construction related activity for all station, street improvement or landscape designs cited in Stipulations II. A and II. B until completion of SHPO review, or as stipulated in II.C.1, and/or the appropriate local review board has been obtained.

D. Minimization of Construction Impacts

1. No historic property will be used for construction staging or systems operation staging without prior consultation with - SHPO and/or approval of the appropriate local review boards.

2. In order to avoid any potential adverse effect on historic properties situated in the immediate vicinity of project construction and/or construction staging activity, FTA shall require that the following measures, or other measures where applicable, are taken when necessary to minimize construction related impacts on historic properties.

a) Using rigid support of excavation structures (shoring) to minimize the movement of the ground.

b) Underpinning the building prior to excavation.

c) Ground stabilization through cementitious or chemical grouts, freezing the ground, or other modification techniques.

3. Facades of nearby historic buildings will be protected from accumulation of excessive dirt, or will be cleaned in an appropriate manner at the conclusion of construction.

4. Access to all historic properties will be maintained except for unavoidable short periods during construction.

5. Temporary construction sheds, barricades, or material storage will be located so as to avoid obscuring significant views of historic properties.

6. The Project will comply with the City of Seattle noise restrictions for construction and equipment operation (SMC 25.08.425) and any variance granted specifically for this Project.

E. Olmsted Planning Studies

Sound Transit will provide to SHPO funds not to exceed $_[to be determined]_to otherwise compensate for the visual impacts of the project on Cheasty Boulevard that cannot be fully mitigated by modifications of project design, street improvements, and landscaping features. The funds will be allocated from SHPO to the City of Seattle, Department of Neighborhoods, Historic Preservation Program. The organization, management and uses of this fund will be specified in a separate agreement, executed by SHPO, Sound Transit, and the Seattle HPO. These funds are intended for research, inventory, planning, preservation, or interpretation of the Olmsted Plan for Seattle's Parks, Boulevards, and Playgrounds. This work, whether carried out by city staff or outside consultants, must be performed by individuals who meet or exceed the US Secretary of the Interior's professional qualification standards set out in Stipulation IV and who have expertise in the history and design concepts of the Olmsted landscape architecture firm. Results of the research regarding Cheasty Boulevard will be incorporated into the station design through an interpretative display or other means.

III. Changes in Construction Corridors and Ancillary Areas

If during the course of Project planning or construction there arises a need to make changes to construction corridors or ancillary areas (including but not limited to: reroutes of portions of the proposed light rail trackways and guideways, changes to the footprints of stations or park-and-ride lots, disposal of excavation spoils upon public or private lands, or use of a previously unidentified staging or use area is determined to be necessary, etc.), FTA shall take the following steps.

A. Notify SHPO of the project change.
B. Require that the new area of potential effect is inventoried and evaluated in a manner consistent with 36 CFR § 800.4.
C. If requested through further consultation with the Tribes, SHPO and/or Council, conduct a traditional cultural properties inventory in a manner consistent with the National Park Service's National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties. If any traditional cultural properties are found during the inventory phase, FTA will consult with the Tribes, SHPO and Council in accordance with the provisions of this Agreement.
D. Distribute all inventory reports to SHPO for 30-day review and comment.
E. If FTA and SHPO do not agree on NHRP eligibility of any properties, Council will be consulted to help resolve eligibility issues. If SHPO, FTA and Council are unable to reach agreement regarding eligibility, or if Council or the Secretary of the Interior so requests, FTA will obtain a formal determination of eligibility from the Secretary of the Interior pursuant to 36 CFR § 63.
F. FTA will apply the Criteria of Adverse Effect in a manner consistent with 36 CFR § 800.5 to all properties determined to be eligible for inclusion in the NRHP.
G. If archaeological resources or traditional cultural properties will be affected, a Supplemental Treatment Plan will be prepared in consultation with SHPO and Tribal Governments in a manner consistent with Stipulation I.B.
H. If historic resources will be adversely affected, FTA and SHPO will continue consultation in a manner consistent with 36 CFR § 800.6 and will execute a supplemental agreement document to stipulate mitigation measures before authorizing construction to proceed.

IV. Professional Qualifications

FTA shall require that all historic preservation or archaeological resources work performed by Sound Transit or on their behalf pursuant to this Agreement shall be accomplished by or under the direct supervision of a person or person who meet(s) or exceed(s) the pertinent qualifications standard set out in the Secretary of the Interior's *Professional Qualifications Standards* (48 FR 44738-44739).

V. Dispute Resolution

A. Unless otherwise specified in this agreement, should any signatory to this Agreement object in writing within 30 days to any plans provided for review, specifications provided or actions or findings proposed pursuant to this Agreement, FTA shall consult with the objecting party to resolve the objection. Upon receiving the written objections:

1. FTA will notify SHPO as to the nature of the dispute.
2. FTA will attempt to informally resolve the objection.
3. In the event informal attempts are unsuccessful, FTA will invite the objecting party to a reconciliation meeting for the purpose of discussing and resolving the objection. FTA will issue such invitation no later than five working days after receipt of the written objection and will schedule a meeting to be held within 10 working days following receipt of the invitation. The time frames specified herein may be expedited by mutual, written agreement.

B. Should any affected Tribal Government object to any proposed plan, curation procedures or handling of Native American human remains, FTA shall consult

with the objecting Tribal Government to seek to resolve the objection under Stipulation V.A..

C. If, FTA, in consultation with SHPO, determines that an objection cannot be resolved through Stipulation V. A. FTA will forward all documentation relevant to the dispute to Council. Within 15 days of receipt of all documentation, Council shall either:
   1. Provide FTA with recommendations, which FTA shall take into consideration in reaching a final decision regarding the dispute; or
   2. Notify FTA that it will comment within 45 days in accordance with 36 CFR § 800.7(c)(2). Any Council comment provided in response to such a request will be taken into account by FTA in accordance with 36 CFR § 800.7(c)(4) with reference to the subject of the dispute.

D. Any recommendation or comment provided by Council will be understood to pertain only to the subject of the dispute; FTA's responsibilities to carry out all actions under this Agreement that are not the subject of the dispute will remain unchanged.

VI. Amendment

The signatories to this Agreement may request that it be amended, whereupon the parties will consult in accordance with 36 CFR § 800.6 to consider such amendment.

VII. Termination

Any signatory to this Agreement may terminate it by providing 30 days written notice to the other parties, provided that the signatories will consult during this 30-day waiting period to seek agreement on amendments or other actions that would avoid termination. In the event of termination, FTA will comply with 36 CFR § 800.3 – § 800.13 with regard to individual undertakings of the project covered by this Agreement.

VIII. Failure to Carry Out the Terms of the Agreement

If Council determines that the terms of this Agreement are not being carried out, FTA will comply with 36 CFR § 800.3 – § 800.13 with regard to individual undertakings of the project covered by this Agreement.

IX. Scope of Agreement

This Programmatic Agreement is limited in scope to Segments B, C, D, E, and F of the preferred alternative of Sound Transit's Central Link Light Rail Transit Project as described in the Final Environmental Impact Statement, and is entered into solely for that purpose.

X. Effective End Date

This Programmatic Agreement will continue in full force and effect until _____. At any time in the six-month period prior to this date, FTA may request Council and SHPO in writing to review the Project and consider an extension or modification of this Programmatic Agreement. No extension or modification will be effective unless all signatories to the Programmatic Agreement have agreed to it in writing.

XI. Satisfaction of Section 106 Responsibilities

Execution and implementation of this Programmatic Agreement evidences that FTA has satisfied its Section 106 responsibilities for all individual actions of this undertaking.

