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APPENDICES

A Abstracts of Working Papers, Studies, and Reports
B Glossary of Railroad Terminology
C Description of Engineering Improvements

PREFACE

This report is presented in compliance with the Scope of Work, Exhibit B of Agreement Y-6091 between Morrison Knudsen Corporation and Washington State Department of Transportation, for the *Options for Passenger Rail in the Pacific Northwest Rail Corridor*. It was prepared by the San Francisco office of Morrison Knudsen Corporation, with input from the MK/HDR Team members, including the following firms:

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CHAPTER I
RATIONALE FOR THE RAIL PASSENGER OPTIONS REPORT

I.A INTRODUCTION

The Pacific Northwest Rail Corridor described and analyzed in this report extends for 466 miles from Eugene, Oregon to Vancouver, British Columbia. The principal main line rail route passes through Albany, Salem, and Portland, Oregon; Vancouver, Kelso, Centralia, Olympia/Lacey, Tacoma, Seattle, Edmonds, Everett, Mt. Vernon/Burlington, and Bellingham, Washington; to New Westminster and Vancouver, British Columbia. Figure I-1 provides a map of the rail corridor

Intercity passenger mobility is at present largely a function of the corridor's principal highway link, Interstate 5 in the U.S., and Highway 99 in British Columbia. To a lesser extent, intercity corridor travel is handled by regional air carriers serving regional airports at Eugene, Portland, Seattle-Tacoma, Bellingham, and Vancouver, B.C., and by intercity rail passenger and bus services provided by Amtrak, Greyhound, and other private carriers.

At the present time, between 6 and 7 million people live in locations within 10 to 20 miles of the railroad, and the corridor population is expected to grow over 40 percent during the next 20 years. With this growth comes a stronger economy, a predicted 50 percent increase in jobs, and a 75 percent increase in regional intercity travel.

The efficient movement of people and goods within our region is crucial to the ability to compete in world markets, to protect the environment, and to maintain a high quality of life. Improving the rail system within the region is an option that could cost effectively ease our " growing pains."

Over the past three years, the states of Washington and Oregon in particular have commissioned a series of feasibility studies intended to assess the practical problems, the costs, and the benefits of providing public investment to upgrade the corridor passenger rail system.

In connection with these studies, the states of Washington and Oregon have begun specific programs to upgrade rail trackage, improve signal systems and stations, and acquire rolling stock to expand intercity rail passenger service. These efforts have resulted in extending additional corridor passenger trains from Portland to Eugene, expanding service between Portland and Seattle, and reinstating service between Seattle and Vancouver, B.C. Altogether, more than $80 million has been committed so far by the states of Washington and Oregon and by Burlington Northern through cooperative arrangements between the public agencies and the private railroads toward implementation of near-term improvements to rail passenger service.

This document, as its title states, is an Options Report for the entire corridor. Until now, portions of the corridor have been analyzed separately, and improvement strategies developed for distinct segments. This report presents an overview of the whole corridor for the first time. It necessarily reflects the fact that the required improvements in some sectors of the corridor are understood better than in others, and that near-term improvement needs are understood better than long-term needs. In particular, the specific infrastructure improvements, and their estimated costs, can be expected to

change as the environmental and commercial impacts are better understood. As the analysis progresses, the final version of the Options Report will evolve to include a better match between cost-effective investment in railway infrastructure, and the service requirements of the passenger and freight users.

I.B OBJECTIVES OF THE RAIL PASSENGER OPTIONS REPORT

The Options Report has two objectives:

a. Collect and summarize the plans developed over the past three years into a single document which can serve as the basis for conducting the environmental impact reviews necessary prior to designing and constructing further improvements; and

b. Lay out the priorities, timing, and financial demands of the long-run strategy so that all concerned can see the architecture of the system as it develops.

In Oregon and Washington, a great deal of detailed technical analysis has already been undertaken over the past three years. Thus, in these states, the current document is more than a feasibility study in two important respects: rail operations and rail engineering. In both these areas, this Options Report draws heavily upon analyses already done that have developed practical improvements in rail trip times, operating speeds, capacity improvements, and other specific enhancements to the capability of the existing rail system. The British Columbia segment is currently at a more preliminary stage of development, and the Province has not yet made a commitment to provide funding for either a new corridor alignment or for upgrades to the existing corridor.

In other respects also, the developmental process is just beginning. The environmental impacts of many of the proposed engineering improvements have yet to be assessed, and much public involvement and discussion of costs and benefits remains to be done. In these respects, this Options Report is intended to be a map that suggests specific improvements in sufficient detail that it is now possible to proceed to develop the Environmental Impact Statements and public outreach that will need to be done prior to design and construction.

I.C LOGIC AND HISTORY OF THE INCREMENTAL APPROACH

The *Options For Passenger Rail In The Pacific Northwest Rail Corridor* adopts an “ incremental” approach to improving the capacity and capability of the rail corridor. The incremental approach supposes that investment occurs in stages or phases rather than all at once. The incremental approach also supposes that significant investment is directed at improving existing facilities, as opposed to constructing brand new or replacement facilities.

There are a number of reasons for adopting the incremental approach:

a. Total investment is significantly less because the new investment builds upon existing value: the private railroads already possess main line rights-of-way capable of being adapted to more and higher speed service;

b. Financing requirements are spread out over time, as compared with the cost impacts of a major infrastructure project, which must be constructed all at once if it is to have any substantial utility;

c. The level of investment can be tailored, by timing and line segment, to the development of demand. Some sectors may never warrant the level of investment appropriate for the most heavily utilized segments;

d. The incremental improvements to the existing infrastructure can be utilized to enhance rail passenger service as each is completed, providing identifiable benefits derived from each level of investment;

e. Environmental impacts should be less where existing rail lines are being upgraded, as opposed to the impacts of new or "greenfield" alignments;

f. Incremental improvements on existing lines tend to provide service that goes closer to the major origins and destinations than do new alignments, which must necessarily avoid built-up areas. There are exceptions to this rule: as cities spread out into suburbs, the older rail terminals downtown may be in the wrong places. That does not appear to be the case in the PNWRC; in fact, one of the benefits of the approach taken is that the metropolitan centers in places such as Salem, Portland, Tacoma, and Seattle benefit from increased utility in the passenger rail system.

The incremental approach has some disadvantages, too. Average speeds are not as high as with new systems, and there is sometimes a concern that an incrementally upgraded system will not attain truly competitive trip times. Analyses done for the PNWRC in 1992 suggested that an incremental system, similar to the one described in this Plan, might gather 50 percent of the ridership of a truly High Speed (185 mph) European system. But the total public sector investment in infrastructure described in this incremental Plan is only 10 to 12 percent of the infrastructure cost projected for a brand new, Ultra High Speed system.[1] In addition, the current $1.4 billion infrastructure cost projections for 20 years of incremental development in the PNWRC include the investment required to build three significant stretches of new alignment, one of which in British Columbia could be a long tunnel, and the purely local investment that would be needed to support a commuter rail passenger operation between Everett and Tacoma, Washington. Thus, not all the projected capital cost would necessarily be incurred if all the improvements are ultimately not required.

Finally, another development has led to the adoption of the incremental approach; namely, the attitude of the Class 1 railroads. In the past, the carriers viewed rail passenger service as a liability. Now, the carriers in the PNWRC are willing to explore ways to make public investment in better rail passenger service a "win-win" proposition. This evolution in carrier attitudes, into the present framework in which a genuine public-private partnership exists, makes the incremental approach practical. If the carriers were not willing to put the value of their existing investment in plant at the disposal of the public, in return for an appropriate public investment in the private property, the incremental approach simply would not work. Instead, the public would have to bear 100 percent of the cost of investing in new transportation infrastructure, whether in railways, highways, or airports.

I.D PUBLIC BENEFITS OF THE PROJECT

The following factors underlie the justification for development of the PNWRC:

a. Population and development pressures will continue to require increased capacity and investment in the kind of transportation infrastructure that is compatible with sound growth management;

b. Capital funding for transportation infrastructure (highway) improvements will be difficult to come by, particularly if the electorate continues to be reluctant to increase taxes;

c. The environmental impacts of constructing new transportation facilities will continue to be an issue;

d. Rail travel offers significant environmental benefits as compared to automobile use;

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[1] See High Speed Ground Transportation Study, October 1992.

e. Comprehensive, multi-modal transportation systems offer opportunities to combine mass transportation efficiency with individual convenience; and

f. Improved transportation infrastructure will provide economic benefits to the region as a whole.

All these factors are part of the economic and social case that exists for the PNWRC. The issue is ultimately whether the public interest is better served by investment in the rail system than it would be if the money were invested in highways, or invested in something other than transportation.

If no funds are committed to public transportation infrastructure, and the quality of transportation is allowed to decay for lack of investment, regional mobility will ultimately suffer to such an extent that both economic and social life will be adversely affected. There must be continuing investment in transportation infrastructure, or the region will eventually stagnate from congestion, while competing areas in the international market place gain market share.

So the issue is not " no investment," but a question of which investment(s) makes the most sense. In this respect, the economics of incremental upgrades to existing rail lines are very attractive. Consider, for example, the following general benefits of the proposed investment plan:

a. Similar to other public transportation investments (i.e., airports and highways), improvements that are necessary for the operation of incremental higher speed rail passenger service would result in a more efficient PNWRC rail system, including the movement of freight. The specific engineering improvements proposed and discussed in this Options Report have been developed from a series of technically sophisticated analyses of railroad line capacity between Eugene and Vancouver, B.C., so that the improvement program provides rail passenger operational objectives while protecting the existing freight infrastructure.

b. The Options Report, if implemented as proposed, would create added rail capacity in the major urban areas of the corridor. Some of this capacity could be used for commuter services, if local jurisdictions, the carriers, and the freight users concur. For example, the Puget Sound area could gain the capacity for commuter rail service at the same time it gains increased service to destinations such as Portland and Vancouver, B.C. The point is simply that investment in the rail system benefits a combination of long- and short-haul users, whereas urban highway projects are generally required by growth only in short-haul traffic. In the Interstate 5 region, certain investments in airport improvements might be avoided by substituting corridor rail service for corridor air service. In that manner landing and departure capacity needed for future corridor flights could be preserved instead for truly long-haul users.

A staged improvement program that upgrades existing rail lines provides significant transportation capacity at relatively low cost. When measured by cost-per-unit of *capacity*, rail systems generally compare very favorably with highway systems.

As a rough comparison of the economics of expanding rail versus highway systems, consider the cost of adding a freeway lane in each direction for 185 miles, or roughly the distance from Portland to Seattle. On the average, each lane might cost $6.5 million per mile, depending on how many bridges and interchanges need to be rebuilt, how much urban land is required.[2] To add one lane each way, this works out to $2.4 billion for the distance.

[2] 1993 Oregon Roads Finance Study, Phase II Technical Report. Sometimes highway costs are much higher. The replacement Cypress Freeway in Oakland, California is projected to cost almost $700 million, or over $140 million per mile. The cost of this one 5-mile highway project would pay for two-thirds of the entire infrastructure upgrade cost of the whole 466-mile PNWRC.

By contrast, the upgrade of the PNWRC rail line as proposed in this Options Report, for the 185 miles between Portland and Seattle, would cost only $507 million, or $2.7 million per mile. Furthermore, the rail improvement is not only cheaper in absolute terms, it is cheaper per unit of additional capacity. Table I-1, below, compares the cost-per-mile of the highway and rail improvements with their added capacity to move people.[3]

Table I-1
Comparative Cost
Highway and Rail Capacity

	Typical Cost Per Mile	**Latent Capacity**	**Typical Cost Per Psgr. Mile**
One Freeway Lane	$6.5 Million	32,400 Psgrs. Per Day	$200
Upgrade Rail Line	$2.7 Million	30,000 Psgrs. Per Day	$90

3 The comparison assumes a freeway lane can handle 2,200 passengers per hour (about 1800 typical vehicles), while the improved railway could handle 2,000 passengers per hour (about four trains). The peak capacity of the railway could be made much higher if required, simply by running more, and longer, trains.

The issue, however, is not simply the cost of capacity. Put purely in terms of the most efficient way to provide incremental transportation capacity, the rail line improvements are economically more efficient than investment in other transportation infrastructure. But the value of the capacity will be realized only if people use the system. This requires that the rail system be integrated with other modes. As connections improve, ridership rises. And the total cost of the rail system, and so its total benefits, will be much more a function of the number of passengers using the system, relative to its capacity, than of the pure cost of the capacity. Railroads inherently have high fixed costs, and therefore benefit disproportionately from economies of scale.

The U.S. Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) recognizes the importance of intermodalism by making it part of the name of the act, and by emphasizing intermodal activities linked to the availability of federal funds. It is a fundamental concept that for public transportation and passenger rail to succeed, it is essential that the component modes interconnect. Currently, it is misleading to refer to public transportation system as a single system.

To create a seamless public transportation system wherein users may travel between cities or regions and change modes requires significant attention and coordination. Facilitation of such services provides several benefits: a large proportion of traffic in the Puget Sound area, for example, is either through traffic, or traffic with only an origin or destination within the region. Access often requires multiple modes, such as connecting a train to a bus. Incompatible schedules, ticketing, or facilities create barriers. No entity but a state or Province has jurisdiction sufficiently broad to ensure the accomplishment of the coordination tasks needed to create and operate the system seamlessly.

Connectivity has two dimensions. The first is the need for facilities through which modal connections can be made. The second is a system of ticketing, communication, and information, that permits the user to freely move through the connecting modes and services. The Options Report recommends action strategies to partner and support local, regional, and private entities to support interconnecting modes and services.

As ridership rises, previous studies of various segments of the PNWRC have suggested that unit costs (cost of operation and maintenance, plus depreciation on one-time capital investment), should fall to less than \$0.35 per passenger mile. If the cost of the *capacity* is used as the benchmark, rather than simply expected *ridership*, then costs are much lower: latent costs are about \$0.02 per passenger mile.

By contrast, direct motor vehicle costs in the U.S. are already in the \$0.50 per mile range,[4] and the cost of maintaining the public infrastructure adds between \$0.20 and \$0.70 per vehicle mile to the numbers, depending on the environment and the source of the data.[5] Total costs for the highway alternative can therefore easily reach \$1.20 per passenger mile, in private-plus-public costs; it is part of the price we pay for the flexibility of automobile travel. Additional costs that are not included in the total are the social and environmental costs of highway travel. Examples of these are the impacts of increased air pollution and noise.

I.E APPROACH TO COST RECOVERY ISSUES

The costs of any publicly funded transportation project inevitably become the subject of debate because the public perceives the public capital investment to be only part of the problem. The other part of the problem is the need for operating subsidy. In point of fact, competing modes — especially highways — require continuing subsidies too, since user fees and fuel taxes do not always cover the full cost of operating and maintaining the infrastructure.

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4 American Automobile Association, "Your Driving Costs," 1995 edition.

5 See, for example, figures from the Federal Reserve Bank, quotedin the San Francisco Chronicle, June 15, 1992.

Nevertheless, the *perception* is that while highways may require capital "subsidy" (i.e., investment), they don't require operating subsidies, while trains, buses and streetcars do. Subsidies mean taxes, and voters generally dislike taxes. Consequently, rail systems may languish, not so much because capital funding is lacking but because on-going operating assistance is lacking.

In the PNWRC, the structure of the public-private partnership offers some new strategies for dealing with cost-recovery issues. For example, the value of public capital investment in private railway infrastructure can be offset against the costs of continuing maintenance. This strategy allows the public to invest capital on a project specific basis, while the carriers, who benefit from the use of the improved facility, contribute by paying a larger share of the maintenance. For them, the avoided cost of the project capital is a significant economic benefit.

Other strategies potentially exist to mitigate the on-going operating costs. From a policy point of view, public agencies are increasingly able to use transportation funds flexibly, according to the needs of the local environment.

Finally, there are other aspects of the public-private partnership approach to funding that may play a role as well, including, for example, commercial development opportunities on land at or adjacent to stations.

Even so, this Options Report must recognize that the PNWRC will require both capital and operating assistance over the life of the planning horizon. For this reason, the final and in some ways most important section of this document is the chapter on the financial issues.

CHAPTER II
EVALUATION OF REPORTS AND STUDIES

II.A INTRODUCTION

The states of Washington and Oregon, and the Province of British Columbia have been involved individually or jointly in rail passenger service studies in the corridor over the last five years. The first element of this Options Report, therefore, was to review and evaluate the key reports and studies developed for the various segments of the corridor. These studies have proposed a series of improvements in the existing alignment or construction of new alignments that would result in higher rail passenger service operating speeds and reduced travel times.

This chapter presents a bibliography of the working papers, studies, and reports reviewed, presents an overview of abstracts developed for the material, and develops a comparison matrix of proposed service levels, patronage estimates, capital costs, and annual operating costs for each service level.

II.B BIBLIOGRAPHY OF WORKING PAPERS, STUDIES, AND REPORTS REVIEWED

The following is a bibliography of the relevant working papers, reports, and studies that are related to rail passenger service in the PNWRC that were used to compile this Options Report. The material was developed under the direction of the Washington State Department of Transportation, the Oregon Department of Transportation, the Province of British Columbia, the Greater Vancouver Regional District, and/or local municipalities.

1. British Columbia

Greater Vancouver Regional District, Strategic Planning Department, *Livable Region Strategy: Proposals--Creating Our Future*, August 1993.

Greater Vancouver Regional District and the Province of British Columbia, *Transport 2021 Report: A Long-Range Transportation Plan for Greater Vancouver,* September 1993.

Greater Vancouver Regional District and the Province of British Columbia, *Transport 2021 Report: A Medium-Range Transportation Plan for Greater Vancouver,* October 1993.

Greater Vancouver Regional District, Strategic Planning Department, *1992 Greater Vancouver Travel Survey, Reports 1 through 6,* March and April 1994.

2. Washington

Wilbur Smith Associates, *(Washington) Statewide Rail Passenger Program - Technical Report*, Prepared for Washington State Department of Transportation, January 1992.

Wilbur Smith Associates, *(Washington) Statewide Rail Passenger Program (Gap Study) - Passenger Train Speed Increases to Maximums Higher Than 79 mph,* Prepared for Washington State Department of Transportation, 3 Working Papers Presented in June, September, and December 1992.

Gannett Fleming, Inc., *High Speed Ground Transportation Study,* Prepared for High Speed Ground Transportation Committee and the Washington State Legislative Transportation Committee, October 1992.

Wilbur Smith Associates, *(Washington) Statewide Rail Passenger Program - Restoration of Passenger Rail Service Between Seattle and Vancouver, BC,* Prepared for Washington State Department of Transportation, December 1992.

Regional Transit Authority (RTA), *Phase I Study Options,* May 17, 1994.

Wilbur Smith Associates, *Washington Rail Capacity Analysis,* Prepared for Washington State Department of Transportation, 1994.

Washington State Department of Transportation, *Preliminary Statewide Multimodal Transportation Plan 1994,* December 1994.

3. Oregon

Wilbur Smith Associates, *Oregon Rail Passenger Policy and Plan - Analysis of Alternatives,* Prepared for Oregon Department of Transportation, May 1992.

Cambridge Systematics, Inc., *Oregon Rail Passenger Policy and Plan,* Prepared for the Oregon Department of Transportation, August 1992.

Wilbur Smith Associates, *Oregon High Speed Rail Capacity Analysis - Recommended Investment Program, FY 1993-1997,* Prepared for Oregon Department of Transportation, July 1994.

Oregon Department of Transportation, *Oregon High Speed Rail Business Plan,* August 1994.

Parsons Brinckerhoff Quade & Douglas, Inc., *Findings on Near-Term Passenger Demand in the Willamette Valley,* Prepared for Oregon Department of Transportation, Transportation Development Branch, August 1994.

4. Corridor

Morrison Knudsen Corporation, *Incremental High Speed Rail, Pacific Northwest Corridor,* Prepared for the PNWC High Speed Rail Technical Group, April 1994.

II.C OVERVIEW OF WORKING PAPERS, STUDIES, AND REPORTS

General

Abstracts have been prepared for each of the working papers, studies, and reports that have been reviewed; the abstracts are included as an appendix to this report.

The information from the previous work that is most relevant to the present PNWRC Options Report is previously generated data concerned with incremental upgrades to existing rail lines or line relocations. Such line improvements will result in a conventional high speed rail (HSR) system with maximum speeds in the range of 110 to 125 mph. A truly High Speed Ground Transportation Corridor (HSGT) capable of supporting train speeds of up to 185 mph is not practical at this time because of the high costs of implementing such a service. This is not to say that such a goal is unrealistic; rather, HSGT could follow as an outgrowth of an incremental upgrade to a conventional HSR system, when ridership levels and public policy decisions lead to the demand for a HSGT system. This would probably occur beyond the planning horizon of the present plan (20 years).

The PNWRC Options Report utilizes patronage estimates developed in previous studies, and updated to reflect current experience. Previous patronage estimates were carried forward through the planning horizon 20 years out, with a mathematical extension applied to the previous figures.

Rail passenger train service levels for the PNWRC Options Report are also based on the train service patterns that had been developed for the various segments of the corridor in previous studies. The report now ties the whole corridor together, making adjustments in proposed schedules as required to obtain the most efficient utilization of rolling stock while providing the optimum levels of service. Since the report is intended to address intercity service, schedule and patronage information is not included for the commuter services that may ultimately share some track segments with the intercity service.

Finally, the operating and maintenance (O&M) cost estimates in the Options Report are also based on previous estimates. The report does, however, reflect the latest three-tier based Amtrak costing methodology, wherein Tier 1 reflects the overhead and system costs (general and administrative), Tier 2 reflects route costs — which are avoidable only if all passenger service is discontinued, and Tier 3 reflects per-train costs. All costs are restated as necessary in 1995 dollars.

Synopsis of Abstracts

This portion of the chapter presents a brief synopsis of the abstracts of the working papers, studies, and reports listed in the bibliography. Table II-1 is a comparison matrix covering train service levels, estimated patronage, and capital and operating costs for the three periods covered by most of the documents reviewed for this study.

1. British Columbia

The four reports covering transportation for the Greater Vancouver Regional District are basically planning and policy documents. As such they do not contain any specific data related to train service levels, projected rail passenger patronage, or estimated capital and operating costs.

2. Washington

The *Statewide Rail Passenger Program Technical Report* completed in 1992 proposed a series of incremental upgrades and improvements to railroad facilities to provide a maximum operating speed of 79 mph, along with increasing levels of service. Table II-1 reflects the costs of railroad facility improvements, increased levels of service, and resulting patronage levels for the Portland-Seattle-Vancouver, BC corridor. In the first biennium, capital expenditures of $42.5 million and increasing train service levels between Portland and Seattle to five daily round trips were forecast to result in annual patronage of approximately 665,400 to 761,100 riders. In the second biennium, capital expenditures of $62.1 million and extending one of the five daily round trips to Vancouver, BC were forecast to result in annual patronage of 727,400 to 847,900 riders. In the third biennium, capital expenditures of $23 million, expansion of service levels to six daily round trips between Portland and Seattle, and extending three of those round trips to Vancouver were forecast to result in 890,300 to 1,202,800 annual riders.

The *Statewide Rail Passenger Program GAP Study* prepared in 1992 supplemented the work done in the previous study. The three working papers in the GAP Study discussed the improvements required in railroad facilities and rolling stock to obtain operating speeds up to a maximum of 125 mph, estimated the capital costs involved, and projected the patronage resulting from the improvements. Although there was no time frame indicated for obtaining indicated results, Table II-1 lists the results in the third biennium.

Two different speed upgrade scenarios were analyzed. The basic schedule scenario contemplated four daily round trips between Seattle and Vancouver, BC, nine daily round trips between Seattle and Portland, and eight daily round trips between Portland and Eugene, with a resulting patronage of 1,430,000 to 1,979,000 riders. The enhanced schedule scenario with faster trip times and more frequent schedules contemplated eight daily round trips between Seattle and Vancouver, and 17 daily round trips between Seattle, Portland, and Eugene, with a resulting patronage of 2,295,000 to 3,292,000 riders (patronage figures reflect estimates for the entire PNWRC). Annual operating and maintenance costs are estimated to be $59.7 million for the basic schedule scenario and $114.6 million for the enhanced schedule scenario. Total capital costs for facility improvements and rolling stock are estimated to be $719.6 million.

The *Statewide Rail Passenger Program - Restoration of Passenger Rail Service Between Seattle, Washington and Vancouver, British Columbia* prepared in 1992 estimated the capital investment necessary to allow an early re-establishment of conventional Amtrak passenger service over the Burlington Northern line between the two cities. The service proposed would begin before a large-scale program of improvements is completed, using standard Amtrak locomotives and cars operating at a maximum speed of 79 mph to achieve a running time of 3_ hours between the two cities. For a service level of two round trips daily, the estimated capital costs are $61.5 million. There is no estimate of patronage or operating costs for the service.

The *Washington Rail Capacity Analysis* summarizes the results of a series of computer simulations of train operations performed for the state of Washington. The analysis was based on train service levels prescribed in other studies, thus makes no recommendations related to service levels, capital improvements, or patronage.