FEDERAL TRANSIT ADMINISTRATION, REGION X

By:_____Date:_____
Regional Administrator

WASHINGTON STATE HISTORIC PRESERVATION OFFICER

By:_____Date:_____
State Historic Preservation Officer

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:_____Date:_____
Executive Director

Archaeological Resources Monitoring and Treatment Plans

INTRODUCTION

As part of the Programmatic Agreement for the Central Link Light Rail Project (hereafter the Project), FTA has developed this Archaeological Resources Monitoring and Treatment Plan (hereafter the Plan or plans, as appropriate) to govern the actions to be taken when historic properties are discovered during the implementation of the project. The plans describe the general research design, field techniques, and analytic methods that will guide cultural resource investigations if archaeological deposits are identified during construction of the Link Light Rail Project (see end note). Detailed data recovery plans, or supplements to the treatment plan, will be developed on a case-by-case basis if archaeological deposits are identified.

The revised Section 106 process (May 18, 1999 Final Rule – Protection of Historic Properties - 36 CFR Part 800), includes steps to address discovery, identification, evaluation and project effects on historic properties. Normally, when it is determined that historic properties will be adversely affected, the parties resolve adverse effects through consultation that often leads to a Memorandum of Agreement. However, discovery, identification, and evaluation of historic properties within an ongoing construction project require the normal Section 106 process to be expedited.

The initial step in the Section 106 process is discovery of an archaeological resource. Areas with a high probability for intact subsurface cultural deposits along the selected light rail route were identified as part of project planning (Courtois and Bard 1999). If archaeological deposits are discovered during construction, the resources will be identified and assigned to a class of historic property. Attributes such as size, depth, content, age of deposits, and integrity will be recorded if possible. The next step is to evaluate the significance of the historic property for listing in the NRHP using criteria outlined in 36 CFR Part 63.

FTA has prepared this Plan in consultation with the SHPO, the Muckleshoot and Suquamish Indian Tribes, the Duwamish Indian Tribal Organization and is consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties, the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, and the Advisory Council on Historic Preservation's Treatment of Archaeological Properties: A Handbook. This Plan provides the results of previous research and research questions that could be addressed if significant archaeological sites are found during construction; field and laboratory analysis methods that could be used for documenting artifacts and data; provisions for records management and timely dissemination of research findings to professional peers and arrangements for presenting findings to the public (focusing on the community that may have interests in the results). This Plan also provides procedures to evaluate and treat discoveries of unexpected remains or newly identified historic properties including necessary consultation with other parties and provisions for curation of recovered materials and records resulting from any data recovery that may be conducted, in accordance with 36 CFR part 79 (except in the case of unexpected discoveries that may need to be considered for repatriation pursuant to NAGPRA).

Project Description

As described in the Final EIS and Record of Decision (ROD) for the Central Link Light Rail Project, the preferred alternative passes through several archaeological moderate or high probability areas:

- Segment B – High probability area located between the proposed Pacific Station and the northern shore of Portage Bay near the University of Washington.
- Segment C – Moderate probability areas associated with former Elliott Bay tideflats that were filled in the early decades of the 20th century.
- Segment D – High probability area at the base of the hill that flanks the eastern margin of the Duwamish River Valley floodplain.
- Segment E – Continuation of the high probability area described for Segment D as it continues to follow the selected route across the Duwamish River floodplain along the north flank of the northernmost of two culturally important hills (on South Boeing Access Road) and crosses the Duwamish River along Pacific Avenue S. and continues along Tukwila International Boulevard until it joins a moderate probability area. The moderate probability area follows the gradual slope climb of Tukwila International Boulevard until a point just north of S. 130th Street.
- Segment F – Moderate probability area just west of Bow Lake.

The moderate and high probability areas described above in Segments B through F will be subject to archaeological monitoring in accordance with this Treatment Plan.

ENVIRONMENTAL AND CULTURAL SETTING

The environmental and cultural setting for archaeological resources that might be present within the selected route of the Central Link Light Rail Project has been described by Courtois and Bard (1999). The following discussion of designated probability areas assumes the archaeologist(s) implementing this plan will consult the environmental and cultural setting provided by Courtois and Bard (1999) and will consult other professional cultural resource study documents pertaining to the Seattle vicinity, as needed and appropriate.

Hunter-Fisher-Gatherer Archaeology

Courtois and Bard (1999) present a review of the archaeology in the project area. Construction of the preferred alternative would affect no known/recorded archaeological sites. Other alternatives studied and not selected for construction pass within close proximity to known/recorded sites. One rejected alternative in particular (E-3), might intrude into a large, important archaeological site (45-KI-438/438A). Courtois and Bard (1999) provide detailed descriptions of archaeologically sensitive areas and the following summary should be used in conjunction with Courtois and Bard (1999).

High Probability Areas for Hunter-Gatherer Resources

The high probability area designated in part of Segment B between Portage Bay and the proposed Pacific Station is an area where either prehistoric or historic archaeological remains might be present (Courtois and Bard 1999:Figure 33). As described by Lewarch, et al. (1999:4):

The Denny/Lake Union project area encompasses the former shorelines of Lake Union and Elliott Bay, an inland prairie habitat that was south of Lake Union, and upland forests. Four areas within the project area have a particularly high probability for archaeological deposits: the former Elliott Bay shoreline and tideflats west of the east side of Elliott Avenue West in the Elliott Bay sub basin; the former shoreline and south margin of Lake Union north of Republican Street in the South Lake Union sub basin; a stream and ravine south of Republican Street in the South Lake Union sub basin; and a former prairie northeast of the Seattle Center in the South Lake Union sub basin.

As described by Lewarch, et al. (1999:8), the South Lake Union area encompassed a rich array of productive habitats that were used by the hunter-fisher-gatherer populations. Historic filling probably covered archaeological deposits and created historic period archaeological deposits. For example, a ravine with a stream and marshy lowlands south of the southern end of Lake Union was filled with

regrading spoils and other debris; this area now has a high potential for buried prehistoric and historic archaeological sites. A large prairie situated east of the present Seattle Center near Broad Street was described in early historical and ethnographic accounts as a grassland habitat and/or as a marshy grassland. As explained by Lewarch, et al. (1999:8) this prairie may have originally been part of Lake Union but that it was gradually exposed as the lake level lowered during the Holocene – geological evidence for higher levels of Lake Union support this hypothesis. If this was the case, the higher elevation margins of the prairie could hold middle Holocene archaeological deposits.

The moderate probability areas designated in Segment C correspond to former tideflats what were filled in the opening years of the 20th century. While there may be present prehistoric archaeological remains embedded in sediments below the late 19th century tideflat surface, the main archaeological potential of this industrial area (see Figure 34) are historic period artifacts and debris that may have been incorporated within the fill material that was spread over the former tideflats. Archaeological remains that might be associated with specific late 19th and early 20th century structures could be present beneath the selected route and/or selected Maintenance Base site.

The high probability area designated in Segment D might yield prehistoric archaeological remains; historic archaeological sensitivity is low (see Figure 35). This area consists of a gentle rise just east of the Duwamish River and is located close to the culturally important hill features at South Boeing Access Road. Early topographic maps also depict the presence of wetland or marsh environments in the immediate vicinity. This high probability area is connected to the high probability areas designated in Segment E.

Although the high and moderate probability areas designated in Segment E might yield prehistoric archaeological remains, historic archaeological sensitivity is believed to be low (Courtois, et al. 1999: Figure 36). The preferred alternative passing through Segment E makes one Duwamish River crossing.

Finally, the moderate probability area designated just west of Bow Lake in Segment F (Figure 37) might yield prehistoric archaeological remains; historic archaeological sensitivity is low. Discovery of scuttled Indian canoes in Angle Lake in recent years and growing knowledge of the importance of inland lakes and prairie environments suggest areas near Bow Lake may have a moderate probability of containing archaeological deposits.

ARCHAEOLOGICAL RESOURCES MONITORING PLAN

This Plan attempts to accommodate construction techniques, construction schedules, and construction logistics to the extent possible without compromising potential archaeological resources. The monitoring protocol outlined here is modeled after a protocol successfully implemented throughout the King County Water Pollution Control Division's Alki Transfer/CSO and West Point Secondary Sewage Treatment Plant Upgrade projects and is being employed in the Denny/Lake Union Project. The monitoring methodology is predicated on different kinds of construction techniques and visibility of subsurface deposits that may have cultural materials.