The *High Speed Ground Transportation Study* completed in 1992 developed costs and patronage for rail (or MagLev) service at speeds of 185 mph and 300 mph. In general, the cost and patronage data used in this plan has been developed specifically for the incremental rail alternative, and not adopted from the HSGT study.

The *Preliminary Statewide Multimodal Transportation Plan 1994* reviewed the needs for the overall transportation system in the state of Washington. Intercity passenger rail service objectives require an investment of approximately $1.54 billion over a 20-year time frame. There are no service levels, capital improvements, or patronage estimates specifically related to the planning periods covered by the Options Report, thus no figures from the multimodal plan are included in Table II-1.

The *Regional Transit Authority Phase I Study Options* adopted in October 1994 provided recommendations for transportation of Seattle commuters, with the commuter rail portion describing improvements to achieve a maximum speed of 79 mph. Since such improvements would impact the intercity rail passenger service proposed for the PNWRC, the costs would be shared with the intercity rail passenger service. The total costs for the combined improvements necessary to support commuter and intercity rail passenger service are accordingly carried through the report. Projected commuter patronage would be separate from an intercity service; thus none of the commuter patronage estimates are included in Table II-1.

3. Oregon

The *Oregon Rail Passenger Policy and Plan* prepared in 1992 analyzes the passenger rail alternatives defined in previous work for rail corridors in Oregon. The primary focus is on the Willamette Valley between Eugene and Portland, with two concepts: an intercity service between the two endpoints, and an interurban service on the west side of the valley between the same two cities.

The early stage service scenario (assumed for the first biennium) projects three round trips daily between Portland and Eugene with a maximum speed of 79 mph in the corridor and a trip time of 2 hours 20 minutes. Capital costs for this stage are estimated to be $25 million. The second stage service scenario assumes five round trips, a trip time of 2 hours 5 minutes, and maximum speeds of 110 mph, with capital investments between $130 and $160 million. The third stage service scenario assumes nine round trips, a trip time of 1 hour 45 minutes, and significant capital improvements consisting of heavy upgrade/realignments and capacity enhancements costing approximately $200 million. Oregon-related rolling stock costs are estimated to be $2.5 million for the first stage, $9.8 million for the second stage, and $18.8 million for the third stage (these costs are added to the above capital costs in Table II-1).

Annual operating costs for the first stage are estimated to be $8.1 million, $13 million for the second stage, and $29 million for the third stage. Annual Willamette Valley patronage is estimated to be 175,200 for the first stage, 350,000 for the second stage, and 700,000 for the third stage (these figures do not include the effect of train service south of Eugene).

The *Oregon High Speed Rail Capacity Analysis, Investment Program Recommendations, FY 1993-1997* prepared in 1994 presents the results of computer simulation modeling of current and future rail service levels on the Southern Pacific line between Portland and Eugene. It also recommends a phased program of improvements to increase capacity and provide for higher train speeds. In the first biennium train service levels would consist of two daily round trips, with estimated capital costs of $7.3 million. In the second biennium, service levels would consist of four daily round trips, with capital costs of $13.1 million. In the third biennium, service levels would consist of five daily round trips, with capital costs estimated at $30 million. There are no estimates of patronage or operating costs in this report.

The *Oregon High Speed Rail Business Plan* prepared in 1994 outlines the improvements to be completed on the rail corridor between Portland and Eugene over three bienniums and lays out the basic program for implementation. In the first biennium train service levels would consist of two daily round trips, with the cost of capital improvements estimated at $10.3 to $12.8 million. In the second biennium service levels would consist of three daily round trips, with the cost of capital improvements to operate at a maximum speed of 79 mph estimated at $56.5 to $62.5 million. In the third biennium, service levels consist of four daily round trips, with the cost of capital improvements to operate at 110 mph estimated at $165.7 million. Projected annual patronage by the third biennium is estimated to be 274,000 to 332,000 riders.

The *Findings on Near-Term Passenger Demand In The Willamette Valley* estimated patronage of 274,000 to 332,000 for a train service level of four daily round trips between Portland and Eugene by the year 2000 (the end of the third biennium). Estimated travel time for the corridor is 2 hours 17 minutes. There are no capital or operating cost estimates in this paper.

4. Corridor

The *Incremental High Speed Rail - Pacific Northwest Corridor* paper is an informal discussion of policy issues related to the creation of incremental High Speed Rail in the Pacific Northwest Corridor. There are no train service levels, cost estimates, or patronage projections in this paper.

II.D ANALYSIS OF RESULTS

Table II-1 summarizes the results recorded from each previous report or study. The table suggests that previous work has developed a range of levels of investment and levels of service. Higher capital investment strategies result in significantly higher patronage levels. The segments of the corridor where rail passenger service is provided now generally require less capital investment than segments where passenger service did not exist. For example, within Washington the *Statewide Rail Passenger Program Technical Report* initially suggested that approximately $42.5 million would be required in capital improvements to 146 miles of railroad to provide for five daily round trips between Seattle and Portland, where service is currently being provided. On the other hand, the *Statewide Rail Passenger Program - Restoration of Passenger Rail Service Between Seattle and Vancouver* estimated costs of $61.5 million for capital improvements to approximately 156 miles of railroad, most of which did not have passenger service, to provide for only two daily round trips. Areas where passenger service did not exist require greater initial investment.

Another conclusion clearly indicated is that achievement of higher operating speeds requires higher capital investment , but as a consequence results in higher patronage levels. For example, the *Statewide - Technical Report* indicates investment of approximately $127.6 million over three bienniums to achieve maximum operating speeds of 79 mph, which will result in projected patronage of 890,000 to 1,202,800 riders. The GAP Study indicates investment of $719.6 million by the end of the third biennium to achieve maximum operating speeds of 110 mph resulting in 1,430,00 to 1,979,000 patrons, or maximum operating speeds of up to 125 mph resulting in 2,295,000 to 3,292,000 patrons.

Realistically, the first increment of an upgrade to a high speed rail corridor is to achieve 79 mph operation over as much of the corridor as possible. Table II-1 lists several reports that detail the improvements required to achieve 79 mph operation over much of the corridor, the service levels which the improvements would support, and the projected patronage that would result. As additional funding becomes available, the next incremental upgrade to 110 mph maximum operating speeds can be programmed, using the list of projects from the reports indicated in Table II-1.

The development of the PNWRC Options Report proposes a level of investment and projects service levels and estimated patronage levels based on the work that is summarized in Table II-1. It combines into a full-corridor plan, and in some cases updates, the various segments addressed in the past reports. The report is based on utilizing the data consistent with the level of funding allocated to provide the desired service level of speeds and number of trains in operation.

CHAPTER III
TRAIN OPERATIONS, COSTS, AND REVENUES

III.A INTRODUCTION

This chapter addresses the patronage, train service, costs, and revenues projected for the PNWRC over the 20-year planning period.

In order to place the assumptions regarding PNWRC development in context, recent experience in California regarding rail corridor development with state assistance is discussed.

Existing PNWRC services and patronage are described, followed by a discussion of the track and train service upgrades that have been projected for the corridor over the next 20 years as set forth in previous studies. The anticipated effect of these improvements on patronage is also discussed, and future revenues are estimated by analyzing yields from corridors with similar services.

In the later phases of the Options Report, the service frequencies assumed in the ridership and revenue projections are very high by comparison with current or historical experience (see Table III-6 following). The infrastructure investment plan recognizes that this increase in passenger service is being imposed upon an already heavily-used railway corridor. To ensure a proper balance between demand, capacity, and service performance, extensive analysis and modeling have been undertaken with respect to the critical segments over the past four years. Even so, traffic forecasts — particularly for expedited freight traffic — continue to increase, and plans for commercially viable freight service continue to reflect ever more demanding standards of performance and reliability. Consequently, the continuing ability of the investment plan, as described in Chapter IV, to support the service plan described in this chapter, will be subject to constant further analysis as the required environmental impact studies are undertaken.

Finally, in order to anticipate the future financial performance and subsidy needs resulting from corridor operations, Amtrak costing methodology is discussed and an estimate of future train operating expenses is made, comparing them with estimated passenger train revenues. The extent to which net operating losses might represent a state (or provincial) obligation would be defined in future negotiations.

III.B RELEVANT EXPERIENCE IN CALIFORNIA CORRIDORS

Two California rail corridors offer some comparison of what might be expected from continued corridor development in the Pacific Northwest. The San Diego and San Joaquin Corridors have experienced gradual increases in train service, and are being upgraded for greater capacity and higher speeds based on their proven record of passenger attraction.

San Diego Corridor

The San Diego Corridor (Santa Barbara-Los Angeles-San Diego) is the busiest rail corridor outside the Northeastern states. Roughly half of the service is state-supported through the 403(b) program.[1] Prior to August, 1976, there were three daily round trips operated between Los Angeles and San Diego (129 miles), carrying less than 400,000 riders per year. Schedules were primarily oriented to provide connections to Amtrak's long distance trains in Los Angeles. State participation commenced in 1976-77, when the fourth and fifth round trips were added. A sixth trip was added in 1977-78, and within two years annual patronage rose to over 1,200,000 riders. A seventh trip was added in 1980-1981, an eighth trip in 1987-1988, and a ninth trip in 1992-93. In 1988-89, one round trip was extended 103 miles to Santa Barbara. A second trip was extended in 1991-92, and a third trip in 1993-94. Annual ridership has grown to nearly 1,800,000. Ridership growth has flattened in the last few years due to the sagging economy, negative impacts of poor performance related to track improvement projects, and perhaps in part to the introduction of commute service along portions of the route which may have attracted some riders away from the Amtrak service.

Passenger miles per train mile have remained relatively constant, generally ranging from 140 to 160. The revenue to cost ratio for the route has risen from 36 percent in 1976-77 to over 100 percent in recent years as computed on a short term avoidable cost basis. Feeder bus services attract passengers from beyond the immediate service route of the trains, and supplement the train service in some time slots. New or substantially rebuilt multi-modal stations have been completed in several communities, further contributing to patronage growth. Long range plans of the state call for additional service extensions from Los Angeles to Santa Barbara, and further frequency additions between San Diego and Los Angeles when track capacity improvements are completed.

The corridor is highly urbanized, and the total population of the five counties along the corridor is 14,811,000. There are major trip generators throughout the length of the corridor, and weekend travel is heavier than weekdays on most trains. Auto is the principal competitive mode of travel for most trips.

San Diego Corridor ridership growth is shown in Table III-1.

San Joaquin Corridor

The San Joaquin Corridor, from San Francisco/Oakland through the San Joaquin Valley to Bakersfield, had no rail passenger service from 1971 to 1973. One round trip was reinstituted by Amtrak in 1973, and the service became a state-supported 403(b) route in 1979-80. A second round trip was initiated in 1979-80; a third trip in 1989-90, and a fourth trip in 1992-93. Ridership has grown with the improved service levels, rising from about 66,000 in the mid-1970's to over 500,000 in the last two years. Passenger miles per train mile have also improved from below 50 to over 100. The revenue to cost ratio was about 30 percent when state support began, and is now just over 50 percent, but reached a peak of 87 percent just before the addition of the third frequency. Schedule adjustments were recently made to improve the economic performance of the route.

[1] Section 403(b) of the Amtrak authorizing legislation sets out a procedure for state or local agencies to supplement basic system trains with additional service, on a cost sharing basis.

Table III-1
San Diego Corridor Ridership

Fiscal Year	Round Trips per Day	Riders	Passenger Miles per Train Mile
73/74	3	381,800	na
74/75	3	356,600	na
75/76	3	376,900	na
76/77	5	608,000	146
77/78	6	753,200	128
78/79	6	967,300	163
79/80	6	1,218,200	177
80/81	7	1,238,100	152
81/82	7	1,167,700	144
82/83	7	1,131,100	138
83/84	7	1,221,256	143
84/85	7	1,240,000	152
85/86	7	1,394,300	167
86/87	7	1,461,000	173
87/88	8	1,661,500	174
88/89	8	1,717,500	164
89/90	8	1,746,700	174
90/91	8	1,791,800	159
91/92	8	1,673,100	161
92/93	9	1,810,500	155
93/94	9	1,699,882	129

The San Joaquin trains are supported by an extensive feeder bus system between Bakersfield and Southern California, and to many locations in Northern California.

The rail route is 312 miles long, with major population centers spaced along the route. The total population of the counties served directly by the train service is 4,823,000.

California plans to increase service frequencies to six trips, and to extend train service from Stockton to Sacramento. A major track upgrade project is in progress to provide both capacity and speed improvements.

San Joaquin Corridor ridership growth is shown in Table III-2.

III.C PACIFIC NORTHWEST CORRIDOR PROFILE

Since Amtrak assumed operation of passenger service, the Pacific Northwest corridor has been served principally by long distance trains which traverse the corridor to Seattle, supplemented by limited corridor service, in most years consisting of one round trip between Seattle and Portland.

Table III-2
San Joaquin Corridor Ridership

Fiscal Year	Round Trips per Day	Riders	Passenger Miles per Train Mile
73/74	1	38,800	84
74/75	1	67,000	44
75/76	1	66,500	44
76/77	1	87,600	56
77/78	1	80,600	53
78/79	1	87,600	60
79/80	2	123,300	64
80/81	2	159,500	55
81/82	2	189,500	65
82/83	2	186,100	63
83/84	2	248,300	85
84/85	2	269,800	94
85/86	2	280,800	101
86/87	2	304,700	106
87/88	2	340,600	121
88/89	2	370,200	134
89/90	3	418,800	117
90/91	3	463,900	104
91/92	3	483,600	104
92/93	4	516,100	110
93/94	4	558,600	94

Experimental local service was operated for nineteen months in 1980 and 1981 between Portland and Eugene. Service between Seattle and Vancouver, BC was provided by Amtrak from 1972 to 1981. In 1994 Washington contracted with Amtrak to initiate a second corridor round trip between Seattle and Portland using the Talgo equipment. In late 1994 one of the Seattle-Portland trains was extended to Eugene with financial support from the state of Oregon. Seattle-Vancouver service was reintroduced in May 1995 with one daily round trip.

Development of the corridor has been limited because the long distance trains lack the consistent on-time performance necessary to build local travel and they are limited in capacity, particularly during summer and holiday peak travel periods.

A new station was built to serve Tacoma in 1984, and a new facility at Olympia/Lacey replaced the former East Olympia facility in 1992. A significant increase in patronage followed construction of the Olympia station, from about 1,200 passengers per month before it opened to about 1,900 passengers per month after its completion.

Table III-3 summarizes recent patronage (total passengers on and off) at corridor stations.

Table III-3
Pacific Northwest Corridor Station Patronage

Station	1990	1991	1992	1993	1994
Everett	14,900	15,800	17,600	15,700	16,223
Edmonds	7,400	7,400	7,400	7,400	7,123
Seattle	349,900	359,300	362,500	316,900	339,639
Tacoma	84,000	84,900	84,300	72,300	78,399
Olympia	18,100	21,100	22,800	22,100	24,805
Centralia	12,700	10,500	10,000	12,100	17,808
Kelso	17,400	17,000	16,500	15,600	16,058
Vancouver	44,500	40,500	42,200	39,200	41,602
Portland	342,800	350,900	358,400	327,800	338,905
Salem	25,800	26,600	25,100	21,000	22,420
Albany	16,800	16,500	15,300	13,600	15,403
Eugene	51,600	48,100	45,950	40,700	49,099

Source: Amtrak and Washington DOT.

Table III-4 shows derived annual rail passenger travel patterns and volumes between Seattle, Portland, and Eugene, based on samples of recent Amtrak train manifests. The table shows only local passengers traveling within the corridor, and does not show passengers traveling between the corridor and external points on Amtrak's long distance trains. Only the major markets (city-pairs) are shown.

Based on the train manifests sampled, current total ridership between corridor stations (excluding a small number of trips between Everett, Edmonds, and Seattle) is 382,000 per year, accounting for 63,934,300 passenger miles, or an average trip length of 167 miles. Seattle-Portland trips account for 38 percent of the trips and 42 percent of all passenger miles in the corridor. Data in Table III-4 was gathered from two sources. The higher patronage suggested by the sample data reflects extension of Mt. Rainier service to Eugene, and the impact of patronage generated by the Talgo service between Seattle and Portland. The annual ridership derived from the sample data may overstate a sustained or normal level because the unique qualities of the Talgo service induced some riders who wanted to experience the Talgo, and thus, increased ridership above " normal" levels during the sample period. Note that Table III-4 reflects travel between major market pairs, not all travel in the corridor.

Sampling of Amtrak train manifests shows that the Coast Starlight (Seattle-Los Angeles) generates about 198,500 annual trips between corridor stations and stations south of Eugene. Seattle and Portland are the major generators of these trips. The Pioneer (Seattle-Portland-Denver-Chicago) generates about 48,100 trips per year between corridor stations and external stations with its current tri-weekly schedule. The Empire Builder (Seattle-Spokane-Chicago) generates about 169,900 trips per year (based on pre 1995 daily service levels) between corridor locations and external stations. The vast majority of these are trips to or from Portland or Seattle. The Seattle section of the train, which traverses the corridor only between Everett and Seattle, carries an insignificant number of passengers within the corridor, and the Portland section carries virtually no local passengers for the ten miles between Vancouver, Washington and Portland.

Table III-4
Primary Passenger Markets

City Pair	1995 Sample Data		Calendar 1994	
	Annual Passengers	Annual Passenger Miles	Annual Passengers	Annual Passenger Miles
Seattle-Tacoma	8,400	335,000	6,648	265,920
Seattle-Olympia	7,000	504,000	6,084	438,050
Seattle-Centralia	6,800	641,200	6,643	624,440
Seattle-Kelso	10,200	1,394,600	8,152	1,116,820
Seattle-Vancouver, BC	29,700	5,220,700	20,474	3,603,420
Seattle-Portland	145,200	27,000,800	119,511	22,229,050
Seattle-Salem	16,600	3,489,400	5,496	1,313,540
Seattle-Albany	7,700	2,066,000	3,639	971,610
Seattle-Eugene	21,100	6,540,100	9,490	2,941,900
Tacoma-Centralia	3,000	163,400	2,875	155,250
Tacoma-Kelso	3,200	312,600	1,973	191,380
Tacoma-Vancouver, BC	9,200	1,245,500	6,815	926,700
Tacoma-Portland	42,700	6,231,800	33,729	4,924,430
Tacoma-Salem	3,700	726,400	2,188	435,410
Tacoma-Albany	2,100	480,600	1,230	279,210
Tacoma-Eugene	4,400	1,182,600	2,608	704,160
Olympia-Vancouver, BC	1,700	177,900	1,169	121,580
Olympia-Portland	10,100	1,153,500	8,277	943,580
Centralia-Portland	4,000	369,400	2,855	262,660
Portland-Salem	5,300	278,600	2,735	144,960
Portland-Albany	4,700	378,400	2,206	178,690
Portland-Eugene	19,500	2,416,900	10,878	1,348,870
Salem-Eugene	2,400	171,000	1,092	77,530

Data derived from random samples of long distance train manifests during 1991-1995, and samples of corridor train manifests in 1994 and 1995. Amtrak Calendar 1994 data from Washington DOT.

III.D IMPROVED RUNNING TIMES AND SERVICE LEVELS

Improvements designed to increase passenger train speeds have been proposed by both Washington and Oregon in their rail passenger plans. Short-term improvements are proposed in phases to be accomplished over the next five to six years. Capacity improvements are generally obtained by adding more track (providing multiple track or passing sidings); speed improvements are obtained by making improvements to track, signals, or alignment that eliminate existing speed restrictions. Modifications to regulated municipal speed restrictions are an additional method of obtaining improvements in operating speeds.

The Washington Rail Passenger Program[2] contains base case (1991) run times, and projected run times under three phases of improvement. In this analysis, there has been an allowance for station dwell time and recovery time normally found in passenger schedules, and have extrapolated the improvement plan to allow run time projections through the end of the 20-year planning horizon (see Table III-5). For Vancouver, BC-Seattle, track improvement projects are planned or currently underway to permit service with an overall schedule time of just under 4 hours, although the initial service in May of 1995 required about 4.5 hours. Current Seattle-Portland service has best schedule time of 3 hours 50 minutes. The improvements developed for these faster running times are those that yield the maximum running time reduction over a 20-year time frame. Further reductions could be made, but at greater cost per minute of time saved. In some cases, the improvements needed to accommodate increased frequencies also will contribute to faster running times, such as more track capacity (particularly on the single track line between Vancouver, BC and Everett) or improvements to the signal system (see discussion in the section on engineering improvements).

Finally, the total improvement in running time in each planning phase is the sum of engineering (track and signal) and rolling stock technology. All of the running times shown in Table III-5 assume the benefits of high speed trainsets (capable of operating up to 125 mph). For example, the total reductions in trip times in Phase I assume a combination of improvements from engineering work and from use of high technology rolling stock equipped with tilt suspension, released to operate at higher curve speeds. The Phase I time reduction shown assumes:

Vancouver, BC-Seattle	Rolling stock time savings	-	9 minutes
	Engineering time savings	-	6 minutes
Seattle-Portland	Rolling stock time savings	-	14 minutes
	Engineering time savings	-	19 minutes
Portland-Eugene	Rolling stock time savings	-	6 minutes
	Engineering time savings	-	15 minutes

2 Wilbur Smith Associates, January, 1992.

Oregon's rail planning efforts as set forth in the Oregon High Speed Rail Capacity Analysis[3] also have identified near-term improvements that will cut running times between Portland and Eugene with a phased package of improvements over a six year time frame. The cumulative effect of these improvements is assumed in Table III-5 to be complete by Phase 2.

Table III-5
PNWRC Scheduled Running time Assumptions
(Hours:Minutes)

	Current Base	Phase 1	Phase 2	Phase 3	Phase 4
Vancouver BC to Seattle	3:55[4]	3:40	3:24	3:13	2:57
Seattle to Portland	3:50	3:17	2:59	2:42	2:30
Portland to Eugene	2:36	2:15	2:00	1:50	1:45
Total Time[5]	10:21	9:12	8:23	7:45	7:12

Phase 1: 5-6 years from Current Base
Phase 2: 5-6 years from Phase 1
Phase 3: 5-6 years from Phase 2
Phase 4: 5-6 years from Phase 3

Given the trip time reductions outlined in the Washington and Oregon plans for the short term, and the long range objective of continuing to improve the track and signal facilities in the corridor as frequencies are increased, it seems reasonable to assume the target travel times between the major centers along the corridor shown in Table III-5. These travel times are attainable largely by using current rail alignments and require considerable track upgrading for higher speeds (see engineering discussion). Running times in Phases 3 and 4 assume maximum operating speeds of up to 125 mph on sections of the corridor.

Running times beyond year 2000 assume implementation of certain new alignments for higher speed operations, such as the Point Defiance Bypass and alternative alignments in British Columbia. They also assume use of tilt train technology.

Projected Service Levels

The Washington Rail Passenger Program has ridership projections keyed to modest increases in frequency in the Vancouver-Seattle-Portland-Eugene corridor (Six round trips Seattle-Portland, with about half of these extending north to Vancouver or south to Eugene.) The Washington State "Gap" study projects ridership for as many as nine daily frequencies between Seattle-Portland, three between Vancouver BC-Seattle, and eight between Portland-Eugene.

For analysis purposes, it is assumed that the corridor can support added frequencies over the 20-year period as shown in Table III-6. These frequency levels will provide hourly corridor service between Seattle and Portland in 20 years, where projected patronage demand is the highest, and service every 2-3 hours on the extensions to Vancouver, BC and to Eugene.

3 Wilbur Smith Associates, September, 1994.

4 After all improvements underway are complete, estimated for December 1995.

5 Excludes Seattle and Portland dwell time.

Table III-6
Assumed Corridor Service Levels
(Daily Round Trips)

		Current Base	Phase 1	Phase 2	Phase 3	Phase 4
Vancouver BC-Seattle:	Corridor	1	3	4	5	6
	Long Distance	0	1	1	1	1
Seattle-Portland:	Corridor	2	6	9	12	15
	Long Distance	2	2	2	2	2
Portland-Eugene:	Corridor	1	3	5	6	7
	Long Distance	1	1	1	1	1
Equipment Requirements:	Trainsets	4	7	12	15	15

Long distance train assumptions include the Empire Builder operating between Everett and Seattle, the Pioneer between Seattle and Portland, and the Coast Starlight between Seattle and Eugene. The long distance trains are assumed to be daily, although frequency is less than daily now.

An analysis was made of the number of trainsets required to operate the projected service levels (each trainset consists of a locomotive and sufficient cars to accommodate projected patronage on an average travel day, with seating for 250 passengers or more). To obtain maximum utilization of the rolling stock and to provide for maintenance and servicing of the trainsets, each trainset is assumed to make a minimum of a round trip each day, with some trainsets making up to three trips per day. It is also assumed that there will be one central maintenance/service base, either in Portland or Seattle, since the highest level of service is between those two points, and the equipment cycling can be set up so that each trainset returns to the base every two or three days for heavy servicing/light maintenance.

Table III-6 also includes the estimated number of trainsets required for operation of the projected service levels for each phase. This includes spare trainsets required when one or two trainsets are removed from service for performance of mandated periodic maintenance/inspection.

III.E PATRONAGE PROJECTIONS

A number of interrelated factors will be responsible for patronage growth on rail services in the corridor. The key factors will be frequency of service, the speed of service compared with driving times over short distances and air travel times over longer distances, fare levels as related to the real or perceived cost of competing modes, and convenience and attractiveness of the service. Other factors that influence patronage are population and business activity growth in the service area, the convenience of station facilities, and the degree of intermodal travel encouraged by the rail system via connecting services. Finally, the ability of the rail system to satisfy a variety of trip purposes that include business travel, vacation or leisure travel, and other purposes will influence patronage on the system.

The Washington Rail Passenger Program projected patronage for a range of service options for year 2000. The highest service level, with six daily trains between Seattle and Portland, and three trains extended to Vancouver, BC and two trains to Eugene, was projected to attract from 653,000 to 965,000 annual corridor trips, plus another 237,000 trips generated on long distance trains in the corridor. These projections excluded local trips within Oregon. The "Gap" Study (Working Paper #3[6]) included projections for more intensive levels of corridor service. A basic schedule that provided nine daily round trips between Seattle and Portland, and a lesser number extending to Vancouver and Eugene, was projected to attract from 1,430,000 to 1,979,000 annual passengers. An enhanced schedule with as many as 17 round trips on the core segment between Seattle and

6 Wilbur Smith Associates, November, 1992.

Portland was projected to have from 2,295,000 to 3,292,000 annual riders. No target years were given for attaining these levels, but the projections assumed significant improvements in running times.

The Oregon Rail Passenger Policy and Plan[7] contains projections of Portland-Eugene ridership with different service levels. Ridership would be 175,000 annually with three round trips, increasing to 350,000 riders at five round trips, and 700,000 riders with nine round trips. While not stated explicitly, this apparently includes ridership with trip ends in Washington State that would be induced by through service opportunities from corridor service, rather than service strictly limited to travel within Oregon.

Because the current study does not include resources for new ridership modeling, the projections developed for the state plans have been adjusted and extrapolated, and related to the probable frequencies of train operation assumed for this plan. To this extent, they may represent — particularly in the more distant years — an "if you build it, they will come" estimate of patronage in the sense that it is based on continuing patronage attraction by added services rather than an analysis of total travel and an assignment of reasonable market share to rail. This has been the experience to date in the San Diego Corridor.

The preliminary patronage projections in Table III-7 are generally consistent with the projections of the Washington Rail Passenger Program for similar service levels between Seattle and Portland. To verify the reasonableness of the projections, this Report has included projected average trip distance and passenger miles per train mile (PM/TM), which is a measure of the average occupancy of each train. Average trip lengths are expected to increase as more opportunities are provided for through travel within the corridor, and PM/TM measures are expected to increase as the service expands.

It should be noted that projection of patronage is not an exact science, and actual ridership of an implemented service may be higher or lower than projections. The figures used in this report are extrapolated from work done for the states of Washington and Oregon over the last five years. The projections are based on experience from observed reality in similar passenger rail corridors around the country.

7 Wilbur Smith Associates, May, 1992.

Table III-7
Projected Annual Patronage Data

	1995	2000	2005	2010	2015
Annual Train Miles (000)	475.9	1,427.8	2,130.1	2,741.8	3,353.6
Low PM/TM	120	125	130	135	140
High PM/TM	130	140	150	165	180
Low Passenger Miles (000)	57,108	178,475	276,913	370,143	469,504
High Passenger Miles (000)	61,867	199,892	319,515	452,397	603,648
Average Trip Distance	165	190	215	225	230
Low Passengers (000)	346.1	939.3	1,288.0	1,645.1	2,041.3
High Passengers (000)	374.9	1,052.1	1,486.1	2,010.7	2,624.6
Long Distance Passengers (000)	245.0	250.0	255.0	260.0	260.0
Low Total Passengers (000)	**591.1**	**1,189.3**	**1,543.0**	**1,905.1**	**2,301.3**
High Total Passengers (000)	**619.9**	**1,302.1**	**1,741.1**	**2,270.7**	**2,884.6**

Note: Long distance passengers are passengers from corridor points to stations outside the corridor on Amtrak long distance trains. These projections assume continuation of current long distance trains, on a daily basis. Fare levels and reservation policies are expected to divert most corridor passengers away from the long distance trains as corridor frequencies increase.

III.F OPERATING COSTS AND REVENUES

The primary source of operating cost data for rail passenger service is Amtrak. Over the years, Amtrak has developed an analysis methodology for determining direct operating costs of train service, and for allocating shared costs and systemwide costs to each route or service. Amtrak is now revising this methodology based on more recent examination of their accounting and reporting systems, since the former system is believed to understate the real costs of train service because it underallocated the shared and systemwide costs. The new methodology is not yet fully developed, and we have adapted available data to follow the proposed cost methodology. The methodology consists of determining costs in three major groupings:

1) **Costs directly related to each train or group of trains comprising a particular service.** These would include train and engine crew costs, fuel, on-board service labor and supplies, payments to railroads for providing services, equipment maintenance, reservations and sales expenses, and station expenses related directly to the service. Generally, these are the costs that would be saved upon discontinuance of any train. For the most part, they are driven by service measurements, such as train miles, car or engine miles, number of passengers, or similar factors.

2) **Costs related to a particular route or group of related routes comprising a system, and shared between a number of trains using that route or system of routes.** Typically these will include station and facility ownership costs and management costs that relate to the route or the system, rather than to any single train operated over the route. These costs would not vary significantly as individual trains are added to or deleted from the route, but would not be incurred if there were no service at all over the route.

3) **Costs of management and operation of the entire Amtrak system that are not directly related to either individual trains or to route systems.**

The Options Report estimates service costs based primarily on the first category of costs — those stemming directly from train operations. However, it is likely that future contracts with states for operation of corridor services that are not part of Amtrak's national system trains will include not only the direct costs, but will also allocate portions of the shared route costs and the system management costs to the corridor operating costs when determining the required state or local contribution to the operation. Amtrak has estimated that these costs represented an additional 37 percent above and beyond the basic train costs in FY 1994. This analysis projects only the direct, or "train-related" costs. It also excludes possible cost changes that may result from Amtrak's renegotiation of operating contracts with the railroads which will occur in 1996.

Unit costs shown in Table III-8 have been derived from recent Amtrak data for the Seattle-Portland service (Mount Rainier), and checked against comparable data for the Capitol Corridor service in California and other corridor operations. All costs are based on data for the federal 1994 fiscal year (October 1993-September 1994).

Currently, only the Portland-Eugene extension of the Mt. Rainier, the Seattle-Portland Mt. Adams and the new Seattle-Vancouver trains are locally supported; the long distance trains plus the other Seattle-Portland corridor train are national system trains. Forecasts presented assume only the long distance trains will be operated as national system trains, and costs are developed for all the corridor trains which may require some level of state support. No attempt has been made to determine appropriate support levels for each state, as that will require negotiation between the states based on detailed patronage data and determination of relative benefits.

If Amtrak extended the "Coast Starlight" service from Seattle to Vancouver, BC, this would probably take the place of one corridor round-trip train, and would reduce slightly cost and revenue figures for the corridor service.

"Cost drivers" were selected based on the most appropriate operating characteristic. These have been generalized by cost category. Amtrak's revised cost accounting system, when fully developed, will have significantly greater detail, but is not ready for our use at this time. Train miles, engine miles, car miles, and passengers are believed most directly related to operating costs and to revenue generation projections.

The unit costs shown in Table III-8 reflect costs for the year ending in September 1994. The Seattle-Portland route (186 miles long) data are for one round trip per day. The Capitol Corridor route (152 miles long) data reflect one daily round trip the full length of the corridor, and two round trips operating a shorter distance within the corridor, plus one "deadhead" round trip per day to position equipment for service.

The unit costs are, in general, directly related to passenger volumes and train operations, and thus, will provide few economies of scale as the corridor service grows. However, the route-related costs and the overall management costs associated with the service (not shown in Table III-8) will not increase in proportion to service growth, so there will be some overall economies of scale associated with growth of corridor service.

Table III-8
Projected Unit Costs of Corridor Operation - $

Cost Group	Seattle-Portland 1994	Capitol Corridor 1994	PNW Corridor Assumptions
Transportation Operations	9.85 per train mile	11.26 per train mile	10.00 per train mile
Locomotive Repair	3.10 per engine mile	2.27 per engine mile	3.00 per engine mile
Car Repair	1.60 per car mile	1.06 per car mile	1.20 per car mile
Track and Facility Maintenance	1.70 per train mile	1.30 per train mile	1.50 per train mile
On Board Service and Commissary	2.39 per train mile	2.34 per train mile	2.35 per train mile

Stations and Marketing	4.02 per passenger	5.55 per passenger	4.50 per passenger
Insurance and General Support	5.05 per train mile	4.98 per train mile	5.00 per train mile
Railroad Costs and Performance Payments	1.84 per train mile	2.84 per train mile	2.00 per train mile

III.G FARE LEVELS AND REVENUE

Current Amtrak fares between Seattle and Eugene are mileage based. Base one-way fares range from about $0.25 per mile for short trips to $0.13 per mile for the full 310-mile distance. Discounted round trip fares are offered, with a variety of restrictions and with limited seating availability for the lowest discounted fares, ranging from $0.18 per mile for short trips to as low as $0.07 per mile for the lowest round trip discount fare for the full distance.

The average trip distance (each half of a round trip is considered a trip) for all trips within the corridor based on samples of recent train manifests (reservation records) is 167 miles. The average trip length for the Seattle-Portland service is 155 miles, and the 1994 passenger revenue per trip averaged $.074 per mile. While this figure is near the lowest discount fare, it may reflect some passengers who use the corridor train in conjunction with a long distance trip, where even lower per mile fares are possible and the corridor's share of the total trip fare is lower than the cost of travel within the corridor alone. It also reflects additional discounts granted to children and seniors.

Table III-9 illustrates current fare levels in the corridor for trips of varying length.

It is difficult to project fare levels over a long time period. Fares will change depending on market factors, competitive travel costs (auto and air), and public policy. However, as the number of frequencies increase and travel time declines, more business travel will be attracted to the service, suggesting that average fare levels will be able to rise since in many instances train travel will become competitive with air travel.[8] On the other hand, extending additional service throughout the length of the corridor may raise average trip length, and thus lower the per mile revenue received from each passenger. Fare levels have been projected conservatively, but with higher average yields than current fares.

Based on increasing average trip distances, and current fares applicable in the corridor, the projected transportation revenue yield is projected at the levels shown in Table III-10.

Table III-9
Current Amtrak Fare Levels (May, 1995)

Trip	Miles	One Way	Discounted Round trip	One Way per Mile	Discounted Round Trip per Mile
Olympia to Centralia	22	$6	$8	$0.273	$0.182
Seattle to Tacoma	40	$8	$10	$0.200	$0.125
Seattle to Olympia	72	$14	$16	$0.194	$0.111
Portland to Eugene	124	$19	$20	$0.153	$0.081
Seattle to Vancouver, BC	155	$29	$42	$0.187	$0.135
Seattle to Portland	186	$25	$26	$0.134	$0.070
Tacoma to Albany	227	$31	$32	$0.137	$0.071
Seattle to Eugene	310	$40	$42	$0.129	$0.068

[8] For example, yieldper passenger-mile on the 125 MPH New York-Washington Metroliner service is over $0.30.

Notes:	Discounted round trip fare is the lowest available; other fares are offered at higher rates with less restriction.
	Premium fare charged for Talgo train was $3.00 additional for travel between Seattle and Portland. Current Vancouver, BC-Seattle Talgo surcharge is $5.00.

For the purposes of this Options Report, food and beverage revenues are projected at a constant level of $1.35 per passenger. The current Seattle-Portland level is $1.31 per passenger, while the Capitol Corridor service with its shorter average trip length yields only $1.04 per passenger. Food and beverage service is assumed to be lounge and snack service (sandwich and fast-food items) similar to current service provided on the Mt. Rainier train. The current Mt. Baker International train yields approximately $5.00 per passenger in food and beverage revenues, exceeding all expectations. This is a direct result of its enhanced dining service.

Table III-10
Estimated Average Trip Length and Average Yield Per Passenger Mile

	Average Trip Length	Average Yield
1995	165 miles	$0.080
2000	190 miles	$0.100
2005	215 miles	$0.120
2010	225 miles	$0.140
2015	230 miles	$0.160

Table III-11 projects train operating costs and revenue for the corridor service. As stated above, costs reflect Amtrak's current policy of charging all costs associated with train operations, including long term equipment maintenance costs and supporting overhead costs, to each service. They do not include the additional route- and system-related costs (about 37 percent in excess of costs given here) *some* of which could be included in computations of required support levels depending on the language of the 403(b) contracts and Amtrak's policy at the time. Total estimated subsidy requirements resulting from low and high revenue assumptions are shown at the bottom of the table. Again, the extent to which this might be a state (or provincial) responsibility depends on the results of future negotiations.

Table III-11
Projected Annual Costs and Revenues

Attributes	1995	2000	2005	2010	2015
Train Miles (000)	476	1,428	2,130	2,742	3,354
Engine Miles (000)	476	1,428	2,130	2,742	3,354
Car Miles (000)	1,904	5,712	8,521	10,968	13,414
Low Passengers (000)	346	939	1,288	1,645	2,041
High Passengers (000)	375	1,052	1,486	2,011	2,625
Average Trip Length	165	190	215	225	230
Average Yield per Mile	0.080	0.100	0.120	0.140	0.160
COSTS ($000)					
Transportation Operations	4,760	14,279	21,301	27,419	33,536
Locomotive Maintenance	1,428	4,284	6,390	8,226	10,061
Car Maintenance	2,285	6,854	10,225	13,161	16,097
Track/Facility Maintenance	714	2,142	3,195	4,113	5,030
Onboard Service & Commissary	1,119	3,356	5,006	6,443	7,881
Stations and Marketing (Low)	1,557	4,267	5,796	7,403	9,186
Stations and Marketing (High)	1,687	4,734	6,688	9,048	11,811
General Support	2,380	7,139	10,651	13,710	16,768
Railroad Payments	952	2,856	4,260	4,484	6,707
TOTAL COSTS (LOW)	**15,194**	**45,136**	**66,825**	**85,958**	**105,267**
TOTAL COSTS (HIGH)	**15,323**	**45,643**	**67,716**	**87,603**	**107,892**
REVENUE ($000)[1]					
Low Passenger Revenue	4,569	17,847	33,230	51,821	75,120
Low Food/Beverage Revenue	467	1,268	1,739	2,221	2,756
TOTAL LOW REVENUE	**5,036**	**19,115**	**34,969**	**54,042**	**77,876**
High Passenger Revenue	4,949	19,990	38,341	63,337	96,585
High Food/Beverage Revenue	506	1,420	2,006	2,714	3,543
TOTAL HIGH REVENUE	**5,455**	**21,410**	**40,348**	**66,051**	**100,128**
SUBSIDY REQUIREMENTS ($000)					
Low Costs, Low Revenues	10,158	26,021	31,855	31,916	27,391
High Costs, High Revenues	9,869	24,233	27,368	21,552	7,763

[1] Does not include revenue from local passengers on long-distance trains.

CHAPTER IV
PROPOSED IMPROVEMENTS TO RAILROAD INFRASTRUCTURE

IV.A INTRODUCTION

The improvement plan for railroad roadway (track, structures, and signals) contains three components:

a. Improvements to existing trackage, designed to permit increased passenger service to operate in conjunction with the expected level of freight service (shared use trackage).

b. Construction of new passenger trackage parallel to the existing trackage, but separate from it (shared use right of way).

c. New passenger bypass routes in key areas of British Columbia, Washington, and Oregon.

In this section, improvements of categories a. and b. will be discussed together as upgrades and enhancements to existing infrastructure, while the bypass routing alternatives are treated separately, in stand-alone subsections.

In the earlier phases (I and II), these improvements are closely coordinated with the required line capacity under expected rail traffic demand scenarios. In the later phases, the investment plan accounts for known capacity requirements, but the program is still tentative, and subject to further refinement in cooperation with the freight railroads.

Approach to Designing Engineering Improvements

The improvement plan is based on the following engineering strategy:

a. First priority is accorded to designing and constructing low-cost improvements that will relieve obvious operating bottlenecks and/or points where train speeds are severely restricted. This approach has been adopted for two reasons: first, the total capacity of a rail line is usually a function of its most restricted point or points; and second, the greatest increases in *average* train speed are achieved by increasing slow speed zones to modestly higher ones, as opposed to increasing high maximum speed zones to even higher maximum speeds[1].

b. Second priority is accorded to designing and constructing projects that increase the capacity and capability of existing railway infrastructure. In most cases, incremental improvements to existing trackage will help minimize the environmental impacts caused by new construction, and will build upon the value of investment that is already there. In some cases, such as the Point Defiance Bypass in Washington, it is wiser to invest in a new facility rather than attempting to build new capacity incrementally on the segment along the Tacoma Narrows where high costs and severe impacts on land use would result. In the case of the Point Defiance Bypass, use can be made of an existing rail line and its right-of-way, so even this major investment follows the principle that existing facilities should be upgraded wherever possible.

c. Third priority is accorded to those large mega-projects, such as the design and construction of the proposed BC and Oregon bypasses, which enhance service speeds and train frequencies, but which appear to be relatively more expensive in cost-per-mile, and

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[1] Increasing a train's speed from 30 mph to 60 mph (30 mph difference) saves 1 minute per mile; increasing the same train's speed from 90 mph to 120 mph (30 mph difference) saves only 10 seconds per mile.

have potentially larger environmental impacts to overcome. They will generally take longer to bring to fruition, and therefore logically are more likely to come on line toward the end of the planning horizon.

Obviously, external pressures may have an impact on the prioritizing of projects. An example is the White Rock-Crescent Beach area in BC where the right-of-way passes through an urbanized location where population is increasing and there is heavy recreational use adjacent to the corridor. Even though the rail line may have the capacity to accommodate the projected service levels, the government may decide to force construction of a bypass route at an early stage in the project.

IV.B LIST OF PROPOSED IMPROVEMENTS

The presentation of the proposed improvement projects, cost estimates, benefits, and impacts is illustrated by two tables and by a set of strip maps (Figures IV-1 to IV-9). Table IV-1 lists all projects in geographical order, from south to north, together with capital cost estimates, passenger train schedule impacts, benefits to railway line capacity, and an initial assessment of likely environmental impacts. Mitigation costs are included within the contingency applied to construction costs.

Table IV-2 summarizes the same roadway capital projects, in order of functional priority, by jurisdiction and planning phase. In general, groups of projects within a given planning phase can be assumed to have a similar utility and priority, except as noted in the narrative. Experience with the PNWRC investment made to date suggests that individual project priorities within a given plan and contract period will change from time to time due to the permitting sequence, material purchase lead times, and similar factors. Consequently, it is pointless to rigorously assign specific project priorities in the Option Report document when the actual implementation of the plan will combine groups of associated projects that can be constructed all at one time.

The project list documented in Table IV-1 and shown in Figures IV-1 to IV-9 will be discussed by jurisdiction, beginning at the south end of the corridor.

Oregon

Between Eugene and Portland, the projects listed in Table IV-1 are essentially groups of the smaller, similar-in-kind projects developed in greater detail in the *Oregon High Speed Rail Capacity Analysis* (WSA, July 1994). Except for projects 1 (the Harrisburg Bypass) and 3 (Harrisburg-Albany Passenger Main) all the Oregon projects listed are upgrades to the existing Southern Pacific main track between Eugene and Portland. Projects 7, 8, 10, 11, and 12 all involve improvements to at-grade crossings, and to railway infrastructure such as track, ties, curve elevation and signal control systems, on the existing right-of-way. Projects 2 and 9 would upgrade two existing river bridges that presently impose speed restrictions on both passenger and freight trains; projects 4, 5, and 6 represent

Figure IV-1

Figure IV-2

Figure IV-3

Figure IV-4

Figure IV-5

Figure IV-6

Figure IV-7

Figure IV-8

Figure IV-9

Table IV-1

Table IV-1

Table IV-1

Table IV-1

Table IV-1

Table IV-1

Table IV-2

investment required to avoid unacceptable interference between freight and passenger trains over the planning horizon, and at the proposed passenger frequencies set forth in Chapter III, preceding. Finally, the Harrisburg Bypass, which is connected on the north to a segment of new high speed (125 mph) passenger main track stretching to the southern limits of Albany, has two functions: it creates over 30 miles of continuous 125 mph design trackage, and it largely separates passenger from freight trains for a significant distance in the southern end of the corridor. In this "parallel high speed" configuration, where new passenger-quality main track is laid on subgrade adjacent to the existing main track, the design and cost standards provide for access crossovers at certain locations, so that if necessary trains can meet or pass one another using the adjacent track, or one track can be temporarily removed from service for maintenance.

Table IV-2 shows the project priorities and capital expenditures in the Oregon segment over the four phases of the 20-year planning horizon. The Oregon portion of the projected capital investment in railway plant includes the costs for upgrading the Burlington Northern main line between Portland and Vancouver, Washington. This item is noted separately from the investments required to improve the Southern Pacific line between Eugene and Portland.

Finally, certain monies, as noted in Table IV-2, are already committed by ODOT to the first elements of the Phase 1 upgrades. These funds total approximately $6.5 million and should be understood as a "down payment" on the Phase 1 program.

Washington

Between Vancouver, Washington and Tacoma the projects listed in Table IV-1 represent groupings of projects developed in a series of operating and engineering analyses performed by the consultants for WSDOT, with the cooperation of Burlington Northern, over the past three years (see Chapter II above for specific references, including the Washington "Statewide Rail Passenger Program (Gap Study)" [WSA, 1992], and the "Washington Rail Capacity Analysis" [WSA, 1994]). Except for the Point Defiance Bypass, which would re-route intercity passenger service onto a new route south of Tacoma, all of the projects listed in Table IV-1 between Vancouver, Washington and St. Clair, approximately four miles south of Nisqually, represent enhancements to the existing rail right-of-way, or represent new construction on the same or new and parallel subgrade.

Projects 14, 15, 18, 19, 21, and 22 consist of physical improvements to trackage shared by freight and passenger trains. These improvements have the effect of increasing train speeds (particularly in municipal areas where the physical improvements have been joined by lifting of WUTC imposed train speed limits), and increasing capacity (particularly at Kalama and Longview, where substantial relief from freight train congestion at the Columbia River grain terminals is required if passenger train frequencies are to be increased).

Projects 16, 17, 20, and 23 together would create some 40 miles of 110 to 125 mph passenger line at four locations. This trackage would have the cumulative effect of reducing Portland-Seattle schedules by about 30 minutes, and would separate high speed passenger from freight trains, reducing interferences and increasing safety.

Projects 24-26 inclusive are discussed separately below, in a section which explores the alternative routes for this bypass between either Tenino or Nisqually, and Lakeview station, at Lakewood in South Tacoma.

Between Lakeview/Lakewood and Seattle (projects 25-28 inclusive) and again between Seattle and Everett (Project 29), the Options Report presupposes construction of the engineering improvements on BN and Union Pacific trackage set forth in the Regional Transit System Commuter Infrastructure Program and Capital Cost Estimate produced for Seattle RTA by the PB/KE team. The large number of individual engineering projects on the Lakeview-Everett line segment are summarized in Table IV-1, with the total cost estimates for the roadway, structures, and signals portion of the RTA Plan shown by segment. No costs are included in Table IV-1 for commuter facilities such as stations; and for details concerning the specific engineering projects proposed for the potential commuter territory between Lakeview and Everett, the reader is referred to the RTA Plan. *All engineering and operating assumptions in the plan assume the implementation of a Seattle-Tacoma commuter rail service in Planning Phase 1, and extension of the service to Everett no later than Phase 2.*

None of the territory between Lakeview and Everett is planned for improvements to allow train speeds in excess of 80 mph. The territory is too congested to make extremely high speed operations practical. However, the proposed investment in railway plant provides a significant improvement in average speeds for all trains (largely by removing severe speed restrictions that exist today) and by significantly increasing the capacity of the corridor in the area adjacent to the Ports of Tacoma and Seattle. In addition, the use of the former Milwaukee Road (Tacoma Eastern) and Prairie Line trackage between Reservation (North Tacoma) and Lakeview (Figure IV-6) avoids interference between passenger and freight trains in the vicinity of the BN and UP Tacoma yards while capacity improvements near Seattle are designed to move the passenger main line tracks away from those used by freight trains entering or leaving the Port of Seattle.

North of Everett, a number of projects (e.g. 33-34; 36-42; 45-46) are intended to create additional capacity on this single track line. This capacity is a requirement if the current, newly reinstated service is to be expanded in frequency.

Projects 35, 43, and 44 as well as Projects 30 and 31 (done earlier, prior to re-inauguration of the Vancouver, B.C.-Seattle service), have all been designed to improve train speeds. These projects also complement a program designed to lift WUTC speed restrictions in cities and towns.