Construction Techniques

Construction techniques are described in the Final EIS. In general, the light rail tracks will be constructed deep beneath the surface—in some places deeper than 200 ft. Deep tunneling will be used to construct several lengthy segments, mostly in the northern and central portions of light rail. In other areas, the tracks will be constructed on elevated guideways supported by concrete columns. The foundation supports for the concrete columns will require subsurface excavation—probably some variation of cut-and-cover construction (or open trench/open cut construction). Other segments will be constructed at-grade. At-grade construction will require some subsurface excavation to prepare

suitable support for the tracks and ties. Construction techniques are reviewed briefly here to determine when and how archaeologists may inspect soil stratigraphy for cultural deposits.

Mined Construction

Mined construction refers to the controlled, sequential, excavation and ground support of an underground space, primarily at the depth some stations will ultimately be located. In mining for a station in soft ground as typically found in the Seattle area, segmental linings may be used to provide both initial support of the excavation and to serve as the final structural lining, or, in the method often referred to as New Austrian Tunneling Method, initial support for the sequential excavation may be provided by a combination of shotcrete and steel reinforcement and a reinforced concrete final lining in a second operation after completion of the excavations.

For either technique, the soft ground may be dewatered and/or, if needed, "modified" by grouting or chemical treatment prior to excavation. The major advantage in mining a station is that the amount of surface disruption with impacts on buildings, traffic and utilities can be greatly reduced in comparison to cut-and-cover construction.

With such long tunnel segments planned, there will be several tunnel portals that would be excavated to accommodate spoil removal and insertion of segmental linings. These tunnel portals may or may not also correspond to future station locations. Professional archaeologists would monitor the sequential excavation until such time that pre-Holocene (Pleistocene) glacial deposits have been reached—deposits believed to predate Native American occupation of Puget Sound.

Cut and Cover (and Open Cut) Construction

Cut-and-cover (and open cut) construction requires that excavation proceed downward from the surface to the station invert level or to the bottom of guideway support columns or support bedding for tracks and ties. Any existing overlying structures must, out of necessity, be removed unless the stations are located in streets or open spaces. Utilities must be diverted or supported across the excavations. The excavation is braced or tied-back as it proceeds downward. The excavation can be decked over at the street level to allow traffic to continue once the excavation is deep enough (10 to 15 ft) to allow earth moving equipment below. Openings are provided in the decking to allow removal of the excavated material. The excavation can proceed all the way to below the bottom of the station, and then the station can be constructed from the bottom up.

Construction Staging Areas

Construction equipment staging areas have been generally identified in advance of construction although these may change or be modified. It is possible that additional staging areas could be placed in locations where they may impact cultural resources. Archaeologists would review maps of proposed construction staging areas to determine if there is a high probability for cultural resources.

Monitoring Procedures

CH2M HILL reviewed project plans and geotechnical reports during the development of the Draft EIS to determine moderate and high probability areas for cultural resource monitoring. Professional archaeologists would continue to review documents as plans and specifications are finalized and additional geotechnical information becomes available. A table would be generated that identifies probable construction techniques by station along the selected alignment, with an estimate of soil types that might be found and areas designated for monitoring during earth-disturbing operations.

Bid Documents and Contract Clauses

A clause will be included in the construction specifications noting that cultural resources considerations are included. The clause will note that although no known sites currently impede the Project's preferred alternative, the potential still exists for encountered resources. The clause will require that contractor supervisory personnel be familiar with procedures established to consider

cultural resources if encountered during construction. Part of this responsibility included attending or participating in a summary briefing on the issues and requirements during preconstruction meetings (see below).

A clause or clauses will be included in the prime construction contracts requiring adherence to procedures for consideration of cultural resources if encountered during construction. The clause will specify applicable authorities and require adherence to notification and protection procedures as specified under this plan and further developed during final design of the light rail project.

The clause will specify that contractor representatives will be required to attend a briefing on cultural resource issues, and that these personnel will ensure that all project personnel under their authority are able to identify conditions requiring a determination from the project Archaeologist. In addition, the clause will require a contractual "flow-down" of the clause to applicable subcontractors that are involved with any land-disturbing activities.

Contract language may also identify specific contingency procedures. The purpose of this approach is to clarify and address possible uncertainties associated with work stoppage or redirection resulting from discovery of cultural resources.

Preconstruction Meetings

Preconstruction meetings would be held with representatives of Sound Transit, Sound Transit's field inspectors, the construction company project managers, construction supervisors directly involved in construction excavation, and the project archaeologists. Meetings will serve to: (1) review construction plans, schedules, and areas where archaeologists will monitor; (2) describe the role of field archaeologists in the construction process; (3) establish a chain of command for communication and decision-making among Sound Transit, project archaeologists, and construction personnel; (4) provide personal introductions among people from Sound Transit; project archaeologists, and construction companies who will be working together on a daily basis; and (5) clarify any questions about schedules, construction locations, construction techniques, or notification procedures.

Communication Procedures

Archaeologists would communicate with the on-site Sound Transit inspector to make general requests about equipment movement, placement of backdirt for examination, or ability to access trench or foundation excavations. Archaeologists may also need to communicate directly with excavation equipment operators to access construction excavation areas such as trenches or foundation excavations. Archaeologists may clean trench sidewalls, obtain matrix samples, or quickly evaluate stratigraphy. Archaeologists may also request equipment operators to excavate in thin lifts or to otherwise modify construction excavation procedures to provide exposures of subsurface stratigraphy. Meetings among project archaeologists, equipment operators, and Sound Transit inspectors would occur routinely as dictated by field contingencies.

Monitoring Techniques

Archaeologists would observe construction excavation in areas where native soil may be encountered or fill areas with historic artifacts, which may assist in developing a chronology of, fill placement and/or filling techniques. Monitoring would be identified before construction starts. Archaeologists would keep a daily log of monitoring activities on monitoring forms, which would document cultural resources monitoring efforts even if cultural materials are not found. The purpose of observation is to identify any cultural resources and to assess rapidly the importance of the resources. Most archaeological monitoring would be in excavations. Trench excavation often moves rapidly to minimize slumping and caving of trench sidewalls. Archaeologists would observe equipment work and soil removal from multiple perspectives around and in front of working equipment, requiring close communication with construction supervisors and equipment operators. Archaeologists would often stand on the edge of an excavation observe sediment as it is excavated.

At times, close, direct examination of sidewalls may be necessary to identify native soils or possible cultural deposits, requiring an archaeologist to enter an excavation zone. This would require signaling the equipment operator and/or other construction personnel to notify them to watch carefully. Excavated backdirt also may be examined in concert with monitoring excavation. Backdirt may be placed directly in a truck for removal and disposal, limiting access to backdirt.

Identification of Cultural Resources

If the archaeologist sees cultural deposits such as fire modified rock, cultural shell, foundations, structural timbers, hearths, post molds, or artifacts that are not isolated finds, more intensive identification work may be required. Work would be stopped in an area large enough to ensure the integrity of the cultural deposit. Heavy equipment may be used to provide a better vertical exposure or to remove fill or slump that may obscure deposits. The archaeologist would enter the trench and make a rapid assessment of stratigraphy, matrix, characteristics, evidence of previous disturbance, resource type, and the spatial extent of the resource. If the deposit or materials appear to have integrity and potential significance, more intensive evaluation would be necessary. If an archaeologist identifies anything that remotely appears to be human remains, construction work would be halted immediately, again in an area large enough to maintain integrity of deposit.

Isolated finds would be recorded and placed in a plastic bag and a bag number assigned. Provenience information would be recorded, such as the rail segment, construction station, depth below surface, stratum, date, and name of person finding the material. A bag list would be maintained for the project. Project records would include: drawings of stratigraphy as needed; photographs to document cultural resources, stratigraphy, landform types, and construction conditions, with photograph information maintained on photo records; and daily monitoring logs.