Finally, Project 32 proposes construction of a second tunnel underneath Everett, parallel to the existing single track bore. This project, which comes near the end of the planning horizon, becomes a requirement when the growth in Phase III and Phase IV intercity service, plus inauguration of an Everett commuter service, combined with expected growth in transcontinental freight services, exceeds the maximum practical capacity of the current tunnel.

In general it can be said of the Washington projects that a significant proportion of the total investment is required to address capacity issues — the Vancouver, WA-Everett corridor is already extremely busy, and demand projections in the Washington segments, both passenger and freight, are higher than at the extremities of the corridor.

Table IV-2 displays the projected Washington investment over the planning horizon in the same format as for Oregon. Note that the Washington expenditures for Phase 1 do *not* include the approximately $31.6 million already invested in corridor track and infrastructure by WSDOT over the last two years. (The improvements made with this investment, however, are listed in Table IV-1, accompanied by footnotes that indicate the completion date(s) of the specific projects funded by WSDOT under the state's current and recent contracts with BN. Speed improvements from such projects are also already reflected in the running times proposed for the end of 1995 ("Current" case in Table III-5), and so this "credit" is *NOT* shown in Table IV-2.

British Columbia

The project list for BC follows the same principles and format used for the two U.S. states: early phases are marked by relatively inexpensive projects that enhance capacity and speeds; the later planning phases are marked by significant expansions in track capacity near Vancouver and by the bypass around White Rock and Crescent Beach (discussed separately below). It should be noted, however, that BC has not committed to any capital expenditures, thus any future capital investment and increase in service is conditional.

Some projects in the list on Table IV-1 have been, or are being, completed as part of the current restoration of Seattle-Vancouver B.C. service (for example, projects 47 and 48). The time savings from these projects, like those from the already completed projects in Washington State, are already reflected in the "Current" (1995) scheduled running times shown in Chapter III and so no credit is taken for such time savings in Table IV-2.

All projects slated for implementation *after* 1995 are shown in Table IV-1, and their costs and time savings summarized by Plan Phase, in Table IV-2. In priority order, and conditional upon finding satisfactory funding, the early phase projects include 51-54 and 57a, which together improve speeds and relieve freight congestion between White Rock and New Westminster, as well as in the Vancouver Terminal area (Project 54). Interim improvements north of the existing Fraser River crossing (Project 57a) will relieve congestion utilizing the structure. Subsequently, a general upgrading of the track structure (Project 49), and improvements to the Centralized Control System (CTC) will be required to further improve schedules and reliability. Time savings shown can be achieved using the existing New Westminster Railway bridge.

Finally, as mentioned previously, the large, capital-intensive projects (56 and 57b) are connected to the later-stage increases in passenger train frequencies, though they might need to be advanced if a substantial commuter service were implemented on portions of this line east of Vancouver prior to Phase III. Project 57 provides for an alternative crossing of the Fraser River to the New Westminster Railway Bridge. This new crossing could be a tunnel.

IV.C ALTERNATIVE ROUTES IN OREGON AND WASHINGTON

As part of the Pacific Northwest Passenger Rail Corridor Study, a bypass of the Harrisburg and Junction City areas in Oregon and a bypass of the Point Defiance area in Washington were included as options to reduce travel time along the corridor. For both of these areas, various bypass options were developed to determine their feasibility and magnitude of their associated impacts and costs. If these general bypass options warrant further investigation, more specific alternatives will be developed and a complete environmental review process with a thorough agency and public involvement program will be conducted.

The following section presents the physical characteristics, time savings and estimated construction cost of these various bypass options. Environmental, institutional, community and financial impacts are discussed in subsequent sections of this report.

1. Harrisburg Bypass Options

The existing alignment around the Harrisburg and Junction City areas, north of Eugene, Oregon is presently constrained by the condition of the railroad bridge over the Willamette River, the condition of the existing trackwork, five curves which vary from one to two degrees and the presence of numerous at-grade crossings. The maximum train speed over the existing Willamette River bridge is set at 30 mph. The condition of the existing trackwork limits the maximum passenger train speed through this area to 70 mph. The maximum passenger train speed with improved tracks through the five existing curves range from approximately 71 mph to 101 mph.

The existing alignment also has numerous at-grade crossings including Awbrey Road, Meadow View Road, Tandy Lake Road, Substation Road, Powerline Road, East Cartney Road and two crossings of Prairie Road, as well as several at-grade crossings in Junction City and Harrisburg. The presence of these at-grade crossings constrain the maximum train speed through this area and require improved signal systems.

As a result of these constraints, bypass alignments around Harrisburg and Junction City are being considered to reduce overall corridor travel time. Based on the existing conditions, the general bypass options would replace 13.6 to 15.7 miles of the existing Southern Pacific mainline. Passenger train travel time along the existing mainline between milepost 653 and 670 is estimated at approximately 14.3 minutes.

Harrisburg Bypass Option Assumptions - For study purposes, a representative set of bypass alignment options were developed to determine the feasibility of a bypass in this location. The possible general options are illustrated on Figure IV-10. For each of the bypass options, the maximum horizontal curvature along the bypasses was set at approximately 0.65 degrees to allow a maximum passenger train speed of 125 mph and an operating speed of 110 mph. The vertical grade of all Harrisburg bypass alignments is less than one percent. General roadway overpasses or underpasses were included to grade separate major county roads. Road relocations and re-alignments were also included for minor roadways to eliminate at-grade crossings. An example of the general roadway improvements, that were assumed for each bypass option, are illustrated for Option A only on Figure IV-10. Similar roadway improvements were assumed for the other bypass options

The three general options, illustrated on Figure IV-10, represent the approximate limits required to bypass Harrisburg and Junction City areas. Bypass locations any closer to Harrisburg and Junction City would have severe impacts on the urbanized areas. Any bypass location more distant from Harrisburg and Junction City would begin to impact the urbanized area of Eugene. The physical characteristics of these general bypass options are briefly summarized below.

Option A - This option is the shortest in length of the three Harrisburg bypass options. It is approximately 13.3 miles in length and has the shortest travel time of about 8.5 minutes. Its location is near or just within the incorporated area of Junction City and Harrisburg. As a result, it has the highest number of roadway overpasses and highway relocations to avoid at-grade railroad crossings. A new 1,200-foot bridge over the Willamette River and a new 500-foot bridge over the Curtis Slough were incorporated in this option.

Figure IV-10 - Harrisburg Bypass

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Option B - This option bypasses Harrisburg and Junction City farther to the southeast than Option A. It is approximately 15.5 miles in length and has a travel time of about 8.7 minutes. Its alignment across the Willamette River flood plain is at a wider location than Option A and requires several structures and embankments to cross the various channels and tributaries of the Willamette River and Curtis Slough. A total of about 3,000-feet of new structures was assumed across this flood plain. In additional, several roadway overpasses and highway re-alignments were assumed to grade separate several county roads.

Option C - This option is similar to Option B, except that it swings to the east to follow a portion of an abandoned railroad right-of-way to avoid several creeks, streams and flood plain areas. As a result, it is the longest of the three general bypass options at approximately 16.3 miles in length and has a travel time of about 9.1 minutes. Its alignment across the Willamette River flood plain is the same as Option B and also requires several structures to cross the various channels and tributaries of the Willamette River and Curtis Slough. This bypass option also includes approximately 3,000 feet of new structures to cross the Willamette River and Curtis Slough flood plain. In additional, several roadway overpasses and highway re-alignments were also assumed to avoid at-grade railroad crossings.

Summary of Harrisburg Bypass Options - The physical characteristics, travel time and associated construction costs of these bypass options with existing conditions are summarized in Table IV-3. The construction costs estimates do not include right-of-way acquisition, relocation and mitigation expenses. Roadway overpasses and highway revisions to avoid at-grade crossings are included in these costs. As a result of this analysis, a new bypass of the Harrisburg and Junction City would cost approximately $82 to $90 million and would save 5 to 6 minutes of travel time. However, if grade crossing with improved signal and gate systems were acceptable, the construction costs could be reduced by $20 to $23 million. The construction of the railroad bypass would relocate through train traffic out of Harrisburg and Junction City and would improve the perceived safety problems associated faster trains through the urban areas.

Table IV-3
Physical Characteristics of Harrisburg Bypass Alignments

	Existing	Option A	Option B	Option C
Length	71,800 to 82,900 feet[a]	70,000 feet	82,000 feet	86,200 feet
Bridge Length	6,370 feet	3,200 feet	4,500 feet	4,500 feet
Travel Time [b]	14.3 minutes	8.5 minutes	8.7 minutes	9.1 minutes
Time Savings	NA	5.8 minutes	5.6 minutes	5.2 minutes
Capital Cost [c]	NA	$83 million	$88 million	$90 million
Cost per Time Savings	NA	$14.3 mill./min.	$15.5 mill./min.	$17.3 mill./min.

[a] Option A bypasses approximately 71,800 feet; Options B & C bypass approximately 82,900 feet.

[b] Travel time is estimated between existing milepost 654 to milepost 670. On bypass sections an average speed of 110 mph is assumed.

[c] Costs do not include right-of-way acquisition and relocation expenses.

2. Point Defiance Bypass Options

Point Defiance bypass options were developed to replace rail passenger operations over varying lengths of alignment, depending on the bypass option. The bypass options included in this study are illustrated on Figure IV-11 and extend from either Tacoma to

Nisqually, near the Pierce County/Thurston County line or from Tacoma to Tenino, south of Olympia. Point Defiance is located in the northwest portion of the city of Tacoma. Current passenger trains use the Ruston and Nelson Bennett tunnels through the Point Defiance area with horizontal curves of one to three degrees to turn south along the coast line and proceed to Olympia and Portland, Oregon. The existing maximum allowable passenger train speed along the existing railroad alignment between Tacoma and Nisqually varies from 10 mph to 70 mph. The speed through this area is constrained by the urbanized area of Tacoma, numerous at-grade crossings, numerous horizontal curves, ranging from one to ten degrees, the condition of the Ruston and Nelson Bennett tunnels, and the condition of the existing trackwork throughout the study area. From Nisqually to Tenino, the existing maximum allowable passenger train speed varies from 70 mph to 75 mph. The speed through this area is constrained by several curves of one to two degrees and the condition of the alignment.

Based on the existing conditions, passenger train travel time along the existing mainline from Tacoma to Nisqually is approximately 33.3 minutes. From Nisqually to Tenino the existing passenger train travel time, including a stop at Olympia/Lacey station of two minutes for the Olympia area, is approximately 18.0 minutes. As a result of these constraints, bypass alignments around Point Defiance are being considered to reduce overall corridor travel time. The two bypass options being considered would replace from 26.4 miles to 45.3 miles of the existing passenger train activity on Burlington Northern mainline.

Point Defiance Bypass Option Assumptions - For study purposes, two representative bypass alignment options were included to determine the feasibility of a bypass in this location. These bypass options differ from the Harrisburg Bypass options because of the availability of alternative existing railroad rights-of-way that could be used to reduce adverse impacts on adjacent land uses. For each of the bypass options, existing or abandoned railroad rights-of-way were generally used. A maximum passenger train speed of 125 mph and an operating speed of 110 mph were assumed, wherever possible. Existing sharp horizontal curves along the alternative railroad alignments will reduce the actual travel speed. The vertical grade of the Point Defiance bypass options is generally less than one percent with some short lengths of 1.0 to 3.0 percent to transition between alignments.

Option A: Lakeview Branch - This option generally parallels Interstate 5 from Tacoma to Nisqually and is the shortest in length of the two Point Defiance bypass options. It is approximately 20.5 miles in length and has the shortest travel time of about 17.3 minutes. The northern portion of this option is also proposed for commuter rail use by the Puget Sound Regional Transit Authority (RTA). Its location begins at the Burlington Reservation area, east of Tacoma. From this point it crosses to the Chehalis Western Railroad right-of-way and crosses back to the Burlington Northern right-of-way under Interstate 705, using vertical grades of two to three percent. Pacific Avenue will also be reconstructed to grade separate the railroad alignment. The bypass then follows an existing Burlington Northern rail line, which parallels north and west of Tacoma Way to the Lakeview area of south Tacoma. This portion of the bypass is assumed to be double tracked because of the numerous railroad sidings, proposed commuter rail and existing freight activity. At this point the bypass alignment turns

Figure IV-11 Point Defiance Bypass

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southwest and follows the Burlington Northern's Lakeview Branch to Nisqually and the Burlington Northern's mainline. A new horizontal curve of approximately 1.5 degrees will be constructed to connect the Lakeview Branch to the Burlington Northern's mainline and eliminate six curves which vary from three to eight degrees. A vertical grade of approximately 1.6 percent will be used to join the Burlington Northern's mainline. Because of the close proximity of Interstate 5 and numerous cross streets, several at-grade crossing will remain. These at-grade crossings will be improved with new signals and gates to increase allowable train speeds.

Option B: Prairie Line - This option is the same as Option A to the Lakeview area. From this point, it continues south along the Burlington Northern's Prairie Line across Fort Lewis Military Reservation to the town of Roy. South of Roy, this option transitions to the Chicago, Milwaukee, St. Paul and Pacific Railroad right-of-way and follows it to the town of Rainier. South of Rainier, it transitions to the abandoned railroad right-of-way that has been rail banked and extends to Tenino.

This bypass option is approximately 41.3 miles in length and has a travel time of about 31.6 minutes, including a two minute train stop in Tenino which replaces the Centennial Station stop. Roadway overpasses or underpasses were assumed to grade separate the rail line at major military, state and county roads along the lower portion of this option. Road relocations and re-alignments were also assumed for minor roadways and included as part of this option.

This option also bypasses the existing Olympia/Lacey station.

Summary of Point Defiance Bypass Options - The physical characteristics, travel time and associated construction costs of these bypass options with existing conditions are summarized in Table IV-4. The construction cost estimates do not include right-of-way acquisition, relocation and mitigation expenses but do include improved signal systems for at-grade crossings and roadway improvements and overpasses. Based on these findings, a new Point Defiance bypass would cost approximately $150 million to $210 million and would save approximately 16 to 20 minutes of travel time. Some grade crossings would remain along the bypass options because of the close proximity of I-5 and numerous cross streets.

Table IV-4
Physical Characteristics of Point Defiance Bypass Alignments

	Option A - Lakeview Branch		Option B - Prairie Line	
	Existing	**Option A**	**Existing**	**Option B**
Length	139,400 feet	108,000 feet	239,200 feet	218,000 feet
Bridge Length	1,430 feet	7,125 feet	3,275 ft	7,225 feet
Tunnel Length	4,715 feet	0 feet	4,715 feet	0 feet
Travel Time [a]	33.3 minutes	17.3 minutes	51.3 minutes	31.6 minutes
Time Savings	NA	16.0 minutes	NA	19.7 minutes
Capital Cost [b]	NA	$150 million	NA	$210 million
Cost per Time Savings	NA	$9.4 mill./min.	NA	$10.7 mill./min.

[a] Travel time is estimated between Tacoma and Nisqually for Option A; between Tacoma and Tenino for Option B.

[b] Costs do not include right-of-way acquisition and relocation expenses.

IV.D ALTERNATE ROUTES IN BRITISH COLUMBIA

White Rock Bypass

Intercity passenger trains run on the Burlington Northern Railway (BN) between points in the U.S. Northwest and Vancouver, BC. The BN New Westminster Subdivision, constructed in 1909, skirts along the shoreline of the Pacific from the international border north to Mud Bay, a distance of 18.3 km (11.4 miles). Here it interconnects with the British Columbia Railway (BCR) running east-west to the Roberts Bank coalport terminal, before continuing north for 16.6 km (10.3 miles), heading inland across the delta to the New Westminster Railway swing bridge crossing of the Fraser River, and then on to downtown Vancouver.

Grades along this single track line are quite gentle, seldom reaching 0.5 percent. Horizontal curvature is extensive, with 35 curves comprising 15.4 km (9.6 miles), or 44 percent of this route, and with 11 curves having radii less than 580 m ($D^C = 3°$). There are 16 structures along the route; 11 bridge underpasses, mostly for various streams and rivers, and five roadway overpasses. In addition, there are 12 at-grade crossings, seven public and five private. Of the public crossings, five have warning signals. In the community of White Rock, the track is bordered for a considerable distance by a public walkway on the east side, and by beach and recreational areas on the west side. Pedestrian traffic currently has unrestricted access across the railway right-of-way.

To implement incremental higher speed intercity passenger rail service along this section of the PNWRC, various bypass options were investigated to determine the benefit in terms of reduced travel time versus estimated capital cost.

Two basic alternatives were developed to bypass the existing White Rock shoreline alignment:

Alternative A — Parallels Highway 99 and is located either within the highway right-of-way or between the highway and the BC Hydro right-of-way.

Alternative B — Follows approximately the abandoned alignment of the Great Northern and New Westminster & Southern Railways, around the base of the North Bluff ridge.

Variations of the basic alternatives were also developed, as illustrated on Figure IV-12, White Rock Bypass (plan) and Figure IV-13 (profiles). These alternatives are described briefly below.

Alternative "A1"

This route would diverge from the New Westminster Subdivision just north of the international border, swing across the Semiahmoo reserve lands, cross Highway 99A and 99 between 8th and 16th Avenues, parallel Highway 99 and the BC Hydro line, and reconnect to the BN tracks north of the Mud Bay trestle bridge. This alignment reduces the length by 4.9 km (3.0 miles). The alignment would cross the Nicomekl and Serpentine Rivers to the north and Campbell River to the south. Significant portions of the required right-of-way are owned either by the BC government or BC Hydro. Some portions of service road and several homes would need to be acquired.

Due to the rail alignment's proximity to Highway 99, the vertical alignment of Highway 99 was examined. As-built records of Highway 99 indicated the highway ascended progressively to the north at a maximum grade of 3 percent from the Canada/US border to a high point of 86 m (280 feet) near 24th Avenue, and descended on a maximum grade of 5 percent to the Nicomekl River. At the Nicomekl and Serpentine delta, highway alignment was flat, a few meters above sea level, except at the grade separation with BN north of the delta.

To minimize the impact on Highway 99 and adjacent properties, track profile was designed to match the Highway 99 profile, as shown in Figure IV-13. A maximum 2 percent grade has been used. Retaining walls, relocation of portions of the hydro line and relocation or adjustments to adjacent roads and interchanges will be required for those areas where the track grade cannot be closely matched with the highway grade, or where applicable.

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Figure IV-12

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Figure IV-13

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During the course of this study, BN indicated that the existing ruling grade for heavy haul freight traffic is 0.7 percent. However, BN is prepared to accept a maximum of 1.0 percent grade for the freight traffic. Alternative " A1" with its 2.0 percent grade would be adequate for the high speed passenger trains, but not for the heavy haul freight trains.

Thus, Alternative " A1" is not suitable for consolidating all traffic on a new route as the freight trains would have to remain on the shoreline route through White Rock and Crescent Beach. Track capacity on the existing route would increase with the transfer of passenger trains to the new alignment; however, this benefit is minor in comparison to the estimated construction cost of $100 million US and the estimated land acquisition and relocation costs of $10 to $15 million for this alternative. The addition of a new alignment, without the corresponding removal of the existing, would not improve safety.

Alternative "A2"

Alternative " A2" utilizes the same route as Alternative " A1" with a modified profile (see Figure IV-13) suitable for both freight and passenger trains, by the use of a tunnel to reduce the ruling grade. The 4.4 km (3.7 mile) tunnel construction, from north of 16th Avenue to south of the Nicomekl River, will also minimize impacts on adjacent properties and on ground infrastructure such as Highway 99, the BC Hydro corridor, crossing roads, interchanges, etc. This alternative will permit removal of all train traffic from the shoreline of White Rock and Crescent Beach communities. The tunnel construction would allow grade separation for most of the bypass alignment.

Alternative " A2" is 4.9 km (3.0 miles) shorter than the existing route. This more direct route would reduce operating costs for both freight and passenger traffic. The tunnel section would avoid a majority of the relocation and land acquisition costs associated with a surface route and would minimize environmental and land use impacts for a substantial portion of the alignment. The estimated land acquisition and relocation costs ranges $5 to $10 million. Removing the existing track from the built-up area of White Rock and grade separating the new alignment serve to improve safety.

The tunnel alternative, with high running speed allowable and a shorter distance than the existing route, would reduce the travel time by approximately 15 minutes, at an estimated cost of $265 million (US).

Alternative "B1"

Alternative "B1" generally follows the abandoned alignment of the predecessors of the BN, which generally parallels the present day Highway 15. New right-of-way (mostly held privately) will be required for this bypass alternative. The route is further inland and located around the base of North Bluff ridge. The bypass alternative starts at the US-Canada border (same point as Alternative " A1" and "A2"), swings easterly towards Highway 543 (US)/Highway 15 (Canada), runs along the base of North Bluff ridge and along the back lot lines east of Highway 15 northerly, until it connects with the BCR near Cloverdale. The BCR connection has opportunities to connect further north with either the SRBC route through Surrey or the CNR tracks south of the Fraser River as described under Alternatives " B3" and " B4."

The profile of " B1" is based on a maximum grade of 1.0 percent which is suitable for both high speed passenger and heavy haul freight trains. The vertical alignment rises from the beginning of the alignment to crest approximately between 20th and 24th Streets, and then descends gradually toward the Serpentine/Nicomekl delta area. The alignment will require extensive cut and fill as it descends to the delta area. From the Nicomekl River, the profile is essentially flat, and only a few meters above sea level.

There are ten railroad/highway grade crossings, most of which will require grade separation. Also affected is the Highway 99/8th Avenue interchange. New rail construction is 13.5 km (8.4 miles) long.

The overall route length is 23.7 km (14.7 miles) or 5.4 km (3.3 miles) longer that the existing BN route. Generally, operating costs increase with distance. Therefore, with regards to rail transportation, Alternative " B 1 " suffers in comparison to the existing route. Land acquisition and relocation costs for the 13.5 km of new rail alignment are estimated to range between $15 to $19 million. Removing the existing track from the built-up area of White Rock and grade separating the new alignment would serve to improve safety. This alignment runs primarily through areas denoted as Agricultural Land Reserve. It is inevitable that some existing farms will be severed by the new alignment. The construction costs are estimated at US $72 million.

Alternative "B2"

Alignments commencing at the US-Canada border involve crossing the Semiahmoo reserve lands. Bypass options which commenced south of the border were developed to reduce or eliminate the impact on reserve lands. Alternative " B 2" takes off from north of the Dakota River, runs northerly parallel to Highways 543/15, until it joins the " B 1" alternative south of the North Bluff area. This alignment involves a crossing of Interstate Highway I-5, requiring major revisions.

The alignment passes through a hill south of the border. A tunnel approximately 1 km (0.6 mile) long will be required to avoid large cut and fill sections and impact to adjacent properties. The alignment crosses the Canada/US border 0.5 km (0.3 miles) east of Highway 15 and the existing border crossing at Douglas to avoid the existing built-up area.

New rail construction length is 15.5 km (9.6 miles) while the overall route length is 25.7 km (15.9 miles) or 3.0 km (1.9 miles) longer than the existing BN route. Alternative " B 2" suffers in comparison to the existing route, in terms of increased operating costs due to increased distance. Land acquisition and relocation costs for the 15.5 km of new rail alignment are estimated to range between $19 to $23 million. Removing the existing track from the built-up area of White Rock and grade separating the new alignment would serve to improve safety. This alignment runs primarily through areas denoted as Agricultural Land Reserve. It is inevitable that some existing farms will be severed by the new alignment. In British Columbia, the construction costs are estimated at US $132 million.

Alternative "B3"

To provide a complete bypass of the BN alignment from White Rock to the Fraser River, either of the "B1" or "B2" alternatives could be diverted from the BCR southwest of Cloverdale along a short section of new track to connect with the Southern Railway of British Columbia (SRBC) at Highway 10. The SRBC, formerly the British Columbia Electric Railway, is owned by the British Columbia Hydro and Power Authority. It has a narrow right-of-way which has power lines on both sides in the southern section. This "B3" alternative angles northwesterly across the Serpentine River delta, through industrial and residential areas of Surrey, and into North Delta before turning to the northeast, back into Surrey, and descending to the New Westminster Railway swing bridge.

The combined " B1" + " B3" route is 31.5 km (19.6 miles), compared to 34.9 km (21.7 miles) for the BN route. The combined " B2" + " B3" route is 33.5 km (20.8 miles) compared to 39.3 km (24.4 miles) for the BN route. There are approximately 17 at-grade crossings of the SRBC portion, most of which are located in urban areas. To traverse the highlands near the south bank of the Fraser River, the maximum northbound grade is 2.3 percent and the maximum southbound grade is 2.7 percent.

While somewhat more direct than the "B1" and "B2" routes using BCR track, these routes in combination with the "B3" alternative are not favored due to the steep gradients and numerous at-grade crossings on the SRBC. This route is not suitable for freight traffic due to the steep grades, nor is it suitable for high speed rail due to the numerous at-grade crossings. It is not considered feasible to rebuild this route to accommodate both freight and passenger traffic. There is no rail transportation benefit for a passenger traffic only route, since the existing concerns at White Rock would not be mitigated, and additional concerns would arise in the more urbanized area of Surrey. Construction, land acquisition and relocation costs could be double those of the "B1" alternative.