Work Stoppage, Notification, and Evaluation

The archaeologist would not directly communicate a work stoppage notice or tell the equipment operators to stop all work in an area. The request would be made through the on-site Sound Transit construction inspector. If the Sound Transit inspector cannot be reached immediately, then the on-site construction contractor crew supervisor would be alerted.

Work may be stopped to provide time for additional evaluation, and field archaeologists may contact their home office for assistance or clarification if complex deposits are encountered. Construction work in an area would be stopped if any human remains are identified. The Washington SHPO and affected Tribes would be notified and procedures would be followed as outlined in the treatment plan (see below).

Development of Supplemental Treatment Plan

If a cultural resource site is determined to be probably eligible for listing in the National Register of Historic Places, and would be mitigated through data recovery, a Supplemental Treatment Plan would be developed based on the research design outlined in the Archaeological Resources Treatment Plan (see below). The Supplemental Treatment Plan would include a discussion of specific research problems that the site may contribute understanding to and specific methodology to recover appropriate data to address those questions. A Supplemental Treatment Plan would also be prepared prior to conducting archaeological test excavations in a site which is identified during construction monitoring.

Supplemental Treatment Plans would include introductory sections that identify the resource type, summarize consultation with agencies and Tribes, and outline specific research questions that may be addressed by information held by the site. The initial sections would describe the project and the circumstances associated with resource discovery, and would include a detailed description of identified resources. A description of the applicable NRHP criteria that would probably qualify a site for listing in the NRHP would be presented and detailed, specific research questions referenced from

the treatment plan for each resource. Consultation with the Council, OAHP, FTA, and Tribes would be documented. Field and analytical techniques would be described, including a justification and outline of field and laboratory sampling designs, excavation procedures, and a proposed field and laboratory schedule.

Laboratory analysis techniques, specialized analytic studies, and project specialists would be described and justified relative to questions proposed in the research design for each Supplemental Treatment Plan. Curation procedures, documentation of planned artifact and record curation in a federally approved curation facility, and a description of public dissemination of research results also would be included in Supplemental Research Designs. Much of the information in the Supplemental Treatment Plan will reference key sections of the Archaeological Resources Treatment Plan (below). Specific research questions will focus on the attributes of the archaeological deposits that are discovered.

Reporting Requirements

The project archaeologists would prepare a technical report that documents monitoring methodology, results, and recommendations for future management, background material, and pertinent graphics.

Qualifications

The project archaeologists will meet the National Park Service, Department of the Interior qualifications for professional archaeologists set forth in the Federal Register (1983, Volume 48, No. 190:44739) and the Register of Professional Archaeologists (ROPA) guidelines identifying professional archaeologists with specialties in field work, collections analysis, and archival work.

ARCHAEOLOGICAL RESOURCES TREATMENT PLAN

Research Design

Recovery of data from any archaeological resource identified during project construction that is eligible for listing in the NRHP would emphasize the acquisition of data that contribute to understanding the site and its place in regional prehistory or history. A research design is provided here only as aid in the preparation of Supplemental Treatment Plans for potentially significant cultural resources identified during construction monitoring. The proposed research design consists of two sections: Research Problems and Methodology. The Research Problems section consists of research domains and questions that could be addressed using data from archaeological resources that are found during construction, depending on the nature of the individual resource discovered. The Methodology section details potential field and laboratory methods that could be used to identify and develop sufficient data to address a research problem or problems, depending on the individual resource. A discussion of the possible data types that could be encountered in the project area can be found in the Methodology section.

Research Problems

Cultural resources attain significance when they possess integrity and can provide answers to questions posed through analysis of research problems. The Treatment Plan for the Central Link Light Rail Project cannot address a specific archaeological resource, primarily because there are no known/recorded archaeological resources in the selected Project corridor and because potential archaeological resources would be buried beneath natural or artificial fill.

Portage Bay – South Lake Union Areas

Hunter-Fisher-Gatherer Research Domains

Hunter-fisher-gatherer research domains applicable to the Portage Bay – South Lake Union areas have been well defined by Lewarch, et al. (1999:17-18). To assist the selected Project archaeologist develop site-specific Supplemental Treatment Plans (if sites are found), the research domains developed by Lewarch, et al. (1999:17-18) are included here, with some minor modification.

Hunter-fisher-gatherer cultural deposits that can be used to address research problems that have been posed by local investigators may include intact shell midden deposits, single-use and reoccupied campsites, village sites, structural remains, fire hearths, and other fire modified rock features. Items of low significance would include isolated occurrences of shell, fire-cracked rock, charcoal, fish bone, and artifacts. Useful research questions that have been developed for potential hunter-fisher-gatherer archaeological deposits in the Portage Bay and South Lake Union areas include:

- What is the nature of the subsistence-settlement data that indicates prehistoric use of lake and/or prairie environments near the former shorelines of Portage Bay and Lake Union? What kinds of resources were exploited and during what seasons? Do the subsistence data suggest only use of freshwater resources from the lakes and streams or are marine resources also represented in the archaeological deposits? Do the archaeological deposits provide evidence of salmon processing?
- Is there evidence of a village or a camp on the shores of Portage Bay or Lake Union? If a village and/or seasonal campsite is present, can archaeological deposits be used to differentiate between a winter village or a seasonal summer campsite?
- Is there evidence of a former Indian trail system from Elliott Bay to Lake Union? If trails can be identified, do the trail alignments show use of prairie and/or lake resources by the occupants of the Duwamish villages located at Elliott Bay or at the mouth of the Duwamish River?
- Is there geological and/or archaeological evidence for an Early Holocene higher lake level at Lake Union or Portage Bay?
- Is there evidence of trade or exchange being conducted with Indian groups living on the Columbia plateau (e.g., points or other tools of siliceous rocks that originate from eastern Washington)?

Ethnographic/Ethnohistoric Research Domains

Ethnographic/Ethnohistoric research domains applicable to the Portage Bay – South Lake Union areas have also been defined by Lewarch, et al. (1999:18-19) and are included here in case archaeological sites dating to the ethnographic/ethnohistoric time periods are discovered.

- Did Duwamish villages participate in an economic system where surpluses from one village could be traded to other village(s) in the drainage basin? That is, to what extent did the Duwamish groups operate as one economic unit and to what extent were the ups and downs in food resource procurement success dampened down through networks of inter-village trade and exchange? If such exchange systems were operant, what were the geographic range and/or limits to such systems?
- After the Treaty of 1855 was signed and the Duwamish began moving off the land to be congregated in reservations, their subsistence and settlement patterns were changed. What was the nature of Duwamish subsistence and settlement during this period? How were the Duwamish affected by non-Indian settlement along the Seattle waterfront? Were any features of traditional Duwamish settlement and subsistence retained?
- How were the villages on Lake Union and Portage Bay affected by the Indian Wars of 1855-1856? Did the early removal of the Duwamish from their winter villages accelerate their departure from the Seattle area? Did non-Indian settlers occupy their former home sites?
- What was the nature of historic Duwamish and other Indian settlement and subsistence in the Portage Bay and Lake Union area? Did Duwamish house construction change after exposure

to non-Indian technology and social influence? How did the Duwamish diet change after contact with non-Indians?

- Is there evidence of the former Indian trail from Lake Union to Elliott Bay? Does the trail show an economic and cultural connection to the Duwamish on Elliott Bay? How does this affect the theory that Lake Union villages were connected to those on Lake Washington and with Snoqualmie villages just beyond Lake Washington?
- Is there evidence of Indian and non-Indian interaction present, such as trade goods or artifacts of non-Indian manufacture associated with native subsistence activities? What effect did trade goods have on the economy of the village, or household? Are trade goods associated with class differences? Is there any indication of intermarriage with non-Indians?

Historic Archaeological Research Domains

Historic archaeological research domains applicable to the Portage Bay – South Lake Union areas have also been defined by Lewarch, et al. (1999:20-21) and are included here, with minor modification in case historic archaeological sites are found during excavation of the Pacific Street Station and/or tunnel portals or vent shafts.