Alternative "B4"

Just as Alternative "B2" approximates the former alignment of BN's predecessor, the Great Northern Railroad, south of Cloverdale, Alternative "B4" approximates the continuation of that former alignment north to the Fraser River. It appears that the railbed in this section has been converted into the roadbed for Harvie Road since being abandoned in 1918. The south bank of the Fraser River valley is fairly steep and the extensive cuts and fills necessary for a railway embankment would be disruptive to the residential developments in this area. Presuming such a route were built, it would connect to Canadian National (CN) North America tracks and run westward and along the south shore of the river to either the existing swing bridge or a new tunnel crossing of the Fraser.

The combined "B1" + "B4" route length is 40.5 km (25.1 miles), compared to 34.9 km (21.6 miles) of BN route. the combined "B2" + "B4" route length is 42.5 km (26.4 miles) compared to 39.3 km (24.4 miles) for the BN route.

This alternative is not favored as it will require extensive new right-of-way through agricultural lands, impact residential and industrial development, and is longer than the existing route. Generally, operating costs increase with distance, therefore, with respect to rail transportation, Alternative "B4" suffers in comparison with the existing route. This alignment runs primarily through areas denoted as Agricultural Land Reserve. It is inevitable that some existing farms will be severed by the new rail alignment.

Construction, land acquisition and relocation costs could be three or four times those of the "B1" alternative.

Summary of White Rock Bypass Alternatives

The physical characteristics, travel time savings and associated capital costs of the alternatives with existing conditions are summarized in Table IV-5. The capital cost estimates do not include right-of-way acquisition, relocations and extensive mitigation expenses. Based on these findings, these three bypass alternatives should be considered for further analysis.

Table IV-5
Physical Characteristics of White Rock Bypass Alignments

	Alternatives			
	Existing	**"A2"**	**"B1"**	**"B2"**
Length	60,000 ft. 73,200 ft.	44,300 ft.	78,000 ft.	84,800 ft.

Tunnel Length	N/A	13,500 ft.	N/A	3,450 ft.
Bridge Length	N/A	2,200 ft.	1,600 ft.	200 ft.
Time Savings		15 min.	12 min.	11 min.
Capital Cost *		$265 million	$72 million	$132 million

* Costs do not include right-of-way acquisition and relocation expenses.

Fraser River Crossing

The existing New Westminster Railway single track swing bridge over the Fraser River serves all BN, CN North America, and SRBC traffic entering and leaving Vancouver. Speed on the bridge is limited to 13 km/hr (8 mph) due to the sharp curvatures at the approaches. Shipping traffic often conflicts with and delays rail traffic.

If a new bridge were constructed, it would have to be elevated a minimum of 60 m (200 feet) above the river. This would require approaches 12 km (7.4 miles) long and is not considered to be feasible. A tunnel under the river would be approximately 23 m (75 feet) below water level and would require a total length of 4.6 km (2.9 miles) with 1 percent grades. Such a tunnel with a south portal located 1.5 m (0.0 miles) west of the existing swing bridge could cross under the river in a northeasterly direction to a north portal located near the BN Sapperton Yard. Alternately, the south portal could be located in the vicinity of the CN North America Port Mann Yard and cross under the river in a northwesterly direction to the same north portal location.

Based on reported costs for the recently completed CN North America single track tunnel under the St. Clair River between Sarnia, Ontario and Port Huron, Michigan, an order of magnitude cost for a rail tunnel under the Fraser is US $300 million.

An interim alternative to the use of a tunnel would be to reduce delays at the current bridge to the greatest extent possible. Although marine traffic causes extensive delays, additional delays caused by slow speeds and the length of single track approaches to the existing bridge may be addressed.

The current 10 mph speed restriction on the New Westminster Railway Bridge is a significant source of delay that limits rail line capacity. Capacity and reliability are further diminished by the 0.9 mile single track approach at the north end of the bridge, effectively made 1.5 miles by the four existing road crossings north of the bridge. By extending the second main track from Spruce to the north end of the Bridge, combined with the closure and grade separation of the two private crossings and Spruce Street, occupation of the single track will be reduced greatly by trains waiting to utilize the Bridge. Train movements could occur every 25 minutes in each direction, rather than the current 37 minutes. The estimated cost of these improvements is US $5.5 million.

The addition of the second track allows for more frequent train operations, as well as increased reliability. Recovery from congestion caused by bridge openings can be more quickly resolved.

This interim alternative can be enhanced by modifying the existing New Westminster Railway Bride as necesary to allow speeds up to 30 mph and by changing the draw span to allow for faster opening and closing of the structure.

IV.E RANKING OF IMPROVEMENTS IN ORDER OF ESTIMATED OVERALL BENEFIT

The proposed project sequencing is a function of four factors:

a. The need to relieve capacity constraints caused by increases in train frequencies;

b. The desire to improve trip times at a steady pace throughout the planning horizon, in support of the commercial goals of the service;

c. A recognition that some projects will take longer to clear the environmental impact review process than others; and

d. A desire to space out the funding requirements within each jurisdiction in a way that recognizes practical limits on finances.

As indicated earlier, the considerations lead to a strategy that prioritizes inexpensive projects with large positive impacts on average speeds and/or track capacity. Large projects with long lead times and high costs relative to the minutes of travel time saved tend to come at the end of the planning cycle which is another way of saying that the projects within Planning Phase I all have ranked higher on the desirability scale than those in Phase II, and those in Phase II outrank those in Phase III, etc.

The ranking set forth in Table IV-2 is in order of estimated functional priority. This is not the same as ranking the projects in order of *constructability*. Some of the lower priority projects may be more constructable than the higher priority ones, but the simple fact is that some high priority projects (such as the Point Defiance Bypass) are prerequisites for expanding the passenger service, and cannot be delayed without adversely affecting the commercial viability of the service. The train frequencies, in particular, that are described in Chapter III are vital to the growth in ridership and revenues. These frequency increases cannot be achieved without the Phase I and II investment. Portions of the Phase III investment are also critical to improving overall rail mobility in the Corridor.

Specifically then, within each jurisdiction, the priority rankings reflect the following outline (see also Table IV-6).

Oregon

All of the Phase I projects between Eugene and Portland are upgrades to existing trackage, and represent application of the principle that the least expensive work, with the greatest benefit in terms of improved speeds and capacity, should be done first. Those Phase I projects in Oregon that result in improved trip times (Projects 2, 8, 9, 10, and 12) together cost $16 million, or slightly more than one million dollars per minute saved. In addition, the projects at Millersburg and Albany, and the upgrades at Portland, specifically benefit freight service by reducing delays and congestion.

Equally important in the Oregon Phase I is the Portland-Vancouver, Washington CTC. This project benefits Seattle-Portland service in two ways: it reduces trip times by increasing speeds in the Portland terminal area, and it expedites the mixed flow of passenger and freight trains on the existing tracks. There are three large double track bridges in this stretch, and the bridges would restrict operating capacity except for the signal system enhancements. In this case investment in signals is more effective and much cheaper than constructing new bridges.

The Phase II and III investments in Oregon include the staged construction of the Albany-Harrisburg passenger main track, and the bypass around Harrisburg. These projects carry price tags of between $3.1 and $4.5 million per minute saved but represent the first segments of high speed 125 mph trackage. Note that these estimates do not include potential costs required to allow positive train separation or automatic train control over this segment, which would be a requirement if passenger trains are to operate at speeds greater than 79 mph (see also subsection on the role of Railroad Investment, below).

Table IV-6
List of Projects by Jurisdiction and
Phase in Order of Estimated Functional Priority

	Project	Cost (Millions)	Priority
OREGON			
Phase 1	12	$3.58	1
	10	$4.41	2
	8	$4.23	3
	13	$16.72	4
	5	$.43	5
	4	$1.12	6
	9	$1.29	7
	2	$2.57	8
	Subtotal	**$34.35**	
Phase 2	6	$2.02	1
	11	$1.66	2
	7	$24.26	3
	_ of 3	$19.00	4
	Subtotal	**$46.94**	
Phase 3	Complete 3	$19.00	1
	1/3 of 1	$27.60	2
	Subtotal	**$46.60**	
Phase 4	Complete 1	$55.22	1
	TOTAL	**$183.09**	
WASHINGTON			
Phase 1	35	$1.20	1
	37	$4.27	2
	18	$31.19	3
	1/4 of 27-28	$26.96	4
	34	$2.53	5
	15	$.92	6
	36	$3.80	7
	1/4 of 27-28	$26.96	8
	33	$3.69	9
	38	$1.13	10
	Complete 27-28	$53.91	11

Table IV-6
List of Projects by Jurisdiction and
Phase in Order of Estimated Functional Priority

	Subtotal	**$156.5 7**	

	Project	Cost (Millions)	Priority
WASHINGTON			
Phase 2	45	$3.40	1
	46	$2.67	2
	24-26 incl.	$146.84	3
	1/3 of 44	$6.13	4
	Subtotal	**$159.04**	
Phase 3	21	$15.87	1
	22	$5.13	2
	_ of 29	$16.03	3
	20	$22.21	4
	17	$30.88	5
	Complete 29	$16.03	6
	16	$32.64	7
	Complete 44	$12.25	8
	Subtotal	**$151.04**	
Phase 4	23	$61.57	1
	32	$15.00	2
	19	$35.06	3
	40	$7.10	4
	Subtotal	**$118.73**	
	TOTAL	**$585.38**	
BRITISH COLUMBIA			
Phase 1	53	$25.33	1
	54	$3.48	2
	51	3.62	3
	57a	$5.50	4
	52	$5.13	5
	Subtotal	**$43.06**	
Phase 2	49	$13.27	1
	55	5.33	2
	50	2.52	3
	Subtotal	**$21.12**	
Phase 3	1/3 of 56	$87.37	1
	Subtotal	**$87.37**	

	Project	Cost (Millions)	Priority
BRITISH COLUMBIA			
Phase 4	Complete 56	$174.75	1
	57b	$300.00	2
	Subtotal	474.75	
	TOTAL	**$626.30**	
	GRAND TOTAL	**$1,394.74**	

Washington

The priorities in Washington are dictated in part by the need to expand capacity in the near term to accommodate the increased level of passenger service without restricting freight operations. Consequently, the highest priorities in the Seattle-Vancouver, WA segment go to projects 15, 18, and 27-28 all of which significantly relieve pressure on main line capacity. These projects also significantly benefit running times and operating reliability, particularly when the Oregon improvements between Portland and Vancouver, WA are added. Note, too, that the Seattle-Tacoma improvements support the implementation of Puget Sound commuter service so there are synergistic benefits from prioritizing this work that go far beyond simply measuring the benefits by dollars-per-minute saved. Indeed, if only the time benefits are considered, the combination of projects 27 and 28 would appear to cost $10.8 million per minute saved. But most of the investment in this corridor is required to operate passenger and freight trains together in a mixed-use environment, and to prevent the possibility that the increased passenger traffic would adversely affect the port-related freight services. The same is true for the substantial investment at Kalama-Longview which is strictly a congestion relief measure, but one absolutely required if the corridor is to grow.

In Phase I also are the balance of the capacity enhancement projects required north of Seattle to Blaine needed before service frequencies to Vancouver, BC can be increased. Phase II of the investment program between Seattle and Vancouver, WA consists entirely of the Point Defiance Bypass. The priority accorded this project is largely a function of capacity: the existing line via Point Defiance is restricted by a single-track tunnel, and if the Bypass is not built in Phase II, the further increases in train frequency called for in Phases II and III of the operating plan may not be achievable.

In addition, a significant portion of the Bypass is connected to the RTA commuter system. The trackage between Reservation, North of Tacoma, and Lakeview is required for the commute system, but benefits the intercity program only if the balance of the Bypass (project 24) is completed. Consequently, the Point Defiance Bypass moves up in priority with respect to other improvements between Vancouver, WA and Tacoma.

North of Seattle, the improvements nominated for Phase II are designed to improve train dispatching at relatively modest cost, and begin upgrading other track segments for higher speeds and better maintainability. The phasing of the upgrades in project 44 can be timed to accommodate the funding available; the important priority in this planning phase is the Point Defiance Bypass.

In Phase III, the investment south of Tacoma is characterized by completion of the segments of high-speed (125 mph) passenger main line, while north of Seattle, the improvements complete the upgrading of the line to the border as well as the full list of improvements in the RTA plan between Seattle and Everett. Certain specific sub-projects within the Seattle-Everett segment (especially those near Galer Street and around the Interbay Yard near Ballard) should be done much earlier than Phase III, possibly as an alternative to doing all of the siding extensions north of Everett in Phase I. If this trade-off were made, total public expenditures within the planning phases would remain the same, but the advantages of accelerating the Seattle terminal work into Phase I are that it benefits more users: the Port freight service, the Amtrak service to eastern Washington, and the Vancouver, BC service. Furthermore, improvements near Ballard would smooth the flow of trains north of King Street Station, thus benefiting the City of Seattle as well, and would be a requirement for inaugurating commute service to Everett in Phase II.

Phase IV is marked principally by investment in the fourth and longest stretch of high speed passenger main tracks south of Tacoma, and by new trackage at Everett and Bellingham. The new tunnel at Everett is likely to be a requirement if commute service, expanded intercity passenger service (at the Phase IV level of 6 round trips) and increased container freight traffic are all to be accommodated without undue delays at Everett.

British Columbia

The priority projects in British Columbia during Phase I follow the model discussed earlier in the subsection on Oregon: all the recommended projects are designed either to relieve capacity constraints prior to expanding service frequencies, or to improve train speeds and performance. The additional freight running tracks between Still Creek and Brunette become necessary as passenger train frequencies rise. This is addressed by Project 53.

Phase II follows a similar set of principles, except that the general upgrades produce a greater positive impact on running time. The third and fourth phases are marked by significant increases in investment and in the level of utility of the main line. In addition, Phase 4 includes an alternate crossing of the Fraser River. The options for bypassing White Rock and Crescent Beach are discussed in the separate subsection, above.

Role of Railroad Capital Investment

Tables IV-1 and IV-2 are intended to show the expected extent of public investment in railroad infrastructure in the PNWRC. However, these lists of projects and costs largely exclude the investment that has been made or would be made by the private railroad carriers. This investment over the life of the planning horizon is likely to be substantial.

There are two areas in which additional carrier investment is likely to relate directly to the public investment in corridor infrastructure. The first area is investment in carrier-owned trackage and facilities, particularly rail yards, where the region's freight traffic is handled. The second area is signal or train control systems, which govern the movement of both passenger and freight trains on both shared and exclusive use track segments.

By the end of 1995, BN will have expended approximately $3.25 million of railroad funds on track and signal upgrading and curve improvements related to restoration of the Seattle-Vancouver, BC passenger service. About $1.8 million of this expenditure is taking place in Canada, where BN is assisting the corridor development by undertaking improvements that have no public funding source as yet.

As the capacity and capability investments on the corridor main tracks between Seattle, Tacoma, and Portland take shape, the Options Report anticipates that there will be substantial carrier investment from railway improvements to yards and support trackage. These improvements directly benefit freight users, but should be considered a private sector match in the context of the public-private contractual partnership because the railroad investments in support facilities are necessary to allow the increased passenger service unrestricted access to the main line. In other words, the value of public investment would be sub-optimized were it not for joint investment by the carriers.

Finally, the largest and potentially most significant benefit of carrier investment in the PNWRC is expected to come from railroad investment in Positive Train Separation (PTS) train control technology. PTS uses a combination of computer and satellite technology to produce an advanced train movement and track integrity control system. If PTS proves successful (the initial experimental installation is currently being developed by BN and Union Pacific for testing on the Tacoma-Portland main line, with participation by Amtrak and WSDOT), the new system should meet FRA standards for special safety devices to provide protection for all trains operating in environments where speeds greater than 79 mph are allowed.

Because the PTS test program is underway, the public sector investment program outlined in the Options Report includes no specific costs for conventional systems of high speed train control (e.g., Automatic Train Stop or Automatic Train Control). This investment will be unnecessary if the PTS system proves its value.

The carriers indicate that development and implementation of PTS in the portion of the PNWRC north of Portland, Oregon will likely cost between $50 and $100 million. The system, once in place, would permit passenger speeds up to at least 125 mph on the track segments engineered for those speeds, and could allow speeds above 80 mph on certain other segments of the corridor, provided that track upgrading projects include a sufficient level of work to meet the appropriate Federal Railroad Administration (FRA) track standards for, say, 90 mph, as opposed to the standards for 80 mph. The FRA engineering standards for track presently have speed thresholds at 80 mph (Class 4), 90 mph (Class 5), and 110 mph (Class 6). These standards determine minimum design and maintenance characteristics for track. The FRA signal standards are a separate issue: to operate at speeds over 80 mph both the track and signal systems must currently meet special, higher standards. In Canada, use of PTS would likely require regulatory approval from an appropriate agency, while Transport Canada would need to approve any increased train speeds.

With respect to high speed segments in Oregon, the Options Report currently excludes investment in Automatic Train Stop between Junction City and Albany. It is possible that PTS might be adopted on this line as well as on lines north of Portland, but extending the PTS system to Southern Pacific implies that carrier will equip its locomotive fleet to accept the PTS signals. This is an expense that can only be justified by a system conversion: simply changing 30 or 40 miles in the Willamette Valley makes little economic sense.

Consequently, the cost estimates for the Harrisburg Bypass and Harrisburg-Albany Passenger Main may need to increase if a dedicated, passenger specific installation of Automatic Train Stop is ultimately required to achieve the 125 mph design speeds on these two segments. Elsewhere in Oregon, the Options Report assumes maximum speeds within the regulatory limits of the current signal system.

IV.F INTERMODAL FACILITY/STATION IMPROVEMENTS

Stations and intermodal facilities in the PNWRC presently utilized by Amtrak include the following:

- Oregon - Eugene, Albany, Salem, and Portland Union Station
- Washington - Vancouver, Kelso/Longview, Centralia, Olympia/Lacey, Tacoma, Seattle, Edmonds, Everett, Mount Vernon/Burlington, Bellingham, Blaine
- British Columbia - Vancouver (Pacific Central Station)

Nearly all of these stations have been improved or have improvements programmed to be implemented in the future. A summary of Costs of Intermodal Facility/Station Improvements is provided in Table IV-7.

Oregon

Eugene

A High Speed Rail Southern Terminus Study has just been completed which identified optimum sites for the high speed rail station and train servicing facility in the Eugene-Springfield area for the southern end of the PNWRC. The preferred site is the existing Eugene station presently utilized by Amtrak intercity and long distance trains. With its downtown location and good access from area highways, the site could easily serve as a major intermodal facility. Rail related improvements are estimated to cost $3.6 million, with station building, street, and parking improvements estimated to cost $2.7 million, for a total cost of $6.3 million.

Albany

The Cascades West Council of Governments in coordination with the Oregon Department of Transportation (ODOT) conducted a study to identify a preferred location for an intermodal facility for rail passenger services in the Albany area. The existing Amtrak station on the Southern Pacific Lines was selected as the site for development of a long term rail passenger facility. The study cost of $50,000 was funded by ODOT. Capital costs for improvements to the existing facility are estimated to be $3 million; source of the funding is unknown at this time.

Salem

The Salem-Keizer Area Transportation Study (SKATS) identified modifications to the existing Salem passenger rail station to continue its use and expand the site into an intermodal facility. The total cost of all the improvements identified is estimated to be approximately $3.6 million. Of that total, approximately $600,000 would come from an enhancement grant to purchase the property and from contributions of station tenants. Other funding sources are not specifically identified at this time.

Portland Union Station

Substantial capital investment has been made in the recent past on improvements to Portland Union Station, which continues to serve Amtrak long distance and intercity trains. Although there is a need to improve the present automobile parking arrangement, no additional investment is programmed at this time.

Washington

Vancouver

The existing Burlington Northern depot on West 11th Street will continue to be used for the PNWRC rail passenger service. The WSDOT Rail Division has committed approximately $185,000 for design of improvements to the facility, with final design to be completed in 1995. Because of the station's location across the Columbia River from Portland, it is expected that the station will continue to serve patrons of Amtrak intercity corridor and long distance trains who find it more convenient to use the Vancouver station rather than drive into downtown Portland to use Portland Union Station.

Kelso/ Longview

The existing Burlington Northern depot at South First Street will continue to be used for the PNWRC rail passenger service. The WSDOT Rail Division has provided funding for design and construction of improvements to the building and site. Additional funds have been provided for construction through ISTEA Enhancement, STP Competitive, and TIA sources. Improvements have been completed at a cost of $3 million.

Centralia

The existing Burlington Northern depot on Railroad Avenue is located approximately one block from the Central Business District of Centralia and has the potential of serving as an intermodal facility for trains, transit, and taxi connections. The WSDOT Rail Division has provided funding for design and construction of improvements to the building and site. Additional funds have been provided for construction through ISTEA Enhancement, city of Centralia, and TIA sources. Estimated cost of improvements is $3.8 million, of which $1.8 million of the funding has already been secured.

Olympia/ Lacey

The Olympia rail depot is a new station and intermodal facility that was constructed and opened for service in 1992. Intercity Transit vans provide connecting service between the station and the cities of Olympia and Lacey. Additional platform improvements and parking lot improvements and expansion estimated to cost $537,000 have been proposed but no source of funding has been identified.

Tacoma

The existing depot was constructed in 1984 and is owned and operated by Amtrak. It was constructed to replace the deteriorated Tacoma Terminal building. Proposed improvements consist of a Park and Ride lot with a station facility to be constructed near the Tacoma Dome for use by RTA commuter rail and Amtrak, which would be owned and operated by Pierce Transit. Funding provided consists of $60,000 from Pierce Transit for conceptual design, and $140,000 from WSDOT Rail for conceptual design and environmental compliance. Final design and construction are subject to the decision to move forward on the Point Defiance Bypass.

Seattle

The King Street Station in Seattle dates back to 1905 and was built to serve long distance passenger trains. It is currently owned by Burlington Northern and is operated by Amtrak. Various studies have been conducted and are on-going regarding the amount of intermodal utilization for the station. King Street will continue to be used by Amtrak intercity and long distance trains and would also be used by the proposed RTA commuter rail service. In addition, it is proposed that the facility accommodate intercity buses as well. The “ full build” intermodal transportation terminal is estimated to cost approsimately $100 million. Allocation of costs to potential investment partners is yet to be determined.

Edmonds

The existing Burlington Northern station is currently being used for Amtrak intercity and long distance trains, and would also be used by the proposed RTA commuter rail service. A feasibility study of renovating the existing building and investigating alternate sites was conducted by the city of Edmonds with $31,000 of funding from WSDOT Rail in 1993. Renovation and accommodation of a second track for commuter rail was estimated to cost $210,600; this project is currently unfunded. Use of the existing station would continue until an ultimate facility is completed.

In addition, a multimodal transportation facility that would include ferry, rail, intercity bus, transit, motor vehicle, bicycle, and pedestrian connections is being studied, funded by WSDOT Marine ($75,000) and city of Edmonds ($300,000 STP). Estimated cost of the facility is $80 million, with approximately 10 percent ($8 million) allocated to improvements or additions to railroad facilities.

Everett

The existing Burlington Northern station is currently being used for Amtrak intercity and long distance trains; however, the city of Everett is going through the process of selecting a site for a multimodal facility, which could include the existing station site. The Everett Station Area Study, conducted in 1991, concluded that a multimodal facility could be constructed in the area that would serve to connect Amtrak, commuter trains, and a passenger ferry system. Currently a siting and environmental impacts study is being conducted with funding of $325,000 provided by WSDOT Rail, Sno-Trans, Everett Transit, and the Central Puget Sound Public Transit Account.

Mount Vernon/ Burlington

The newly-established Mt. Baker International train service is using the existing Burlington Northern rail station; however, a multimodal facility is planned for a site adjacent to the station. The facility would include a Skagit Transit complex. Funding of approximately $205,000 has been provided by WSDOT Rail for site planning, design, and construction of a temporary shelter and platform, geotechnical work, a traffic study, and enhanced financial analysis. Funding for the conceptual planning of the transit complex is provided by a $32,000 grant from WSDOT Rural Mobility, and new city street access to the multimodal facility and transit complex will be funded by Skagit Transit ($390,000), city of Mount Vernon ($150,000), and the Transportation Improvement Board Transportation Improvement Account ($1,300,500).

Bellingham

A multimodal facility was recently constructed adjacent to the South Bellingham Cruise Terminal. It consists of a multimodal terminal, rail/intercity bus platform, and connections to the cruise terminal. Funding sources included $48,700 from WSDOT Oil Stripper for siting and conceptual design, $2.2 million from WSDOT Rail for final design and construction, $966,000 from the Port for pre-construction and construction, $500,000 from Whatcom County COG for construction, plus $830,000 from the Port for in-kind land and building donation and project administration.

British Columbia

Vancouver

The PNWRC passenger rail service will utilize the Pacific Central Station as its northern terminus. It is a heritage train station that has been transformed into a showcase, multimodal facility in downtown Vancouver. The station, owned by VIA Rail Canada, Inc., has been fully refurbished and, in 1993, Vancouver's intercity bus terminal was relocated onto the station site. A common station concourse forms an integrated entry for both rail and bus patrons. Amtrak, VIA Rail, and Great Canadian Railtour passenger services operate from the same facility. This intermodal terminal is enhanced by its proximity to BC Transit's Skytrain and bus services.

There are no additional improvements planned to the terminal at this time as part of the PNWRC Options Report.

Table IV-7 Costs of Intermodal Facility/ Station Improvements		
Station	**Cost - $**	**Funded**
Oregon:		
Eugene	6.3 million	No
Albany	3.0 million	No
Salem	3.6 million	$0.6 million only
Portland	0	0
Total	12.9 million	
Washington:		
Vancouver	185,000[1]	Yes
Kelso/Longview	3.0 million	Yes
Centralia	3.8 million	$1.8 million only
Olympia-Lacey	537,000	No
Tacoma	200,000[1]	Yes
Seattle	100 million	No
Edmonds	8 million	$375,000 only
Everett	325,000[2]	Yes
Mount Vernon/Burlington	2.1 million	Yes
Bellingham	4.5 million	Yes
Total	122.6 million	
British Columbia:		
Vancouver	0	0
Grand Total	135.5 million	

1 Design costs only.
2 Siting and environmental impacts study costs only.

IV.G MAINTENANCE/SERVICING FACILITY

Amtrak currently has a maintenance and servicing facility in Seattle in the vicinity of the King Street Station. The facility is used for maintenance and servicing requirements to provide running repairs for locomotives and passenger cars used in long distance trains and intercity trains between Eugene and Seattle; since all the equipment is compatible, heavy maintenance requirements are met by cycling the equipment out of Seattle in a long distance train to a point, such as Los Angeles or Chicago, where more extensive maintenance equipment and facilities are located.

An exception is the Talgo passenger cars currently used in the Mt. Baker International trains between Seattle and Vancouver, BC. That equipment is maintained on leased track at Seattle by

Talgo Company representatives. If the equipment is eventually purchased by the state of Washington, its maintenance probably would be performed at the Amtrak facility near King Street.

In 1994 Amtrak conducted a conceptual study to design and construct a new maintenance facility at Seattle. Buildings include a 175´ by 50´ single track locomotive shop, a 1200´ by 60´ double track service and inspection building, and a 400´ by 40´ single track car repair shop. Additional buildings include a fuel and sanding building, a car washer, a mail dock, and a combined catering and police/crew building. Three service platforms would be provided.

Conceptual costs for the maintenance/servicing facility are estimated at $76 million. This estimate does not include site preparation costs, such as demolition or environmental clean-up costs.

IV.H LAND ACQUISITION COSTS

It is assumed that some of the track expansions, improvements and upgrades along the existing alignment in the Corridor will occur within the railroad owned right-of-way. However, during the project specific engineering and environmental analysis, improvements that would require additional right-of-way may be identified.

Construction of any of the bypass options proposed for Oregon, Washington, or British Columbia would require acquisition of property. Although a more detailed investigation of right-of-way requirements and costs will be undertaken in the environmental phase of this study, order-of-magnitude costs have been developed for acquisition of land for the proposed bypasses. The costs and basis for their development are explained below.

Harrisburg Bypass

The two bypass options, “A” and “C,” both traverse mainly farm land. Option A will require approximately 200 acres for railroad and highway/road relocation, and Option C will require approximately 237 acres for railroad and highway/road relocation. Raw land costs are estimated at approximately $4,000 per acre, resulting in a rough cost of $1 million. This cost does not include damages to remainder, acquisition of structures, relocation expenses, whole takes, and economic issues. With those factors considered, the order-of-magnitude cost for acquiring land for this bypass is $3 million.

Point Defiance Bypass

Although the Lakewood Bypass option of this proposed alignment change utilizes an existing rail line, it is estimated that approximately 30 acres would need to be acquired in Tacoma and Nisqually. Land costs in Tacoma are estimated to be $250,000 per acre, with a cost of $10,000 per acre elsewhere; thus land for this bypass would cost approximately $4 million.

The Prairie Line Bypass option would require acquisition of approximately 232 acres, with a land cost of approximately $6 million. This cost does not include damages to remainder, acquisition of structures, relocation expenses, whole takes, and economic issues. With those factors considered, the order-of-magnitude cost for acquiring land for the Point Defiance Bypass is $10 million.

White Rock Bypass

The proposed "A2" alignment would utilize a substantial amount of public right-of-way and would also be in tunnel. Costs for acquiring needed land and handling relocation expenses is estimated to range between $5 to 10 million.

The proposed "B1" alignment would require approximately 13.5 km of new right-of-way, at an estimated cost of $15 to 19 million for acquisition and relocation expenses.

The proposed "B2" alignment would require approximately 15.5 km of new right-of-way, at an estimated cost of $19 to 23 million for acquisition and relocation expenses.

Therefore, order-of-magnitude costs for land acquisition in British Columbia could be as high as $23 million.

Total land acquisition costs for construction of the bypass option in Oregon, Washington, and British Columbia is approximately $36 million.

IV.I SUMMARY OF CAPITAL COSTS

The following is a summary of capital costs for the PNWRC Options Report:

Project Costs	$1,394.7 million
Intermodal Facility/Station Costs	135.5 million
Land Acquisition Costs	36.0 million
Total	$1,566.2 million, say $1.57 billion

Note: Does not include rolling stock necessary for enhanced service or $76 million for an Amtrak Maintenance/Servicing Facility in Seattle, to be funded by Amtrak.

CHAPTER V
ENVIRONMENTAL CONDITIONS AND IMPACTS

V.A INTRODUCTION

The purpose of this environmental review is to ensure that 1) the Pacific Northwest Rail Corridor Options Report does not gravely impact the natural and built environment, and 2) any environmental features that may constrain the location of alternative rail alignments are identified. An in-depth environmental analysis was not performed. Following completion of this preliminary work, the Options Report alternatives will undergo an environmental assessment as part of the U.S. National Environmental Policy Act (NEPA). If and when an environmental assessment is required in British Columbia, it will be subject to the B.C. Environmental Assessment Act and appropriate federal legislation.

A number of steps were taken to identify the existing environmental conditions and impacts. Step one included the collection and review of existing data. In particular, this entailed review of previously documented environmental conditions relating to operations and physical improvements to the existing rail line between Eugene, Oregon and Vancouver, British Columbia. Step two entailed field trips to the three bypass areas as well as to specific improvement areas along the existing right-of-way. Step three involved the collection of additional environmental data as necessary. Conceptual mitigation plans were not developed specifically for each improvement area. Order of magnitude costs for mitigation were, however, added to estimated costs presented in Chapter IV.

V.B GENERAL CONDITIONS

General conditions were documented and areas of concern were mapped. These maps are presented in Figures V-1, V-2 and V-3. When doing this inventory and analysis, NEPA technical areas were used as a guideline to ensure that no environmental features were missed. However, particular technical areas were addressed only if there appeared to be a major constraint. If a fatal flaw or major concern was not identified for a particular bypass or improvement, then that technical area was not addressed.

Eugene to Portland

This segment travels through the Willamette Valley where a variety of farming activities occur. Farming communities, farm to market roads, and small cities and towns occur throughout this section. The PNWRC in this section travels through the heart of the Willamette River valley where stream crossings and associated wetlands and floodplains are prevalent. Primary sources of information included the National Wetlands Inventory Maps, US Geological Survey Maps, Federal Emergency Management Agency Flood Insurance Rate Maps, and contacts with Linn County, Lane County, Oregon State Lands, and National Resource Conservation Service officials.

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Figure V-1

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Figure V-2

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Figure V-3

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1. Eugene to Harrisburg Bypass

The area from Eugene to Harrisburg follows the existing Southern Pacific line beginning with light industrial uses in downtown, traveling northerly near a park, a school and golf range. Isolated residential development occurs near the rail line, but most are several hundred feet away.

From Eugene, the alignment runs north along the Southern Pacific rail line parallel to the Willamette River ranging from distances of a few hundred feet up to two miles away from the river. Other drainages, including Spring Creek, are in the vicinity of the line north of Eugene. Several wetlands and floodplains are associated with the streams and drainages.

2. Harrisburg Bypass

The primary impacts of the bypass alternatives are to farming practices, houses, farm to market roads, and other isolated issues. The three primary bypass alternatives A, B, and C traverse and impact very similar natural environmental resources. Several streams and drainages include associated floodplains in the Willamette Valley.

The bypass alternatives have not been included in the regional transportation or land use plans, or considered for avoidance of environmental impacts. Coordination with Linn and Lane Counties, Oregon Division of State Lands, Oregon Department of Environmental Quality and US Corps of Engineers will be necessary as detailed alternatives analysis begins.

Alternative A - Near the south end of this alignment, the line comes within about 500 feet of Shadow Hills Country Club. As it proceeds northeasterly, spinach fields, cornfields and other croplands would be impacted along with occasional farmhouses. In the vicinity of Tosta Road on the east side of the river, the chemical waste works and a large hazelnut orchard would be impacted directly or by restricted access. Impacts to houses will either be by acquisition or increased noise and vibration.

For Alternative A, about 20 Palustrine emergent, scrub-shrub and forested wetlands are impacted, including those associated with Cannon Creek, Muddy Creek and Willamette River.

For Alternative A1, about 15 wetlands are impacted. Wetlands are a mix of Palustrine emergent, scrub-shrub, and forested. Wildlife and habitat associated with streams and wetlands will be impacted including the Willamette Greenway on the east side of the river.

Stream Crossings and Floodplains Widths		
	Alternative A	**Alternative A1**
Camous Creek	600 feet	1,200 feet
Camous Creek	500 feet	600 feet
Muddy Creek	300 feet	
Muddy Creek	200 feet	
Willamette River/Curtis Slough	21,500 feet	21,500 feet
TOTAL	23,100 feet	23,300 feet

Alternative B - Near the south end of this alignment, several houses are in close proximity to this line. Moving northeasterly, grazing land, seed cropland, and orchards are impacted. Northeast of the Willamette River, the alignment follows back fence lines of properties to reduce impacts on farming practices and houses.

About 25 Palustrine emergent, scrub-shrub, forested, and unconsolidated bottom wetlands will be impacted by this alternative. This alignment traverses Marshall Island in the Willamette River floodplain where wildlife habitat occurs.

Stream Crossings and Floodplain Widths	
Muddy Creek	300 feet
Dry Muddy Creek	700 feet
Dry Muddy Creek	700 feet
Camous Creek	250 feet
Drainage	200 feet
Willamette River	12,300 feet
Drainage	500 feet
Drainage	300 feet
Drainage	500 feet
Drainage	300 feet
Drainage	300 feet
TOTAL	16,350 feet

Alternative C - Near the south end of this alignment several houses would be impacted by acquisition, increased noise or vibration, or degraded visual quality.

Northeast of the river crossing, grazing land is impacted both north and south of the connector lines to the existing Southern Pacific line that would be used.

About 12 Palustrine emergent, forested, scrub-shrub and unconsolidated seasonal flooded wetlands are impacted by this alternative. There is little impact at the south and north ends and this alternative is similar to Alternative B at the crossing of the Willamette River.

Stream Crossings and Floodplain Width	
Muddy Creek (Existing Alignment)	500 feet
Dry Muddy Creek	300 feet
Drainage	300 feet
Willamette River	12,300 feet
Drainage	500 feet
Drainage	300 feet
Drainage	500 feet
Drainage	300 feet
TOTAL	15,000 feet

3. Harrisburg Bypass to Salem

Between the Bypass and Albany, 20 miles of second track is proposed. The existing line passes through extensive non-irrigated farmland in the Willamette Valley. The line passes through developments at Halsey, Shedd, and Tangent prior to entering Albany. Impacts could occur by taking of farmland out of production, or by potential displacement of some residences and businesses. Several streams, tributaries and accompanying wetlands are crossed in this section. Major streams and tributaries are: Little Muddy Creek, Muddy Creek, Calapoola River, Lake Creek, and Oak Creek. Resident trout exist in these streams. Impacts of adding the second trackage will include taking of wetlands, stream crossings, wildlife disruption, and potential fisheries and degradated water quality during construction.

Between Albany and Salem, a 2,000-foot siding extension is proposed near Millersburg. The rail line continues through a mixture of non-irrigated farmland, small urban developments, forest land used for commercial purposes, irrigated agricultural land and range land. The siding extension will likely impact agricultural land, either irrigated or non-irrigated, or range land. The rail line crosses the Santiam River and several creeks, including the Chehulpum, Sidney Canal, McKinney, and Bear. Both scrub-shrub and forested wetlands are associated with the streams. The proposed track siding at Millersburg could impact wetlands normally associated with drainages along the tracks. Other impacts are expected to be minor.

The major construction activity in this section will be the siding extension at Millersburg, the bridge upgrade over the Santiam River, and upgrading of the Albany Yard. These improvements, along with crossing improvements, should be consistent with local and regional plans. Close coordination with the Linn and Marion Counties, city of Albany, and the various other local communities and resource agencies will be necessary to assure that various issues are considered during final design.

4. Salem to Portland

Between Salem and Oregon City, the rail line passes through diverse irrigated and non-irrigated agricultural land, including grazing, vegetables, seed crops (ryegrass), and tree and shrub nurseries. The line passes through the center of several small urban areas, such as Canby which is bisected by the line. The line parallels highway 99E from Canby to Oregon City. Mixed land uses exist along the line with a generous setback for most residences. Impacts are most likely going to be in urban areas where noise, vibration, and potential safety concerns may exist.

No major improvements are anticipated in this section. Between Salem and Oregon City, the Pudding River and several creeks are crossed, including the Fitzpatrick, Carnes, Mill, Molalla, and Parrott. The line runs along the bank of the Willamette River between Canby and Oregon City. New impacts are expected to be minor.

Between Oregon City and downtown Portland and on to the crossing of the Columbia River to Washington, land uses are generally commercial to industrial. The line passes next to a golf course just north of Oregon City, it utilizes existing historic bridges over the Willamette River into Old Town and again where it passes through the St. Johns. Impacts in this section are expected to be minor. The major natural resources are located at the crossings of the Willamette River at Old Town and St. Johns Community, and the traversing of wetlands near Lake Smith and Columbia Slough crossing approaching the main channel of the Columbia River. Since no major improvements are anticipated, impacts are expected to be minor.

The only upgrades in this section will be grade crossings and the yard in Portland. The proposal should be consistent with local, regional and state plans. Close coordination is important to be carried out with the cities of Salem, Oregon City, Milwaukie and Portland, along with other local municipalities.

Portland to Vancouver, Washington

The alignment within this geographic area passes through dense urban areas which include various intensities of industrial use. Improvements within this area include the Lake Yard and River Crossing Upgrades. It is not anticipated that the yard improvements would result in major impacts to the natural or built environment. However, upgrades to the existing Willamette and Columbia River crossings could impact vegetation and wildlife habitats. Care needs to be taken in construction techniques and scheduling.

Vancouver, Washington to Tacoma

The topography and land uses in Washington State continue to follow those found in neighboring Oregon. The existing alignment passes through a number of counties and jurisdictions in this section. The area is predominately rural in nature except for the urbanized areas in Vancouver and Tacoma. Traveling north from Vancouver, the rail line runs within close proximity of the Shillapo-Vancouver Wildlife Refuge and the Ridgefield Wildlife Refuge.

Within Clark County, the area surrounding the city of Vancouver is predominately residential and rural in nature with very little environmental concerns. Lands within the northern portion of Clark County are well drained by the tributaries of the Lewis River and therefore do not have many wetland impacts. In Lewis County, the alignment passes through a number of wetlands; specifically, the principal wetlands associated with South Hanford Creek, Salzer Creek, and the Napavine Prairies, Neukaum Prairie, and Owens Prairie. After crossing the Lewis River into Cowlitz County, the rail line runs through or near many communities such as Kalama, Kelso, and Castle Rock. Major water crossings include the Toutle River and the Cowlitz River.

A number of improvements are proposed within this area. These improvements include upgrades to the Vancouver Yard, and adding a third track to the existing double track along the Ridgefield Passenger Mainline Numbers 1 and 2. This third track may impact wetlands normally associated with drainages along tracks. Similar improvements are proposed further north at the Vader-Winlock Passenger Main. Again, impacts to wetlands associated with drainage could result. In addition, all improvements should be coordinated closely with local and county agencies to ensure consistency with local plans.

Other improvements in the area include the Kalama-Longview Freight Running Track and the Toutle Center Siding. These improvements are proposed within the existing rail right-of-way and no impacts are anticipated. Crossover improvements at Napavine, Centralia, and Bucoda-Tenino could result in increased noise in the area as well as safety concerns.

1. Point Defiance Bypass

The Point Defiance Bypass area is predominately rural in nature with many stream and river crossings and associated wetlands and wildlife habitat. The entire area is scattered with various densities of residential uses and associated commercial services. Major uses include Fort Lewis and McChord Air Force Base.

Alternative A (Lakeview Branch) - This Bypass option leaves the existing rail line just south east of the Nisqually National Wildlife Refuge. The line then continues north, parallel to I-5, through Fort Lewis. Environmental concerns for this alternative focus on the wetlands and associated wildlife habitat at the Nisqually Refuge. Other areas of concern include the proximity of the bypass to the Fort Lewis Museum (an historic structure) as well as the residences which abut the line just north of Fort Lewis. Noise, safety, and aesthetics are major issues within this residential area. This line crosses Murray Creek and Clover Creek.

Alternative B (Prairie Line) - This Bypass option leaves the existing rail line just south of Tenino and travels northeast along the abandoned Prairie line. This route passes through the communities of Tenino, Rainier, McKenna, and Roy, and the alignment presents a number of environmental concerns, primarily within or near these communities. Just north of the crossover from the existing line to the bypass, the proposed alignment runs adjacent to the Depot Museum, an historic structure in Tenino. The line also runs through a camping area and city park at this location. Other areas of concern are the impacts to the local businesses and overall communities of Rainier and Roy, where the alignment runs through the downtown areas resulting in the loss of parking and safety issues.

Wetlands and marshlands around the city of Roy are also of major concern if widening or fill is required. Floodplains in this area are also an area of concern. In addition, the alignment crosses a number of streams and rivers, including Scatter Creek and its tributaries, McIntosh Lake, Deschutes River, Yelm Creek, Nisqually River, Murray Creek, and Clover Creek. Upgrading of the abandoned line could result in sediment and fill thus impacting water quality, wildlife habitat and wetlands.

In addition, train operation via this bypass alternative would result in the loss of the Olympia/Lacey Station which could impact residents from the Olympia area.

2. Lakeview to Tacoma Dome Upgrades

Both bypass options, as well as the existing line, tie into this segment. The alignment in this segment will be doubletracked within the railroad's own right-of-way. Impacts in this area are mainly associated with increased noise levels and the loss of access for some businesses in the area, particularly along South Tacoma Way near 50th Street. Since this area is already developed as an industrial area, impacts to the natural environment are basically nonexistent.

3. Tacoma Dome to Reservation Upgrades

These upgrades are proposed in a heavily developed area of downtown Tacoma and will result in significant impacts to the community. Major improvement is proposed around 25th Street between C and G Streets. Impacts will include the taking of approximately three commercial buildings, two of which are currently in active use. In addition, the new Freight House Square mall may experience impacts due to safety, noise, and aesthetics.

Tacoma to Seattle

This segment is very urban in nature and is a mix of residential, commercial and industrial uses. Improvements in this area include mainline upgrades from Black River to the Argo Union Pacific Mainline and from Reservation to King Street Burlington Northern Mainline.

Because of the urban nature of the environment and the minor improvements in this area, major impacts are not anticipated. Impacts to wetlands normally associated with drainage along tracks is anticipated. In addition, the alignment crosses the Green River and the White River. These crossings could lead to potential water quality impacts due to erosion and sediment runoff and dust emissions.

Throughout this segment, a number of parks are located within a few hundred feet of the alignments. However, none of the existing parks are near or adjacent to potential improvement areas. Temporary noise and dust impacts may occur during construction.

Railroad operations could be adjacent to historic properties in downtown Seattle, the Green River Valley, and the Puyallup River Valley. Rail operations would not disturb or adversely affect any historic site or structure.

The noise from rail operations would probably have relatively little impact along the alignment between Seattle and Tacoma, given the high speeds and volumes of trains already using the tracks and the relative lack of residential areas or other noise-sensitive receptors.

Seattle to Everett

This segment of the corridor traverses the existing rail line from downtown Seattle north to downtown Everett. The corridor runs through fairly diverse land uses ranging from urban to waterfront to rural/agricultural.

Depending on the type of improvement called for, additional land could be needed to allow for improvements to service.

In Edmonds, the at-grade rail line improvements will result in extensive traffic and safety impacts. These improvements may also impact wetlands normally associated with drainage along tracks.

Everett to Blaine

This section of the alignment travels through rural, scenic areas which have extensive environmentally sensitive areas, including the Nooksack River Basin, Samish River Basin and the Stillaguamish River Basin. In addition, the alignment crosses the Skagit River, a designated Wild and Scenic River.

A number of improvements are proposed through this section. Siding additions and extensions are all proposed within existing right-of-way; therefore the impacts will be limited to the loss of wetlands due to fill.

The one improvement which will likely result in some impacts is the Bellingham Mainline relocation which will require the relocation of the existing rail line to an abandoned line. This relocation is in an existing industrial area and should not have any natural environmental impacts. A replacement bridge is proposed as part of this improvement: the bridge replacement could impact vegetation and wildlife habitats associated with water crossings. Care needs to be taken in construction techniques and scheduling.

The Blaine Siding extension will also result in the filling of Category III wetlands due to grading. As part of this project, one business and two residences will also lose access. Acquisition or new access may be required.

County plans, however, endorse the proposition of public transit and rail access including the Whatcom County Land Use Plan (1982) and the Birch Bay Blaine Subarea Plan (1987). Additional environmental analysis was performed for this segment in the SEPA Environmental Checklist/NEPA Documented Categorical Exclusion — Reinitiation of Passenger Rail Service between Seattle and Vancouver, British Columbia, 1994.

Blaine to Vancouver

This section of the rail line travels through hilly terrain with a mix of land uses including rural residential, agricultural, and light industrial. The area just north of Blaine to the outskirts of New Westminster is predominately agricultural with associated residences.

1. White Rock Bypasses

The existing rail line follows the shoreline of Semiahmoo Bay, Boundary Bay, and Mud Bay. Steep bluffs exist in the vicinity of Kwomets Point.

Three bypasses of White Rock are being explored to avoid safety, noise and visual impacts associated with the existing alignment and to also raise speed limits: Alternative A-1 which runs parallel to Highway 99, Alternative B-1 which runs northeasterly through the Agricultural Land Reserve, and Alternative B-2 which crosses the US/Canada border east of Blaine before tying into the B-1 alignment.

The existing Burlington Northern (BN) line follows the shoreline through the town of White Rock and borders the residential community in the vicinity of Kwomets Point. It also bisects the community of Crescent Beach. Tourists and residents must cross the rail line to gain access to beach areas.

None of the Bypass alternatives are included in the regional transportation plan or land use plans for the region. Issues, policies, plans or approvals that need to be taken into consideration include: Agricultural Land Reserve; Semiahmoo Reserve; Serpentine Wildlife Sanctuary; Multiple Account Evaluation Guideline; and local transportation and land use plans. Environmental authorities that need to be contacted include: BC Agricultural Land Commission; BC Ministry of Environment; BC Fish and Wildlife; Fisheries and Oceans Canada; and Surrey Planning Department.

Alternative A-1 - This alignment runs parallel to Highway 99 on the east. Fergus Creek, Nicomekl River and Serpentine River would be crossed along with six other unnamed streams or tributaries. The Serpentine Wildlife Management Area east of Highway 99 is a wildlife refuge for many resident and migrating wildlife. Both salmon and trout species are present in the rivers and their tributaries. Wetlands and floodplains are associated with the river crossings. Much of the land adjacent to Highway 99 is grass and brush from vegetation under the hydro transmission line running parallel to the highway. In the Nicomekl and Serpentine River Drainage basins, the line crosses an Agricultural Land Reserve which provides agricultural land, floodplain and wetland protection. The Serpentine Wildlife Management Area and the Fraser Estuary Management Program could affect the location of this rail line.

The A-1 alternative parallels Highway 99 on the east side. Near the south end, several houses would be either acquired or have noise or vibration impacts. Overall, approximately 25 residences would be displaced.

A hydro electric transmission line exists on the east side in the general vicinity of the proposed rail line.

Impacts on the Agricultural Land Reserve will require close coordination with authorities to assure future economic development opportunities for agricultural producers. The Semiahmoo Reserve is traversed at the south end of this alignment.

The Ministry of Transportation and Highways is proposing a new interchange on Highway 99 at 152nd Street, with first stage construction scheduled for 1997.