- Is there evidence of former street levels beneath existing streets? If so, is there evidence of historic fill? What types of fill were used? If historic refuse is present, what kinds of activities are represented?
- Are there archaeological deposits associated with the original homesteads and farm established on Donation Land Claims of early Seattle pioneers?
- Is there archaeological evidence of the operation of saw mills in the project area? Is there any refuse or other evidence of the fire that destroyed the nearby Western mill in 1909? Is there evidence of any ecological damage caused by pollution from the mills? Was sawdust from mill operations used as material to fill former marsh areas? Is there historic refuse within the fill deposits that could help define employee characteristics or manufacturing techniques? Can stages of fill placement be determined?
- Are there archaeological remains from early transportation systems extant in the project area? Do remnants of former plank roads exist beneath fill layers?
- Is there evidence of ethnic communities within the blue-collar worker neighborhoods that were established to provide labor for the manufacturing facilities? Is there evidence of Indian labor being used in the lumber mills? Can class distinctions be determined? If so, were demographic changes and class or race segregation based on landform types or proximity to the labor locations?
- Is there archaeological evidence of former Chinese laundry operations in the project area? If so, does the evidence point to the common practice of living within the business itself? Is there historic refuse or organic material present? If so, do historic artifacts indicate the extent of acculturation experienced by the Chinese immigrants? Is there evidence that determines whether the occupation was permanent or transient? If occupation sequences are interrupted or terminated, can they be attributed to the Chinese expulsion period?

Former Elliott Bay Tideflats

Hunter-Fisher-Gatherer Research Domains

Hunter-fisher-gatherer research domains applicable to the former Elliott Bay tideflats area have been defined by Lewarch, et al. (1999:22-23) and are included here, with minor modification.

- Are there hunter-fisher-gatherer archaeological deposits in the former tideflats portion of the Project Area? If there are such deposits, what activities are represented and how old are the deposits?

- Are there hunter-fisher-gatherer archaeological deposits east of the filled tideflats that may have been inundated and/or buried during earthquakes on the Seattle Fault? Are old ground surfaces below the historic tideflat and beach deposits which may have subsided or dropped in elevation during earthquakes on the Seattle Fault?

Ethnographic/Ethnohistoric Research Domains

Ethnographic/ethnohistoric research domains applicable to the former Elliott Bay tideflats area have been defined by Lewarch, et al. (1999:23-24) and are included here, with minor modification, in case any significant archaeological sites dating to the ethnographic or ethnohistoric time periods are found during construction.

- Were permanent Duwamish villages established within the Elliott Bay tideflats or were there only seasonal encampments? Did the Duwamish or other visiting Puget Sound groups establish seasonal camps in the Elliott Bay area?
- How was the Duwamish subsistence/settlement pattern on Elliott Bay affected after the Treaty of 1855? How were the Duwamish affected by non-Indian settlement in Seattle? Did the Duwamish incorporate wage labor into their subsistence cycle? What features of settlement and subsistence were retained? What were the levels of adaptation of non-native material goods by historic Indian populations in Seattle?
- How were camps and villages on Elliott Bay affected by the Indian Wars? Did the Indian Wars affect the settlement and subsistence patterns of the camps and/or villages on the Elliott Bay highlands? Did they return each year to seasonally harvest plants and salmon? Did all of the people living or using the project area move to the detention camp at Fort Madison? Did some stay or return for seasonal harvesting opportunities or to reestablish their former village sites? Is there evidence of Indian houses on the Elliott Bay shoreline as indicated in early maps?

Historic Archaeological Research Domains

Historic archaeological research domains applicable to the former Elliott Bay tideflats area have been defined by Lewarch, et al. (1999:24-25) and are included here, with minor modification in case significant historic archaeological sites are found during construction.

- Is there evidence of regrading and filling operations in the project area? If so, can types of machinery used during regrading or filling be determined? Can shifts in technological strategies be documented, such as the change from sluicing and trestled flumes to electric shovels and conveyor belts, based on patterns in fill or debris from machinery that may have been discarded in the fill? Can fill episodes be differentiated by time period and a particular fill project?
- Are there remnants of the industrial development along the shoreline bluffs facing the former tideflats? What types of industrial technology are indicated? Is there evidence of land modification? Is there historic refuse associated with lumber mills, breweries and other manufacturing industries? Is working ethnicity represented?
- Is there evidence of changing transportation technology buried under fill in the former tideflat areas? Are there artifacts or pilings from early railroad trestles that demonstrate construction or operations technology?

Duwamish River Valley

The Link Light Rail project's preferred alternative will make one crossing of the Duwamish River Valley around Boeing Access Road. Two important environments of the Duwamish River Valley are the river delta/tidal estuary environment and the upper valley riverine environment. Relevant information from Larson and Lewarch's (1993) Archaeological Resources Treatment and Monitoring Plans for the Alki Transfer/CSO Project is presented here to help frame the basic research domains.

Larson and Lewarch (1993:10) describe the river delta/tidal estuary environment as follows:

Portions of the Northern Transfer/Alki segment till traverse this environmental zone as well as the littoral environment. Most of the landform has been modified with fill placement to form Harbor Island and by dredging the contemporary channels of the Duwamish River, or the Duwamish Waterway. Overall, this zone has a low potential for finding intact, undisturbed hunter-gatherer sites. Native soil deposits that have not been disturbed by construction and fill placement activities have a moderate probability for hunter-gatherer settlements. Recorded settlements and special purpose sites occur on higher elevation marine or river terraces or on landforms that rise above tide flats and marshy estuarine environments.

Larson and Lewarch (1993:10) describe the upper valley riverine environment as follows:

Portions of the Southern Transfer/Allentown and Southern Transfer/Interurban segments will traverse this area. River terrace landforms that have not been disturbed by previous construction activities have a high probability for hunter-gatherer sites. Even terraces that have been covered with fill material may have a high potential for hunter-gatherer resources if construction has not removed native alluvial soils. Possible site types include villages as well as special purpose sites and short-term campsites. Sites dating to the last 1,200 years are more likely than earlier period sites.

Hunter-Fisher-Gatherer Research Domains

As explained by Larson and Lewarch (1993:16-17), hunter-gatherer cultural deposits which may address the research problems include but are not limited to shell middens, single-use and reoccupied campsites, village sites, structural remains, fire hearths, and other fire modified features. Isolated occurrences of shell, fire-cracked rock, charcoal, fish bone, artifacts or other types of cultural deposits are probably no significant. Historic deposits, which may be significant, may include intact artifactual and/or structural deposits representing early campsites, homesteads, sites associated with the Indian Wars or sites with ethnic associations.

- Is there any evidence for pre-4000 B.P. habitation sites in the project area? Where are the habitation sites of the peoples who left Olcott assemblages (that date to ca. 8000 to 4000 years B.P.)?
- Is there any evidence for pre-2000 B.P. shell midden sites in the project area? Are there old shell midden sites that occur along ancient channels of the Duwamish River in the project area that have been covered by alluvial or estuarine deposits?
- Is there any evidence to document the chronological sequence of Duwamish River delta progradation in the project area? Was the former delta and tidal marsh environment near the confluence of the Black and Green Rivers as recently as 1,200 years ago? Where was the mouth of the Duwamish River around 1,200 years B.P.? If the river mouth was near the Black River area 1,200 years ago, would most archaeological sites yield datable materials that would confirm occupation episodes younger than 1,200 years old?
- Is there any evidence for changing subsistence/settlement patterns in the project area? If so, can such changes be linked to region-wide shifts in subsistence organization and settlement type? If there are changes, when did they occur?
- Is there any evidence of the impact of earthquakes on hunter-gather groups in the project area? What was the impact on hunter-gatherer groups of the uplift associated with the magnitude 7 earthquake that shook the project area around 1000 to 1100 years B.P.? If the Duwamish River Valley floodplain was uplifted, what were the resulting changes to local drainage patterns, erosion and deposition processes, vegetation types, and water-free ground surfaces and their impact on hunter-gatherer groups?
- Is there evidence for differences in technological organization throughout the project area? Are there differences in technological organization throughout the lower Duwamish River Valley based on environments exploited by people from sites in littoral or riverine settings?

- Is there evidence for change in fishing technology over time? Are there regional differences in access to various fish species? Are there changes through time in species utilized? Is there evidence of differential access to marine, anadromous, and fresh water species at sites in various geographic locations throughout the project area?

Ethnographic/Ethnohistoric Research Domains

Ethnographic/Ethnohistoric research domains applicable to the Duwamish River Valley have been defined by Larson and Lewarch (1993:20-21) and are included here, with minor modification in case significant archaeological sites dating to the ethnographic or ethnohistoric time periods are found during construction.

- Did Duwamish villages participate in an interdependent economic system where each village's ecological and/or economic strengths produced surplus that was traded to other villages who were in need? How did downstream villages interact with the head village that was located on the Black River? Did the trade networks between Duwamish villages also extend beyond their territory to other parts of Puget Sound or to eastern Washington?
- How did the Treaty of 1855 affect the Duwamish subsistence/settlement pattern? How were the Duwamish affected by increasing non-Indian settlement in the Duwamish River Valley?
- How were the Black River villages affected by the Indian Wars? What happened to the Black River villages? What was the effect on Duwamish cultural practices from being moved in and out of Fort Dent, Suquamish, and back to Duwamish Head during this period of war and disruption?
- What was the nature of Duwamish use of the two hills located at Boeing Access Road? Were these culturally important spots actually occupied? What kinds of activities took place at these hills?

Historic Archaeological Research Domains

Historic archaeological research domains applicable to the Duwamish River Valley have been defined by Larson and Lewarch (1993:21) and are included here, with minor modification in case significant historic archaeological sites are found during construction.

- How did the Indian Wars affect Euroamerican settlement patterns in the Duwamish River Valley? Where were the original homesteads located and did the original settlers return to these spots after the Indian Wars were over? Were there portions of the Duwamish River Valley that were more damaged by the wars than others?
- How did ethnicity affect subsistence/settlement patterns in the Duwamish River Valley? What evidences can be found to demonstrate any differences in the way in which the various ethnic groups (Japanese, Philippine, etc.) farmed the Duwamish River Valley? Were other groups in the Duwamish River Valley? How is this reflected in their homesteads and farms? Are there differences in the layout of homesteads of different ethnic groups that might provide insights into economic organization? Are there differences in artifact assemblages that reflect homestead functions or provide information on participation of homestead inhabitants in the local, regional, and worldwide economy?

Methodology

This section briefly reviews appropriate sampling and data recovery techniques necessary to obtain data to address research problems outlined above. This section presents a generic approach to data recovery because specific resources have not been identified. The most likely types of hunter-fisher-gatherer resources that may be identified are lithic artifacts, fire modified rock lenses or clusters, structural remains, and organic midden with fire modified rock, mammal bone, fish bone, and/or shell. Site types could range from short-term hunter-fisher-gatherer hunting or plant processing locations to winter villages.

Historic archaeological deposits could include refuse disposal areas associated with industrial or household activities, refuse disposal areas for city-wide trash, lumber mill waste, and historic artifacts and/or refuse incorporated into fill. Remnants of historic features such as pilings, roadbeds and grades, railroad trackage, wooden sewer pipes and tunnels, cabins, planking, and foundations could be buried in a variety of contexts, ranging from regrade spoils to construction or road grading fill to landslide deposits.

Based on the experience of local archaeological firms that monitored construction of sewage conveyance pipelines throughout Seattle, certain field techniques have been found appropriate to obtain samples and record information as rapidly as possible in order to:

1. Test the identified resource to determine if it is probably eligible for listing in the NRHP;
2. Determine if in-place preservation or avoidance of NRHP eligible deposits can be accomplished in a cost-efficient and timely manner; and
3. Obtain needed samples and spatial records through data recovery excavation if avoidance or in-place preservation are not feasible.

Testing Phase Excavation

Testing phase excavations may be necessary to obtain sufficient information to determine if an identified resource is potentially eligible for listing in the NRHP. Testing techniques can be tailored to resource type. Important research questions for hunter-fisher-gatherer resources require samples for radiometric dating, fire modified rock analyses, identification of shellfish, fish and mammal species, botanical analyses, and artifact classes representative of activities carried out at the site(s).

Historic period cultural deposits and features require a somewhat different approach. Large samples of diagnostic historic artifacts are necessary to address questions of ethnicity and economic organization. Large linear stratigraphic exposures might be needed to document complex building and fill histories in some areas. Extensive areal exposures of roads, trestles, and pilings may be required within project rights-of-way to adequately document construction techniques or to define building episodes.

Initial field assessment can determine spatial extent of the resource exposed within the construction corridor. Archaeologists can document dimensions and attributes using measured drawings, stratigraphic profiles, plan maps, and photographs.

Test excavations can be undertaken in 50 x 50 cm or 1 x 1-meter units placed as needed in the planned exposure of the resource. A typical approach might employ 50 x 50 cm units to identify sites; such units are especially appropriate within the narrow confines of construction trenches. Shovels and trowels can be used to remove matrix in a combination of natural and arbitrary excavation levels depending on cultural matrix characteristics. If a given natural stratum has a thickness greater than 10 cm, arbitrary 10-cm levels may be used to allow vertical control.

Excavated matrix would be screened through ¼ inch mesh mounted on a shaker screen. Superposition relationships and horizontal extent of strata can be recorded on Unit Level forms and Stratigraphic Profile forms. Diagnostic artifacts and artifact concentrations identified during troweling of surfaces can be piece plotted and cataloged individually.

Testing may include documentation and interpretation of features exposed in construction trench or pit sidewalls, especially for linear historic features such as plank roads, old road grades, or trestles. The goal would be to obtain sufficient information on historic features to evaluate significance and to identify specific research questions that a historic feature can address.

Readily identifiable discrete cultural features such as hearths, roasting pits, post molds, privies, or foundations can be treated as natural units and excavated separately. Records would be maintained on appropriate Unit Level/Feature forms.

Flotation samples approximately one liter in size can be collected from each natural stratum and feature in hunter-fisher-gatherer sites. Flotation samples may also be taken from historic period

features, depending on the feature type and context. For example, discrete refuse disposal areas associated with a historic household may have small, organic lenses that would provide information on household diet. Number of samples and sample locations would be dictated by horizontal extent and vertical depth of a given stratum or feature.

Shell midden deposits and organic midden deposits in hunter-fisher-gatherer sites can be processed using water screens to recover charcoal, fish bone, and other indicators of diet. Large samples of feature matrix and midden deposits would be recovered and placed in large plastic bags for off-site water screening through small mesh to facilitate construction schedules. These samples are necessary to provide quantitative measures of midden and feature constituents, such as gravel, shellfish, sand, fish bone, and mammal bone.

If fragile organic materials such as basketry, netting, or wood planks are encountered, appropriate preservation chemicals and storage vessels can be used to recover and preserve such materials. Depending on size and type of organic artifact, excavation techniques may be changed as appropriate, incorporating water streams from hoses to safely remove an organic object from surrounding matrix. Fragile organic artifacts would be stabilized and removed in the field and then transferred to the laboratory for further processing and stabilization.

Data Recovery Excavation

Data recovery excavation may be required if: (1) identified resources are determined probably eligible for listing in the NRHP, (2) project reroutes or redesign is not feasible, and (3) in-place preservation is not feasible.

A data recovery plan tailored for a specific resource would be developed to guide data recovery excavation and would be presented as a Supplemental Treatment Plan for a specific site. Excavation unit placement would be dictated by the size of the exposed resource area in a construction impact zone and resource type. Sampling designs would be guided by research questions outlined in this Treatment Plan. Archaeologists would employ field and recording techniques comparable to those used during the testing phase. If complex shell midden or village sites are identified, an on-site water-screening facility may be necessary when recovering a complex shell midden site.

Data Analysis and Data Management

Laboratory processing of excavated materials would be conducted concurrently with testing and data recovery excavation and continue after fieldwork is completed.