Summary of potential impacts of this alternative include:

- Semiahmoo Reserve crossing;
- Increase of residential and business noise and vibration;
- Agricultural Land Reserve crossing;
- Serpentine and Nicomekl River crossings;
- Seven stream crossings;
- Adjacent to Serpentine Wildlife Management Area;
- Wetlands and floodplains crossings;
- Utility relocations; and
- Displacement of residences.

Alternative B-1 - Between the US border and Cloverdale, where the new alignment ties into the existing line, approximately 12 streams and primary drainages are crossed. Both forested and scrub-shrub wetlands are associated with this alignment. Much of the land is rural and is either undeveloped, used for grazing land, or is being farmed. Almost all of the alignment except for the southerly 2 km is agricultural land reserve, approximately 12 km on new alignment.

This line impacts houses from the US border to 32nd Street. Impacts will be direct acquisition, noise, vibration and aesthetics. Approximately 25-30 residences would be displaced by this alternative. Several homes in the vicinity of this line are located along the fringe of the Agricultural Land Reserve. Nearly the entire alignment is within the Agricultural Land Reserve (ALR) area. Perpetuation of economic development opportunities within the ALR area will be paramount for future consideration of this alternative. Mitigation strategies could include: keeping the alignment as close to the edge and along property lines as much as possible; maintaining a narrow footprint; avoiding property ownerships; maintaining farm to market transportation routes; integrating farming ownerships or operation; improving regional agricultural drainage; or other mitigation to sustain the economic vitality of the land reserve. First Nations property is traversed at the south end of this alignment.

Summary of potential impacts of this alternative include:

- Semiahmoo Reserve crossing;
- Displacement of residences;
- Increase of noise and vibration;
- Visual intrusion on agricultural and natural environment;
- Agricultural Land Reserve crossing on new alignment;
- Crossing of forested and scrub-shrub wetlands; and
- Several crossings of streams and associated floodplains.

Alternative B-2 - This alignment enters British Columbia generally along the alignment of 184th Street via tunnel from Washington State before entering the Agricultural Land Preserve approximately 0.3 km into British Columbia. The natural resources associated with and impacted by this alignment are similar to those of Alternative B-1.

This alternative, which generally follows the 184th street alignment from Washington into British Columbia, merges into the B-1 alignment near 20th Avenue, approximately 2.5 km north of the border and approximately 2 km east of Highway 99 and the Semiahmoo Reserve. Approximately 30 residences would be displaced. By following the 184th Street alignment, severance of agricultural land ownerships would be minimized.

Summary of potential impacts of this alternative include:

- Displacement of residences;
- Increase of noise and vibration;
- Visual intrusion on agricultural and natural environment;
- Agricultural Land Reserve crossing on new alignment;
- Crossing of forested and scrub-shrub wetlands; and
- Several crossings of streams and associated floodplains.

2. Bypass to Vancouver

Two alternatives are being evaluated for this section, the existing BN alignment and BCHB which travels through East Newton and Newton.

The two options to connect the Bypasses back to the Burlington Northern line south of the Fraser River are not included in any existing transportation plan. Close coordination with Surrey and the communities of Cloverdale, Colebrook, and North Delta are important if analysis of alternatives continues.

Existing Alignment (BN) - Alternatives B1 and B2 - Since the existing line would be used, minimal natural resource impacts is likely to occur. However, the line crosses approximately 3 km of agricultural land reserve just north of Mud Bay.

The existing BN runs parallel to Highway 91, beginning on the south near Mud Bay by traversing about 4 km of Agricultural Land Reserve, then running parallel to a residential community at North Delta before entering an industrial area adjacent to and prior to crossing the Fraser River.

Alternative B3 - SRBC Alignment - This alignment also follows an existing line. Natural resource impacts include crossing the Serpentine River and tributaries in survey as well as potential stream impacts north of Newton where the alignment and stream share a ravine.

Even though this is an existing alignment, right-of-way is restricted and the proximity of several residences and apartments would result in increased noise and vibration from this alternative. This alignment also bisects the industrial areas of East Newton, Newton, and South Westminster. Several major street crossings occur with this alignment.

3. Alternate Fraser River Crossing - If it is determined to provide an alternative Fraser River Crossing, environmental impacts cannot be identified until the potential location for this improvement is identified.

CHAPTER VI
INSTITUTIONAL AND COMMUNITY INVOLVEMENT PLAN

VI.A INTRODUCTION

The *Options For Passenger Rail In The Pacific Northwest Rail Corridor Planning Report* outlines the various options for the implementation of increased and enhanced passenger rail service in the corridor. The primary focus of this report has been on the collection and analysis of engineering data and on operations issues. The public involvement tasks of this phase have been to identify the major issues that may require community outreach as the planning process moves into subsequent phases, and to recommend an approach and techniques for achieving an effective public and institutional involvement program. Some initial public involvement tasks have been undertaken. Presentations have been made at various public transportation and rail conferences and several key individuals and agencies have been contacted, such as the Metropolitan Planning Organizations located within the PNWRC.

At this time, the level of participation by each of the states and the province is not clear, nor do all parties currently have a financial commitment to the next phase. Thus, the ongoing project sponsorship may be by one or more of the three parties. Because public involvement activities should reflect this sponsorship, this report recommends options for structuring public involvement depending upon each sponsor's level of involvement.

It is recommended that, if more than one party sponsors the next phase, public involvement might be developed in two parts: an overall statement of public involvement goals and approaches, and individual plans for each participating jurisdiction to be developed and implemented by each jurisdiction. On the other hand, if only the state of Washington is sponsoring the project, it should develop a public involvement plan for the state and then consult with the other jurisdictions about how they wish to handle information and involvement in their geographic areas.

In either case, it is recommended that public involvement address both community and institutional involvement be developed within 60 days of the inception of the next phase so that all interested parties have a road map for their potential involvement. It is further recommended that any public involvement plans as developed contain provisions for evaluation and revision as needed.

This chapter on Institutional and Community Involvement contains four parts:

1) Goal and public involvement plan development;
2) Approach and philosophy;
3) Issues; and
4) Legal requirements.

VI.B GOAL AND PUBLIC INVOLVEMENT PLAN DEVELOPMENT

The goal of public involvement is to ensure institutional and community understanding of the PNWRC. To accomplish this goal it will be important to:

- Inform people that the project is underway;
- Educate people about the Pacific Northwest Rail Corridor;
- Offer an opportunity for involvement in the project decision-making process;
- Provide information about the project to policy-makers; and
- Conduct public information and involvement in such a way that people know that their concerns and issues were considered.

As indicated above, the structure of project sponsorship should determine how the public involvement for the project is developed and implemented. Thus, the Public Involvement Plan might be a product of all three sponsoring parties, or of two sponsoring parties, or of the sole sponsor. In the event there is a one- or two-party sponsorship, those parties should develop the Public Involvement Plan, assuring that implementation in each jurisdiction is conducted according to its needs and protocols. They should then consult with the other non-sponsoring, but cooperating party or parties to assure coordination of public outreach. It is important that no jurisdiction take responsibility for conducting public involvement in another jurisdiction.

More specifically, approaches to public involvement by the Canadian and United States governments are similar, but not identical. This is also true for the approaches taken by the states of Oregon and Washington and the Province of British Columbia. For example, there are differences between the states and the province in terms of the timing and manner of the public consultation process, in terms of the current level of public awareness and education about the tradeoffs between rail and automobile transportation, and in the status of the public and governmental commitment to financing and building a passenger rail corridor. The Public Involvement Plan of the Province might, therefore, emphasize public consultation and education through informal local meetings or articles in local newsletters or newspapers, but not call for more formal hearings until later project stages.

Placing responsibility for developing and implementing the Public Involvement Plan with the project sponsors in the next phase assures that the emphasis in community and institutional outreach will coincide with project emphasis. Limiting the geographic reach of any one jurisdiction to its boundaries, unless there is close coordination with another jurisdiction, assures that no politically inappropriate outreach will occur.

For each jurisdiction that is developing a Public Involvement Plan, some activities will be dictated by state, provincial, or federal requirements. Other activities will respond to public expectations based on past practice, and some will respond to issues created where the proposed corridor passes through particularly sensitive areas. This report recommends that those developing a Plan consider the following:

- Developing a Public Involvement Plan that addresses both institutional and community involvement needs;
- Identifying interested "stakeholder" groups and citizens who might wish to express their concerns and desires for the project,
- Distributing the plans with a cover letter signed by the appropriate sponsor that describes the full corridor options to these stakeholders; and
- Including in the Plans a method for its periodic evaluation and revision.

If there is more than one sponsor, and therefore, more than one Public Involvement Plan, an overall statement of public involvement goals and approaches should be cooperatively developed. This statement would provide an umbrella for overall public involvement assuring that the messages and timing of individual outreach were consistent and coordinated. Although there is a need for tailored outreach depending on the needs, history, and protocols of each sponsoring jurisdiction, there is also a need for a unified project image and consistent information. Thus, in the event there is more than one sponsor, some active public coordinating mechanism will be crucial. This might be arranged through the next phase Technical Oversight Committee or through a special ad hoc arrangement.

If there is only one sponsor, that entity should take the lead in developing and implementing a Public Involvement Plan for its geographic area, and for consulting with the other jurisdictions about their needs and desires for public involvement.

Regardless of the structure of public involvement sponsorship, it is recommended that products and activities include the following:

- Providing a focal point for media contacts and outreach related to the project, issuing press announcements and releases, and holding briefings on behalf of the project;
- Creating and publishing a project newsletter;
- Developing and managing a project mailing list; and
- Arranging for public open houses, meetings, hearings and briefings.

VI.C APPROACH AND PHILOSOPHY

The institutional and community involvement effort must be proactive. Public involvement in past projects and in inaugurations of new rail services have demonstrated the high level of interest in this corridor. It will be essential to identify various constituencies according to their concerns and needs for information and involvement, and to reach out to those groups. A proactive approach will also create a bridge between the technical work and the concerns of people who live in the proposed corridor.

The recommended philosophy for institutional and community involvement in this project is "no surprises." Operating according to this philosophy requires careful thinking about which groups of people need what types of information, and when. It requires thinking about the many institutions and publics that comprise the constituency for this project, not treating them as a homogenous group. It requires being clear about which groups need primarily information or education, and which need more active involvement. It means creating some involvement activities that inform and educate.

A proactive, no surprises approach to public involvement meets and exceeds the legal requirements for public hearings at specified stages in the EIS or EA preparation process. Under this approach, institutional and community involvement is early and ongoing.

The state and provincial plans for institutional and community involvement should identify specific groups according to their information, education, or involvement needs. They will also identify which public involvement techniques will be used to reach each of these groups.

The states and province should identify specific institutions that need to be involved as they develop their involvement plans. Like community involvement, institutional involvement plans address the specific needs of various organizations such as:

- City/county transportation managers and transportation staff members;
- Metropolitan Planning Organizations (MPO's) in the US and the Greater Vancouver Regional District Council in Canada;
- Ports;
- State legislative representatives and committees;
- State agency staff members;
- Directly affected federal agencies including the McChord Air Force Base and Ft. Lewis Army Base in Washington State;
- Federal agencies with review or enforcement responsibilities, such as the US Environmental Protection Agency (EPA);
- The sovereign First Nations; and
- Public transportation providers.

It is essential that representatives of local and regional governing bodies be actively involved throughout the project. This should be done through one-on-one contacts whenever possible, as well as through periodic briefings of city and county councils or other official bodies. Also, each state or province might wish to have local meetings for agency representatives. These contacts should be made through the state or provincial level. However, for consistency of messages and for accountability and tracking, the overall coordination and arrangements should be a responsibility of the Technical Oversight Committee that is facilitated by the project team.

The First Nations with interest in land that is potentially impacted by the project must be contacted so that an appropriate nation-to-nation communication channel might be devised. The sovereignty of First Nations dictates that they are not treated as other stakeholders, but as separate national entities.

VI.D ISSUES

Issues that arise with each rail corridor improvement include:

- Possible disturbance of existing businesses or land uses;
- Possible impacts from noise or vibration due to increased train speeds;
- Possible safety issues related to grade crossings;
- Possible increases in train speeds though developed areas;
- Possible need for right-of-way acquisition;
- Possible consequences of not proceeding with the project in terms of increased need for new roadways or increased congestion; and,
- Possible tradeoffs in terms of costs and benefits of investment in passenger rail vs. investment in other transportation infrastructure.

This Options Report has identified environmentally sensitive areas, describes alignments alternatives at a " fatal flaw" level of analysis, and identifies broad-based community and environmental impacts. As such, it is a precursor to the programmatic environmental impact statement/corridor alternative selection that are the products of the next planning phase. The task of the next phase of the project is to gather specific impact data in areas where these issues arise and to analyze that data and present the results in draft form to the public and, in final form, to the project decision-makers. It is essential that the public and affected institutions understand that no decisions have been made as a result of this current study, and that there will be ample opportunity for institutional and community involvement as the programmatic EIS is developed.

As part of their involvement plans, each state and the province should identify specific geographic areas where there are likely institutional or community concerns, articulate the issues as understood by the project team and Technical Oversight Committee, and describe how people interested in this project might make their concerns known.

VI. E LEGAL REQUIREMENTS

Compliance with the legal requirements governing this project will necessitate thorough understanding of federal and state and provincial environmental laws. In the United States, the National Environmental Policy Act (NEPA) takes precedence over state laws. Washington State also has a State Environmental Policy ACT (SEPA), although the state of Oregon does not. In Canada there are recently promulgated laws, called the Canadian Environmental Assessment Act and the British Columbia Environmental Assessment Act, that augment public involvement requirements contained in previous environmental legislation, but for which many of the implementing guidelines have yet to be written.

One major difference between Canadian and United States law is the timing of requirements for public involvement. Canadian law requires project-specific public involvement activities, but does not require outreach in the planning phase. United States laws require public involvement during the development of the programmatic EIS, which is pre-project level planning.

Thus in Canada, the provincial representatives will need to determine the appropriate course of action for public involvement in this corridor phase for purposes of increasing public awareness and education, rather than merely holding hearings to conform with legal requirements. Such hearings will come later in the Canadian process.

In Washington and Oregon a similar strategic decision will need to be made about the timing and level of public involvement, although hearings on draft EIS documents are a requirement of this phase of the project under NEPA requirements.

CHAPTER VII
FINANCIAL PROGRAM

VII.A INTRODUCTION

This chapter provides a framework for discussions regarding the financial structure and funding needed to develop and operate rail passenger service in the Pacific Northwest Rail Corridor. There are a number of policy questions to be addressed before a detailed finance plan for the system can be prepared. The most significant outstanding policy issues are those associated with the decision-making process for corridor development and the mechanism for sharing costs among the three partner jurisdictions. Therefore, the goal of this discussion is to: 1) define the total financial commitments required to fund the system plan; 2) frame the major policy questions and provide some preliminary analysis to assist decision makers in choosing appropriate organizational structures; and 3) provide a brief overview of potential sources for project funding.

This section has been organized according to the following four major elements: the first element, VII.B, pulls together costs from the engineering, environmental, and operations sections and presents this information in a comprehensive system-wide manner to define the investments required.

Element VII.C provides an analysis of organizational and governance issues associated with the implementation of the program outlined in the plan. The purpose of this section is to provide an analysis of alternative governance approaches based on the functional requirements of the program.

The third major element of this chapter, VII.D, addresses ways system development and operations costs might be allocated among the principal corridor participants. The process of allocating costs in an equitable manner must be closely linked to the governance and management structure. Cost allocation concepts are presented, including a discussion of how relative equity and benefit could be defined.

The final section, VII.E, addresses funding issues and provides a brief overview of funding sources for system development and operations.

VII.B SYSTEM DEVELOPMENT AND OPERATIONS

The initial task is to identify the financial requirements of the system as defined earlier in the engineering and operations chapters. This presentation considers the corridor in its entirety and does not attempt to determine the responsibility for funding, regardless of the location of particular improvements. The purpose is to look at the corridor as a single entity and describe the complete program, including all facilities and services necessary to provide the targeted levels of intercity rail service.

Capital Investment Needs

Table VII-1 presents the total capital investments required to achieve the desired travel times between Seattle-Vancouver, B.C. and Seattle-Eugene. These cost estimates are given in 1995 dollars and account for the engineering and construction elements of facility improvements and the necessary rolling stock. Estimates of the potential cost impacts resulting from additional right-of-way and environmental needs will be addressed more precisely in the next step of systems planning, the environmental analysis.

Table VII-1
Estimated Capital Costs for Engineering and Rolling Stock
by Phase and Jurisdiction (Millions of 1995 US$)

	Phase I	Phase II	Phase III	Phase IV	Total
Oregon	$34.4	$ 46.9	$46.6	$55.2	$183.1
WA, S. of Seattle	$140.0	$146.8	$106.7	$96.6	$490.1
WA, N. of Seattle	$16.6	$12.2	$44.3	$22.1	$95.2
Washington Total	$156.6	$159.0	$151.0	$118.7	$585.3
British Columbia	$43.1	$21.1	$87.4	$474.8	$626.3
Corridor Investments	$234.0	$227.1	$285.0	$648.7	$1,394.7
Rolling Stock	$119.0	$ 85.0	$34.0	$17.0	$255.0
Right-of-Way Costs	$12.0	$4.0	$18.0	$2.0	$36.0
Station Costs	$10.7	$59.0	$58.0	$7.8	$135.5
Environmental Mitigation	tbd	tbd	tbd	tbd	tbd
Corridor Totals	$375.7	$375.1	$395.0	$675.5	$1,821.2

Source: MK/HDR, 1995, may not add due to rounding.

Assumptions:

1. The source of investment necessary for funding these improvements is not identified.
2. All potential public investment is included.
3. A highest order of magnitude cost for OR, WA, and BC bypasses are funded.

Chapter IV includes a listing of the station facilities that are currently in use along the corridor, which are generally adequate for the initial period of program development. In the long term, a number of these facilities will need to be upgraded. There are a number of multimodal terminal projects which would serve the PNWRC that are currently in the planning stages. These facilities are all locally owned and operated and any future state role in the funding of these planned station improvements has yet to be determined for many of the stations.

Identified station improvements as part of the PNWRC Options Report will cost $135.5 million.

As described in Chapter IV, it is assumed that some of the track expansions, improvements, and upgrades along the existing alignment in the corridor will occur within the railroad owned right-of-way. During the project specific engineering and environmental analysis, improvements that would require additional right-of-way may be identified, and no costs have been included for such acquisition. Land will have to be acquired, however, for construction of the proposed bypasses in Oregon, Washington, and British Columbia. Total identified land acquisition costs are estimated to be $36 million.

Summary of Capital Costs

The following is a summary of capital costs for the PNWRC Options Report:

Project Costs	$1,394.7 million
Rolling Stock	255.0 million
Intermodal Facility/Station Costs	135.5 million
Land Acquisition Costs	36.0 million
Total	$1,821.2 million, say $1.82 billion

Note: Does not include $76 million for an Amtrak Maintenance/Servicing Facility in Seattle, to be funded by Amtrak.

The phasing of the capital investment in the corridor is based on the incremental travel time goals established in the operations analysis and the relative cost effectiveness of each capital project. The investments allocated to a particular phase are necessary to achieve the travel time and capacity requirements of the operating plan for the next incremental project phase. The sequencing of capital projects was generally determined according to a simple cost effectiveness measure which quantified system benefits (primarily in terms of travel time savings) and related them to the cost of the improvement. The phasing program also attempts to level the capital expenditures over the various phases to simplify the process of funding the program.

The rate at which system operating goals are achieved will be determined by the rate of public investment in the corridor. Funding will be discussed in a later section of this chapter; however, the availability of funding will have a significant impact on the time required to accomplish the operational targets. For example, the estimated capital needs of $1.8 billion would require annual capital expenditures of approximately $90 million to build the system in 20 years (approximately 5 years per phase) or $60 million per year to accomplish the task in 30 years (7.5 years per phase). These figures do not include allowances for inflation or the funds needed for additional right-of-way, extensive environmental mitigation, or interest on any debt used for the project.

Clearly, this is a program that will require significant public investments. However, one of the advantages of pursuing an incremental development approach is that the decision to fund individual projects is made on an annual or biennial basis and can be made on project merits, using available current information and system performance relative to policy goals. If the performance of the system does not achieve certain levels, the next incremental project(s) may not be successful in the competition for transportation funding. Funds may be more effectively used for other transportation improvements. Thus, the point at which the corridor is "built-out" will likely depend on the success of the program in meeting its stated service, ridership and cost recovery goals.

Operations and Subsidy Requirements

A summary of annual operating costs, revenues and subsidy requirements by project phase is presented in Table VII-2.

The annual operating and maintenance requirements are based on expanding corridor service levels as the infrastructure is put into place to meet threshold travel time reductions. These costs are partially offset by the income from operations. The balance is the estimated public funding support needed to provide these levels of service.

The annual cost of providing intercity rail service is projected to range from approximately $15 million in Phase I and increase with the level of service to over $105 million at project buildout. These estimated costs are expressed in constant 1995 dollars and are based on current operating experience and comparable corridor activity elsewhere in the Amtrak system. The cost efficiency of the system remains essentially unchanged as new service is added, as demonstrated by the relatively constant average cost per train-mile. This, coupled with a steady or, in the case of the low passenger estimate, increasing cost per passenger figure tends to indicate that these estimates are appropriately conservative.

The estimate of annual operating shortfalls for the first phase is a conservative planning estimate based on current operating experience in the corridor. It provides a good basis for decision making regarding the next increment of service improvement. In subsequent phases there are projected changes in assumptions, which may or may not be realized, that will have a significant bearing on the size of the subsidy requirements at these levels of service.

It is useful to put the subsidy requirements into a policy context. The cost recovery rate measures the percent of operating costs covered by user fees with the balance coming from public subsidy. Under the low passenger ridership scenario, the estimated cost recovery rate begins at approximately 33 percent and improves over time until approximately 74 percent of costs are recovered at project buildout. The 33 percent level compares favorably with most public transit systems, which generally recover approximately 25 percent to 30 percent from the farebox. Under the high range ridership projections, the estimated cost recovery rate begins at approximately 35 percent and improves over time until approximately 93 percent of costs are recovered at project buildout. Thus the intercity rail system is initially expected to require support at a rate comparable to transit systems and gradually improve.

Table VII-2
Annual Operating Costs and Revenues by Phase

	Phase I	Phase II	Phase III	Phase IV	Buildout
Low Passenger Estimate					
Annual train-miles ('000)	476	1,428	2,130	2,742	3,354
Annual passengers ('000)	346	939	1,288	1,645	2,041
Annual operating costs (mil)	$15.2	$45.1	$66.8	$86.0	$105.3
Cost per train-mile	$31.93	$31.58	$31.36	$31.36	$ 31.40
Cost per passenger	$43.93	$48.03	$51.86	$52.28	$ 51.59
Fare revenues (mil)	$ 4.5	$17.8	$33.2	$51.8	$ 75.1
Food/beverage (mil)	$ 0.5	$ 1.3	$ 1.8	$ 2.2	$ 2.8
Total ops. revenues	$ 5.0	$19.1	$35.0	$54.0	$ 77.9
Percent of costs	33%	42%	52%	63%	74%
Subsidy requirements (mil)	$10.2	$26.0	$31.9	$32.0	$ 27.4
Subsidy per passenger	$29.48	$27.69	$24.69	$19.45	$ 13.42
High Passenger Estimate					
Annual train-miles ('000)	476	1,428	2,130	2,742	3,354
Annual passengers ('000)	375	1,052	1,486	2,011	2,625
Annual operating costs (mil)	$15.3	$45.6	$67.7	$87.6	$107.9
Cost per train-mile	$32.14	$31.93	$31.78	$31.95	$ 32.17
Cost per passenger	$40.80	$43.35	$45.56	$43.56	$ 41.10
Fare revenues (mil)	$ 4.9	$20.0	$38.3	$63.3	$ 96.6
Food/beverage (mil)	$ 0.5	$ 1.4	$ 2.0	$ 2.7	$ 3.5
Total ops. revenues	$ 5.4	$21.4	$40.3	$66.0	$100.1
Percent of costs	35%	47%	60%	75%	93%
Subsidy requirements (mil)	$ 9.9	$24.2	$27.4	$21.6	$ 7.8
Subsidy per passenger	$26.40	$23.00	$18.44	$10.74	$ 2.97

Source: MK/HDR, 1995.

Estimated Annual Funding Requirements

While the rate of investment will be determined in large measure by the availability of funding, a reasonable range of annual funding can be estimated. Table VII-3 presents two scenarios for annual funding needs based on different rate-of-investment assumptions. The high end of the investment needs scale is the 20-year program which assumes 5 years per phase and annual operating subsidies based on the low passenger estimates. The other option reduces annual needs by spreading the implementation over 32 years (8 years per phase) and assumes the lower subsidy requirements based on the high passenger estimates.