Hunter-Fisher-Gatherer Sites

When excavating hunter-fisher-gatherer sites, materials from ¼ inch mesh would be sorted for lithic artifacts, lithic debitage, bone artifacts, bone, and charcoal. Depending on the matrix composition and artifact density, shell and unmodified rock would be quantified in different ways. In dense shell middens, shell and unmodified rock would be calibrated using water-screened bulk samples. In lower density midden deposits, the composition of the shellfish assemblage may be determined through a series of carefully selected samples. Artifacts would be cleaned and sorted in the laboratory. Fire modified rock identified in all the screened samples would be saved and analyzed in the laboratory. Residue analysis may be conducted on the edges of selected stone tools when warranted by favorable depositional contexts and recovery procedures, which would preserve and not remove blood residue, which may remain on tool edges.

Bulk samples recovered from hunter-fisher-gatherer shell middens and feature matrices would be screened through a nested series of mesh sizes using water pressure. Non-cultural rock from 1 inch, ½ inch, ¼ inch, and 1/8 inch screens would be counted, weighed, and discarded. Fire modified rock would be retained, counted, weighed, and analyzed in more detail. All artifacts, bone, and shell would be sorted from non-cultural matrix for further analysis. Artifacts would be incorporated into the

samples obtained from ¼ inch and 1/8 inch screens from the remainder of the water-screened site matrix.

Botanical samples would be dried and stored. Selected samples would be forwarded to specialists for flotation and paleobotanical studies. Appropriate preserving chemicals would be employed on any special samples of organic material. Local experts in wet site artifacts would be contacted regarding long-term processing, stabilization, cleaning, and storage of these kinds of artifacts.

Samples of charcoal obtained form screened matrix samples or other sources (e.g., features, bulk matrix samples) would be cleaned in the laboratory to remove extraneous soil and rootlets. Samples to be dated would be selected based on research topics and sent to Beta Analytic, Inc., Miami, Florida for radiometric age determinations.

Data Analysis

Analysis of cultural and contextual samples recovered through field and laboratory processing efforts would depend upon types of material recovered from the hunter-fisher-gatherer site. Undiscovered hunter-fisher-gatherer sites in the project area may have cultural lenses with shellfish, fire modified rock, mammal bone, and charcoal. The following sections address each material type and describe specialized analyses.

Invertebrate Fauna

Data regarding hunter-fisher-gatherer shellfish use at shell midden sites would be obtained from analysis of shell from bulk matrix sample. All hinges and spires from selected samples would be identified to species level, and counted and weighed by species. Hinges that cannot be reliably identified would also be counted and weighed. Shell fragments would be identified to species level and counted and weighed separately from hinges and spires. Fragments too eroded or too small for reliable identification to species level would be counted and weighed. Analysis of shell breakage patterns is a means of identifying possible post-deposition modification of cultural deposits. Interpretation of shellfish data for a site, including habitats represented by the shellfish assemblage, provides information on the habitats use by hunter-fisher-gatherers.

Vertebrate Fauna

All vertebrate faunas recovered from bulk matrix samples and screened matrix would be identified to the most specific taxonomic level possible. For mammal fauna, other variables such as skeletal element, portion, side (if possible), burning, modifications (both natural and taphonomic) and cultural (e.g., tool or butchering marks), number and weight would be recorded for each representative. Analysis of vertebrate fauna, when synthesized with appropriate spatial data, may be useful in determining seasonality, subsistence patterning, and intrasite spatial patterning.

Modified Artifacts

Analysis of all modified objects of stone, bone, and shell from the bulk samples and the screened matrix samples would establish the basis for interpretations regarding technological, functional, and stylistic variability at an identified site.

Fire Modified Rocks

Analysis of fire modified rock would allow an assessment of possible changes in fire technology through time, the type of processing technology employed (i.e., boiling in containers vs. cooking over open fires), and the focus of fire technology (i.e., cooking/processing vs. heating).

Plant Macrofossils

Liter bulk samples collected from each column and from features and/or different components would be analyzed using flotation techniques to obtain charcoal, seeds, and wood for analysis. Botanical remains would be processed and microscopically analyzed for plant genus and species, if possible. Charcoal samples may also be submitted for wood species identification prior to submission for radiocarbon dating.

Matrix Analysis

Samples of site matrix would be analyzed to help determine how site deposits formed and to identify possible post-depositional changes in matrix chemical composition. Matrix analyses would include grain size analysis of samples to determine the most likely mode of deposition and matrix pH, calcium, and phosphate composition to evaluate the likelihood of post-deposition of shell or other organic material.

Historic Period Archaeological Sites

Historic period archaeological sites have the potential to yield thousands of artifacts. Material remains from historic sites would be processed at two levels of specificity. In small, discrete historic artifact distributions, diagnostic artifacts and representative artifacts of all classes of artifacts would be collected in the field and their locations mapped. Larger refuse concentrations would be sampled for diagnostic artifacts and an adequate sample of the range of artifact classes would be obtained. Historic artifacts would be initially classified based on material type. Artifact material categories and subcategories would include glass, ceramics, metal, shell, bone, and miscellaneous categories, such as beads and buttons, which may be metal, glass, or porcelain. Glass would be defined as bottle or vessel, and by function, if possible (e.g., liquor, soda, water, canning jar, and other broad categories). Ceramics would be delineated by paste (softpaste earthenware, hardpaste earthenware, stoneware, softpaste porcelain, and hardpaste porcelain) and surface decoration (transfer, flow transfer, repousse', and hand painted); and function, if possible. Metal artifacts would be classified by broad use categories. Material classes would be tabulated and weighed and he data entered into a historic artifact catalog.

A second phase of analysis would focus on diagnostic artifacts and artifacts that can be grouped by broad function. Potential functional classes include personal items, domestic items, construction, commerce and industry, group services, group rituals, and military. Appropriate modifications to the classification typology would be developed, if needed. This analysis would allow assessment of the temporal range of artifacts in a given assemblage and provide insights into kinds of activities that may have been carried out in a given area.

Ethnohistoric Research Domains

If archaeological sites are discovered and subject to data recovery, some ethnohistoric and/or ethnographic research might provide information that would help interpret the archaeological data from deposits associated with the ethnographic or ethnohistoric periods. Such research might include review of relevant ethnohistories and oral histories, archival data for historic Indian people, and consultation with Tribes. Oral histories and/or interviews with knowledgeable individuals also may provide information that can help to interpret archaeological data from deposits associated with ethnographic or ethnohistoric use episodes.

Data Management

Field and laboratory data would be entered in Excel for Windows computer files on IBM compatible computers. Excel data base files would store updated project sample catalogs and would be used to manipulate data during initial phases of analyses. Analytic and report diagrams such as scatter plots or frequency histograms would be generated using Excel. Corel Draw or similar software would be used to generate analytical and report graphics, such as site plans, stratigraphic profiles, or schematic diagrams of depositional sequences over time. Statistical software would be employed to conduct non-parametric and multivariate analyses as needed. All computer files would be backed up on hard disks and floppy storage disks. Excel files can be converted into ASCII or other computer database formats as required.

Reporting

Report preparation would occur after data analysis from test excavation and/or data recovery efforts. Depending on the number of resources identified, individual site reports may be produced or a single summary volume may present all data from the project. At a minimum, reports would include a description of the study area; relevant historical background research; the research problems and field strategy as implemented and a discussion of any deviation from the proposed methodology; data analyses with pertinent charts, tables, and maps; evaluation of the study in light of the goals and objectives of the study; recommendations for further assessment or management needs; notification of the curation repository for field records, photographs, artifacts, and curated samples; and bibliography. The report would be provided to the OAHP, the Council, FTA, SoundTransit, and the affected Tribes.

Schedule

Project scheduling depends on a number of factors that would only be determined during the course of the project. Fieldwork, testing, data recovery excavation, and report preparation would be conditioned by the number of identified archaeological resources, the construction project construction schedule, types of sites identified, and the amount of data recovery excavation that is required. Schedules of archaeological investigations would be discussed in Supplemental Treatment Plans developed for significant cultural resources.

Curation

Collected artifacts and samples would be curated for future use for research, interpretation, preservation, and cultural resource management activities, using Department of the Interior federal guidelines for curation (36 CFR 79). Artifacts and associated documents resulting from data recovery such as maps, photographs, field notes, bone, shell, soil samples, wood and other botanical samples, and fire modified rock would be curated. Subsequent to completion of analyses, artifacts, data samples, and records would be prepared for curation. Individual artifacts or redundant artifact classes with a number of members, such as fragments of window glass, would be placed in a ziplock bag. An acid-free label would be placed on the outside of the bag and would include site number, catalog number, detailed provenience information, and material type. A sample of fire modified rock would be retained for curation and all bone, shell, and charcoal samples would be bagged and labeled by level and material type. All data would be packed for curation.

Sound Transit would identify a facility for long-term curation of artifacts, data sample, and records resulting from the project investigations. Sound Transit would also consult with affected Tribes to reach agreement about permanent storage. The Burke Museum at the University of Washington would be the most likely candidate for short-term or long-term storage and is the repository for assemblages from other Seattle archaeological sites. If a permanent curation repository for the artifacts in the collection is not acceptable to affected Tribes, conflict resolution would first be handled under the provisions of the dispute resolution section of the Programmatic Agreement, and second, would be undertaken by the lead agency, FTA.

Human Remains

If Native American burials are encountered during test or data recovery efforts, the Washington Indian Graves Act (WAC 27.44) and applicable sections of the Native American Graves Protection and Repatriation Act (NAGPRA)(Public Law 101-601; 104 Stat. 3048; USC 3001-13) require specific procedures which would be followed during the course of the Central Link Light Rail Project as appropriate.

If human graves and associated cultural items are discovered during construction, the applicable federal and state laws require the archaeological contractor and Sound Transit to cease activity in the area of discovery (activities may continue elsewhere in the project area) and to immediately contact

the Office of Archaeology and Historic Preservation (Lacey), the affected Tribes (Suquamish, Muckleshoot, Duwamish), and the King County Medical Examiner. Human remains will not be removed or handled by construction personnel. The area of discovery will be flagged and construction equipment and personnel should be instructed not to enter the area. Assumptions should not be made concerning the origin of the human remains and public disclosure of the find will be avoided. The King County Medical Examiner will be asked to examine the remains in their location of discovery. Under no circumstances will the remains be removed from the site prior to notification to the OAHP and the affected Tribes.

Following identification of remains that are subject to NAGPRA and required notification, Sound Transit will coordinate directly with affected Indian Tribes to determine their wishes with regard to the schedule for return of remains and associated cultural items. Any materials that meet the definition of NAGPRA will be held in a secure location until they are reburied under the directions of the Tribes.

Study, measurements, analysis, and cleaning of the human remains would be conducted subject to approval by the affected Tribes.

Public Participation/Public Dissemination

Data recovery efforts would incorporate professionals from areas such as geology and history, and other specialists depending on the identified resource. Consistent with federal regulatory guidance that encourages public dissemination of the results of taxpayer supported data recovery programs, Sound Transit may sponsor one or more public talks, exhibits and/or development and distribution of a popular summary of data recovery program findings.

Tribal Consultation

Sound Transit will maintain active contact with designated representatives of the Muckleshoot and Suquamish Tribes and the Duwamish Tribal group. Information provided to Sound Transit for submission to the Tribes will include concurrent notices of findings sent to OAHP, the FTA or other regulatory agencies, drafts of agreements and treatment plans, and site reports showing activity at the various archaeological site(s) and the results of any necessary mitigation.

Schedule of Progress Reports

Progress reports would be submitted on a monthly basis for any data recovery effort in progress, throughout the period of field evaluation, analysis, and report preparation.

END NOTE

The Archaeological Resources Monitoring and Treatment Plans are based on the most recently approved plan available for the Seattle vicinity – the Denny/Lake Union Combined Sewer Overflow Control Project, Seattle, King County, Archaeological Resources Treatment and Monitoring Plans prepared by Dennis Lewarch, Leonard Forsman and Lynn Larson (Lewarch, et al. 1999) for the Wastewater Treatment Division of King County Department of Natural Resources. The Denny/Lake Union plan was provided to SoundTransit by the Office of Archaeology and Historic Preservation as a model plan that would be wholly applicable to the Central Link Light Rail Project. Much of the Denny/Lake Union plan is adopted here, verbatim, and the work of Lewach, et al. (1999) is gratefully acknowledged.

Other plans were also reviewed for useful approaches and procedures, including: the Alki Transfer/CSO Project Cultural Resources Assessment-Archaeological Resources Treatment and Monitoring Plan (Larson and Lewarch 1993), the Final Revised Plan of Action (POA), Cultural Resources Data Recovery Plan, Metro West Point Shell Midden (45KI428), Seattle, Washington

(Larson and Lewarch 1991), the Tacoma Second Supply Project Cultural Resources Construction Management Plan – Historic and Cultural Resources Sensitive Areas (Hart Crowser, Inc. 1995), and the Draft Revised – Appendix A – Cultural Resources Construction Management Plan, Remedial Action, West Harbor Operable Unit, and Scelcelb Estuary Mitigation Project, Wyckoff/Eagle Harbor Superfund Site (Hart Crowser, Inc. 1997).

The Plans are very general in scope; it is implicitly assumed that if potentially significant archaeological resources are found, Supplemental Treatment Plan(s) will be prepared to respond to specific discovery situations and the particular nature of the cultural remains encountered (and in accordance with the Programmatic Agreement to which these plans are attached). Therefore, these Plans should be used as a backbone reference plan from which more detailed, supplemental plans can be added as situations and conditions warrant.

References

_____. American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada. Policy Studies Journal 16(4):751-767. 1988

_____. Courtois, S.L., K.H. Krafft, C. Wickwire, J.C. Bard and R. McClintock [Courtois and Bard]. Link Central Light Rail Transit Project, Seattle, Tukwila, and SeaTac, Washington. Final Technical Report – Historic and Archaeological Resources. Report on file, Central Puget Sound Regional Transit Authority, Seattle, Washington. December 1998.

_____. Link Central Light Rail Transit Project, Seattle, *Tukwila and SeaTac, Washington. Final Technical Report - Historic and Prehistoric Archaeological Sites, Historic Buildings and Structures, Native American Traditional Cultural Properties, Paleontological Sites. Report on file, Central Puget Sound Regional Transit Authority, Seattle, Washington. September 1999.

_____. Hart Crowser, Inc. Tacoma Second Supply Project, Cultural Resources Construction Management Plan, Historic and Cultural Resources Sensitive Areas. Plan on file, Tacoma Public Utilities, Tacoma, Washington. March 1995.

_____. Draft Revised. Appendix A. Cultural Resources Construction Management Plan, Remedial Action, West Harbor Operable Unit and Scelcelb Estuary Mitigation Project, Wyckoff/Eagle Harbor Superfund Site. Plan on file, U.S. Environmental Protection Agency and Washington State Department of Ecology, Seattle. February 14, 1997.

Larson, L.L. and D.E. Lewarch. Final. Revised Plan of Action (POA), Cultural Resources Data Recovery Plan Metro West Point Shell Midden (45KI428), Seattle, Washington. National Archaeological Data Base Document No. 1333753 on file, Office of Archaeology and Historic Preservation, Lacey. March 30, 1991.

_____. Alki Transfer/CSO Project Cultural Resources Assessment, Archaeological Resources Treatment and Monitoring Plans. National Archaeological Data Base Document No. 1334013 on file, Office of Archaeology and Historic Preservation, Lacey. March 25, 1993.

_____. Lewarch, D.E., L.A. Forsman, and L.L. Larson. Denny/Lake Union Combined Sewer Overflow Control Project, Seattle, King County, Archaeological Resources Treatment and Monitoring Plans. Plan on file, King County Department of Natural Resources, Wastewater Treatment Division, Seattle. January 22, 1999.

Index

D

E

F