The 20-year program would require annual investments starting at approximately $86 million and growing to over $167 million in the last phase. The buildout estimate assumes that no major capital requirements remain and only the operating subsidy requires support. The slower rate of investment assumed in the 32-year program would reduce the annual requirements to approximately $47 million in 1995 dollars in Phase I, with future phases topping out at $106 million. As a result of the high cost recovery rate of the operating scenario, the buildout subsidy would be less than $8 million.

Table VII-3
Total Annual Funding Needs
(Millions of 1995 US Dollars)

	Phase I	Phase II	Phase III	Phase IV	Buildout
20-Year Program					
Avg. Annual Capital Spending	$75.1	$75.0	$79.0	$135.1	$0.0
Avg. Annual Operating Subsidy	$10.2	$26.0	$31.8	$32.0	$27.4
Annual Funding Need (mil)	$85.3	$101.0	$110.8	$167.1	$27.4
32-Year Program					
Avg. Annual Capital Spending	$47.0	$46.8	$49.4	$84.4	$0.0
Avg. Annual Operating Subsidy	$9.9	$24.2	$27.4	$21.6	$7.8
Annual Funding Need (mil)	$56.9	$71.0	$76.8	$106.0	$7.8

Note: The annual capital funding need assumes that the funding requirements are evenly distributed on an annual basis within each phase. Therefore the Phase I capital need of $375.7 million would amount to an annual requirement of $75.1 million assuming 5-year phases or $47.0 million if each phase were stretched over 8 years. This analysis does not account for the effects of future inflation.
Source: MK/HDR, 1995.

Cost Issues and Policy Considerations

The preliminary phasing program presented above should be interpreted as a framework for continuing with the implementation of expanded intercity rail service in the PNWRC. These figures provide a schedule for future investments in capital infrastructure, equipment and ongoing operating and maintenance needs, and provide a roadmap for discussions regarding cost sharing and funding.

To appreciate the implications of the annual funding requirements, a closer examination of some key assumptions underlying these figures is warranted. The projected annual financial burden due to the capital program is relatively straight forward, as the projects are well defined (with the exception of environmental and right-of-way issues) and the impact on funding reasonably well understood. The operating subsidy requirements, however, are based on a number of assumptions about future policy choices, some of which may have a significant effect on future subsidy requirements necessary to achieve the stated service goals.

The key variables in the determination of the subsidy requirement are the ridership levels, the pricing assumptions and the cost of service delivery. The following is a brief discussion of each of these major policy areas and the sensitivity of the estimated funding requirements to changes in assumptions.

Ridership estimates. The estimates of ridership are based on an extrapolation of estimates from previous planning efforts in the corridor. Generally, the patronage projections are a function of the number of annual train miles of service, the average passenger load factor, and the average trip length. For the purposes of this analysis, the key ridership variable is the average load factor, which is defined as the average number of passengers on the train at any given time or point along the corridor and is determined by dividing passenger-miles by train-miles (PM/TM). This can also be interpreted as the average utilization of available service.

The ridership analysis assumes the average passengers on the train to begin at a range of 120 to 130 in Phase I and gradually increase to a range of 140 to 180 by system buildout. The Talgo trainsets assumed to be operating in the corridor (these were the basis for the capital cost estimates) have a capacity of approximately 250 passengers. Therefore the assumption is that average train occupancy will start at a low of 50 percent and increase to approximately 70 percent. Given that these are average occupancy rates over an entire year, the underlying ridership assumption is that the service will be very well subscribed. On the other hand, experiments to date with Talgo trains in the Corridor have produced average occupancy levels at or above those used in this analysis, indicating that the analysis is, again, appropriately conservative.

The implication for the estimated subsidy requirements is that the range of subsidy needs is based on service efficiency factors which are clearly attainable, given recent experience. In the case of the high passenger estimate, the subsidy at buildout is probably the most optimistic scenario possible given the assumed fare levels, since the service is attracting about as much ridership as can reasonably be expected.

Fare levels. Besides the ridership assumptions, the estimated subsidy requirements are based on significant assumptions regarding fare levels. The operations analysis bases its fare assumptions on the existing Amtrak fare levels in the corridor and assumes that these levels will gradually increase along with the amount and quality of service. Since the fare structure is a function of the length of the trip, the fare assumptions are based on the average price per passenger-mile. Thus the longer the trip the greater the fare revenues.

The operations analysis assumes average trip lengths will gradually increase from 165 miles to 230 miles at system buildout. Combining this with the assumption of increasing prices per passenger mile, results in a 178 percent increase in the average revenue per trip. The effect of both increasing average trip lengths and the price per mile means revenues are expected to grow faster at a faster rate than fares will increase. Experience in other corridors around the country indicates that these are probably reasonable assumptions, especially as the travel times in the corridor become more competitive with air and automobile travel.

VII.C SYSTEM MANAGEMENT AND GOVERNANCE

A key component of the implementation strategy will be the definition of an appropriate structure to provide a forum for the partner jurisdictions to continue with planning efforts and address critical decisions about corridor development, expansion of service and funding commitments. To date there has been a considerable amount of cooperation among the three principal partners, resulting in the achievement of significant project milestones including: improvements to the Seattle-Portland service; the restarting of service to Vancouver, BC; expansion of service to Eugene; and continued planning activities designed to make intercity rail a major element of the regional transportation infrastructure.

As the emphasis continues to move from planning to implementation, a number of challenges lie ahead. There are a number of substantive issues which must be addressed early in the implementation process. Factors such as the size of the corridor investments needed, the potential difficulties of managing the development of a system that serves two states and one province, and the impact of the reorganization and possible privatization of Amtrak, are just some of the issues which will need to be managed if the program is to be successful.

The primary determinant of success in the development of the PNWRC will be the decision-making structure chosen for program implementation. This section provides an analysis of potential governance models to be considered in the next phase of corridor planning and negotiations.

Primary Constituencies

The continuing development of intercity passenger rail services is of considerable interest to a number of parties along the corridor. The type and level of interest will be a key element in how these entities are to be incorporated into the decision making structure. The following is a brief description of the key participants and their interests in corridor development and expansion.

Principal partners. The state of Washington, the state of Oregon, and the Province of British Columbia have already come together and are jointly funding this Options Report. This is a recognition on the part of all three jurisdictions that intercity passenger rail service is an important component of the future regional transportation infrastructure. Each entity also recognizes that there are significant potential economic benefits from expanded rail services, from improved accessibility for tourism and business travel to the facilitation of cross border coordination and cooperation. As a result a clear policy interest exists in the continued improvement of rail facilities and services.

Amtrak. Under the current regulatory environment Amtrak is designated the sole provider of intercity rail services on existing freight railroad tracks. As a result, it is very likely that Amtrak (or perhaps a successor entity) will continue to be the contractor for intercity rail service in the PNWRC. As a result of the recent Amtrak reorganization and the impending reductions in federal support, the emphasis has been shifting toward regionalization of services. It will increasingly be possible to have regional control over service decisions, product marketing, amenities such as food service and to some degree, cost control and management. These changes will encourage Amtrak to take a more partnership-oriented role, since it will require the combined efforts of all parties, especially the service provider, to ensure the ultimate success of the service.

Freight railroads. By virtue of their ownership of the right-of-way and trackage, the freight railroads will be significant participants in the development and expansion of intercity rail service in the corridor. The goal from the outset of the planning effort was to design an intercity system such that the capacity to move freight in the corridor is not adversely affected by the passenger service. The list of facility improvements presented in the engineering section achieves this goal based on current forecasts of future freight requirements. During the construction of these improvements, close coordination with the affected railroads will be imperative to ensure impacts and conflicts are minimized.

Local jurisdictions. There is already significant local community interest in the development of intercity rail services in the corridor. Many of these communities are concerned about the noise and safety impacts of increased service speeds and frequencies. In the case of port jurisdictions, the concerns are likely to focus on conflicts between passenger and freight rail movements. Some jurisdictions may see the corridor improvements as an economic development opportunity, and try to capitalize on the increase in traffic through their communities. Since the local interest in the corridor is generally limited to local concerns, the governance structure does not necessarily need to include individual representation from these communities. However, it would be prudent to acknowledge the need for strong local/regional cooperation and include mechanisms whereby local concerns can be effectively communicated.

Governance Options

The choice of an appropriate decision-making forum will depend on a number of factors, but the goal should be to provide enough structure to address the major challenges. Too much institutional structure is often just as ineffective as not having enough. The key elements of any governance structure include: the representation of the parties of interest; the ability to implement the program decisions efficiently; and, the necessary authority to secure adequate funding.

As stated earlier, the development of the PNWRC presents several unique challenges. The following is a description of three governance options and a brief analysis of the strengths and weaknesses of each.

Cooperative approach. The cooperative approach is essentially a continuation of the current model, whereby the principal parties participate in planning, decision-making and funding on a voluntary, cooperative basis. The representation is primarily at the senior staff level, with each entity responsible for taking major decisions back to their respective administrative or legislative authorities for approval. The management of various program elements such as project development and contracting for service would be assigned to one of the partner entities for implementation. Funding of projects and services would be negotiated as the need arose.

This approach has been successful to date. However, the challenges facing program development may be more than this approach can reasonably accommodate. The best features of the cooperative approach include: 1) making use of existing resources at each jurisdiction for program implementation; 2) recognizing the decision-making autonomy of each principal partner; and, 3) providing maximum flexibility to adjust to changes in the environment.

The weaknesses of this approach include: 1) lack of a formal structure which may not provide enough specific program identity; 2) lack of a mechanism for addressing potential conflicts among the principal partners; 3) inadequate definition of responsibilities and commitments; and, 4) requires an ad hoc approach to policy-maker involvement.

Formalized collaboration through a Memorandum of Agreement. This approach takes the cooperative model and provides additional structure in the form of an agreement (such as a Memorandum of Agreement) which articulates the major program objectives, the common interests of the principal partners, responsibilities for program implementation, procedures for negotiating cost sharing responsibility and possible dispute resolution mechanisms. The agreement could be ratified by either administrative or legislative action. Implementing sub-agreements could be negotiated on an annual, biennial or project phase basis that would include funding responsibilities for project development and operating subsidy needs.

The best feature of this approach is that most of the process and responsibility issues are negotiated up front and documented in an agreement. This provides the program with a clear set of operating principles and allows staff to focus almost exclusively on implementation. The use of a formal agreement will also serve to increase the program's profile with policy-makers, which may result in higher priorities for project funding requests.

A potential weakness of this approach is that most of the interaction among the principal partners is done at the staff level. The involvement of policy makers in program and funding decisions will be the responsibility of staff at each jurisdiction, although, if this were necessary, a policy-level advisory commission could be incorporated into the agreement.

Create an institutional structure. The third governance model is to create a dedicated institutional structure with responsibility for program implementation and policy-level representation. In this example, a cooperative entity would be formed by agreement. The new entity would have complete authority over program decisions and have the ability to issue debt and to contract with vendors for project construction and service provision. The board would be composed of elected officials, or appointed representatives from each partner jurisdiction and some dedicated or reliable source of funding would be identified.

This approach allows policy-makers from the two states and the province to be formally involved in program decisions and negotiations. Funding would be addressed at the start of the program. The responsibility and authority for implementation would be located within a single entity, potentially increasing the effectiveness of program development.

The biggest negative attribute of this approach is the difficulty associated with trying to link three completely separate and autonomous entities under one institutional umbrella. Another serious weakness is the increased costs associated with operating a new entity that may duplicate many functions. Also, the creation of an additional layer of government may not be warranted for a program where the goal is to evaluate the merits of each new increment of development and operation within the context of a complete regional transportation system.

VII.D COST SHARING RESPONSIBILITY

Earlier in this section, the total system development costs and operating subsidy requirements were identified. These were presented for the entire corridor and represent the best estimate of the financial commitments needed to provide the desired level of intercity passenger rail service. These financial commitments were spread out across several phases reflecting threshold service goals. Since the corridor is located in three separate and autonomous jurisdictions, a mechanism for allocating the fiscal responsibility among the key participants is needed. It must be noted, however, that British Columbia has not yet agreed to any cost sharing responsibility to date, so the following discussion provides potential funding strategies.

The development of the PNWRC system will benefit many parties, and the goal of the cost allocation mechanism should be to reflect, in some mutually agreeable manner, the proportionate share of benefits among these entities. Ideally the mechanism will incorporate all investments in the system plan, be updated over time and be flexible to adjust to changing conditions and system performance. However, the only real criteria for a successful allocation methodology is whether the partner jurisdictions are satisfied that the cost sharing is equitable. The mechanism should also be tailored, or easily adaptable, to the overall decision making framework which will govern system development.

One method of cost allocation would be analogous to a general ledger. This ledger would track investments in the corridor by jurisdiction and compare these cumulative totals with current year measures of system benefits. Benefits to each partner would need to be estimated in some consistent and acceptable manner and updated as the system expanded and ridership levels increased. Annual or biennial cost sharing could then be set using the proportionate shares of investment to date relative to the proportionate shares of system benefit. This method would allow investments that have already been made in track improvements and equipment procurement to be recognized in future cost sharing decisions.

This type of process is conceptually appealing since it recognizes the dynamic nature of system development and that each partner may experience different benefits at each phase of program development. However, reaching agreement on a method for measuring benefits will be a challenge. The following example illustrates the impact of different measures of benefit on the cost sharing formula.

Table VII-4 presents one option for allocating the responsibility to capital investment. Financial responsibility for capital needs is assigned according to the jurisdiction in which the project is located with an even share assigned to each participant for the cost of rolling stock procurement.

Table VII-4
Capital Cost Allocation: An Illustrative Example (Millions of $)

	Facilities	Rolling Stock	Stations	Land	Total	Percent Share
By Geography						
Oregon	$183.1	$85.0	$12.9	$3.0	$284.0	16%
Washington	$585.4	$85.0	$122.6	$10.0	$803.0	44%
British Columbia	$626.3	$85.0	0	$23.0	$734.3	40%
Total	$1,394.7	$255.0	$135.5	$36.0	$1,821.2	100%

Source: MK/HDR, 1995. Numbers may not add due to rounding.

Clearly the choice of variables will have a significant effect on the results of any cost allocation methodology. In fact, it may not be possible to develop a simple mechanism based on quantitative methods that will equitably determine cost sharing responsibilities: due to the subjective nature of measuring public benefits, each entity may place a different value on a particular measure of benefit. As a result, the best use of a cost allocation mechanism may be as a planning tool in support of a broader negotiating effort among the principal participants.

The following is a brief description of some of the potential variables which could be factored into an allocation mechanism and used to develop a cost sharing approach. This is provided as a point of departure for continuing negotiations among the partner jurisdictions. It is up to the representatives of each jurisdiction to determine the appropriate role of a cost allocation methodology, which factors would be most suitable and the relative weighting of each.

Track miles. Track miles provide a proxy for each jurisdiction's relative accessibility to the intercity rail service. The number of stations, or the population within some area around stations are other measures of accessibility. While accessibility may not be the most effective measure of relative benefit by itself, this measure could be useful within a more comprehensive cost allocation formula.

Train miles of service. Annual train miles of service provides a measure of the amount of service provided within the jurisdictional boundaries of each entity. As service frequency increases, annual train miles will go up, increasing the availability and convenience of intercity rail service which ultimately adds to the potential benefits to the local population. Train miles will be a good measure of service availability so long as the train sizes are approximately equal. For example, two 200-passenger trains per day would not provide as much potential service as two 300-passenger trains; if train sizes are consistently different in different markets, then seat-miles becomes an alternative way to measure the same thing. Train miles are limited as a measure of service benefit since riders will be using the service to move across jurisdictional boundaries.

Benefits to other transportation infrastructure. One of the goals of the intercity rail program is to alleviate the congestion and capital investment requirements in other intercity transportation facilities, in particular highways and airports. The achievement of these goals will clearly provide public benefits in terms of reduced highway congestion and possibly reduced highway and aviation investments.

Opportunities for joint use of facilities. Where there are opportunities for joint use of facilities, such as with commuter rail in the Puget Sound region, the beneficiaries of an investment may be increased. In this case, the investment would be serving more than one policy goal which could be reflected in the measure of Washington State's benefit. If joint use of facilities were included, a recognition of other agency funding of improvements for the joint use areas would also need to be recognized as a contribution toward those benefits.

System ridership. Ridership as measured between various station pairs, can be used in a couple of ways. First, the ridership figures provide a clear measure of system utilization and the people using the service are the most direct beneficiaries of the service. Therefore, trips which start and end within one jurisdiction would generally be to the sole benefit of that jurisdiction. Trips that cross jurisdictional boundaries could be shared among the affected entities.

The other way in which ridership could affect cost sharing is through the fares paid by the riders. Since one of the goals is to minimize the operating subsidy requirements, the residency (point of origin could be used as a proxy for residency) of system patrons could be a factor in establishing an allocation of costs. The rationale is that patrons using the system are paying for a portion of the cost of the system development and operation through their fares. For example, if 70 percent of all fare revenues were paid by Washington residents, then perhaps Washington should be given some credit for this as part of the allocation of the balance of cost requirements.

Passenger miles, or passenger miles per train mile. Passenger miles is a measure similar to ridership, in that it measures system utilization. However, this measure more closely reflects the contributions toward system costs from residents since fare prices are related to average trip length. Generally, the longer the trip the greater the financial contribution to the operation of the system.

Economic impacts. Measuring ridership attempts to capture the local benefits of intercity rail by relating benefit to the point of trip origin as a proxy for residency. It is likely that the jurisdiction of destination will also experience benefits. In this case the benefits will be in terms of the local economic impact from the visitors spending money on restaurants, lodging and other hospitality related expenditures.

For instance, recent tourism industry surveys indicate that Seattle travelers destined for Vancouver, B.C. spend an average of US $200 per person per day in the local economy. During the summer of 1995, ridership on the Mt. Baker International corresponded to a local impact of up to $40,000 per day in the Vancouver, B.C. region. Depending on how the origin/destination profile of ridership changes over time, the relative economic benefits of the system may need to be adjusted and reflected in a cost allocation formula.

In addition to local benefits, the development of the PNWRC may provide regional benefits in terms of enhanced mobility, more efficient use of existing infrastructure, and improved connectivity among the communities throughout the corridor region. Improved connectivity could be a factor in attracting major events to the region, such as proposed bids for hosting a future Summer Olympic Games. As experienced in the Los Angeles region, the potential to provide substantial positive economic impacts from such events is enormous.

VII.E FUNDING STRATEGIES

The objective of this chapter has been to document the funding requirements, and frame the issues associated with the funding opportunities which would put the full program into place. Having developed a program, however, the financial reality facing program implementation must be addressed. In some ways the capital elements of the program, though much more expensive, are easier to fund, since they are not recurring expenses. In contrast, increasing operating levels implies increased operating subsidies, which may require substantial new financial commitments on the part of the principal participants.

As was stated earlier, the purpose of this chapter is to analyze the financial implications of the Options Report. Before a financial plan can be evaluated, decisions need to be made about how the principal partners will manage the program and how costs will be shared. Since each jurisdiction has just come out of a difficult budget process and funding levels are set for the next year or two, these issues should be a priority and once settled, aspects of a preliminary plan of finance should be compiled for the next budget cycle.

Given the current uncertainties in the public finance environment in Washington State after the passage of Initiative 601, it was decided to avoid specific funding recommendations, as this may unnecessarily tie the program to a particular funding package which may not be feasible with the Initiative's impact on government spending limits. Instead, this analysis spells out the financial implications of proceeding with program implementation, and leaves the specifics of funding to the ongoing deliberations over state transportation investment decisions.

Given the size of the investments required, securing timely and adequate funding will be a major challenge for each of the principal participants. It will be important to look for opportunities to pool capital funds with other potential beneficiaries. For example, if the Regional Transportation Authority (RTA) is successful in its bid for local option funding for regional rapid transit to include commuter rail, an opportunity will exist where state and local funds can be pooled to fund rail capacity projects in the central Puget Sound area.

The following is a brief overview of the major sources of potential project funding.

U.S. Federal Sources

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 set a new direction for federal transportation policy. Instead of narrow funding categories emphasizing highway construction, ISTEA shifted priority to intermodal connections and increased flexibility to meet state and regional mobility and environmental goals. Flexibility can be a hollow promise, however, without full funding. While Congress authorized $155 billion over six years, budget caps and deficit reduction have flattened actual federal spending on transportation this year to about $10 billion less than authorized. With the emphasis in Washington, D.C. increasingly focused on deficit control, the trend is likely to get worse. Thus the initial promise of ISTEA has been less than had been hoped.

Federal transportation funds generally are either allocated by formula to states and programs or they are " discretionary," meaning they are authorized based on the personal request of a member of Congress. Within the formula allocated funds, some flexibility is available to the state and the Metropolitan Planning Organizations (MPOs) in funding decisions. Major applicable categories of program funding under ISTEA are the following:

Surface Transportation Program (STP). Eligible projects include roads, transit, bicycle and pedestrian facilities, car and vanpool facilities, and marine and airport access. Within STP, funds are set aside for enhancements, roadway hazards, railway crossings, and flexible funding for a variety of uses. Within the " enhancements" category, funds are specifically set aside for historic preservation and for rehabilitation of historic transportation structures, which could apply to station improvements.

National Highway System (NHS). The National Highway System will include all interstate routes, major urban and rural arterials, intermodal facilities and highways important for defense purposes. Funding under NHS is available for construction, operational improvements, highway safety, traffic management and transportation enhancements. Improvements to access roads serving major NHS intermodal terminals are also included under this funding source.

Congestion Management and Air Quality (CMAQ). CMAQ funds projects designed to help achieve federal clean air standards by reducing transportation-related emissions.

Non-ISTEA U.S. Federal Sources

Federal Transit Administration. Capital and operating funds are available for transit projects in urban and rural areas and for the elderly and disabled. The main categories are Section 3, transit capital, and Section 9, transit formula funds for capital and operations.

Swift Rail Development Act. The Swift Rail Development Act of 1994 identifies the PNWRC as one of five high-speed passenger rail corridors in the United States. The act clearly places responsibility for corridor development on state and local interests and encourages the participation of private entities. The role of the federal government has been defined primarily as a facilitator for technology development and assistance in corridor planning. While the high speed corridor designation does not guarantee federal participation in system development, it may offer an opportunity for attracting federal capital funds, should they become available in future appropriations.

Amtrak. Amtrak has primarily invested its limited capital funding in the Northeast Corridor and California. However, unlike other modes of transportation, Amtrak has not had a dedicated source of capital funding, and has relied on specific capital appropriations from Congress. Proposed Senate legislation would transfer the 1/2 cent per gallon tax from the transit account of the highway trust fund to a new intercity rail passenger account until the year 2000. These dedicated funds would provide almost $700 million for capital improvements and investments in the Amtrak system, reducing operational costs. Amtrak has stated that if it is to be subsidy free in seven years, it needs adequate capital funding for plant and equipment. Amtrak services beyond the PNWRC would benefit from many of the capacity and speed improvements proposed, thus encouraging additional Federal funding participation.

In October, the House Committee on Transportation and Infrastructure passed the Amtrak Reform and Privatization Act of 1995. This legislation would eliminate burdensome rules which govern route selection, overhaul labor protection rules, limit liability, establish contracting out procedures and eliminate the government's ownership and control over the company's board of directors. Operating assistance would be reduced and eliminated over the next seven years. If passed into law, the bill will provide significant new tools for Amtrak management to streamline operations and reduce the need for Federal operating assistance.

Canadian Federal Funding

Given the international character of the PNWRC, along with demonstrated tourism and economic benefits, a strong rationale for Canadian federal investment appears to exist. The magnitude, timing, and mechanism for such investment remains to be explored.

State and Provincial Funding

The current federal funding environment in both the US and Canada will likely dictate that most of the funding for intercity rail will need to be raised at the state, provincial and on possibly the local level. This will certainly be the case in the first phase of the program as federal support for such programs is likely to be minimal for the foreseeable future.

Each of these jurisdictions has or is currently addressing a long list of unfunded and underfunded transportation programs. The development of an efficient and attractive intercity rail program has been identified as a worthy goal and funds have already been committed by each jurisdiction. However, without an infusion of new transportation revenues, the competition for funding will be extremely competitive and ultimately it will be the respective legislative bodies that will decide how intercity rail fits within the overall transportation system and the priority that rail improvements should have in the allocation of funding.

British Columbia. Generally, transportation programs in British Columbia are funded from general purpose tax revenues. The provincial government has interests in a number of transportation areas including: highways, bus and transit, ferries, and commuter rail. The participation of the province in funding expansion of intercity rail service between Vancouver and Seattle will need to compete favorably with other worthwhile transportation investment opportunities. Given the international dimension of the project, the magnitude of investment needs and the potential economic benefits, the province could look to the development of a federal/provincial partnership as a mechanism to fund intercity rail in the PNWRC.

Washington. The State Legislature is planning to consider enhancing transportation revenue in the 1997 budget session. The effort to bolster eroding state transportation funds and offset reductions in the availability of federal funds is being coordinated by legislative leadership and includes business a well as state and local government interests. Most discussions of transportation revenue enhancements include the likelihood that any proposals to increase taxes will ultimately be submitted to voters statewide. The 1995-97 biennial budget for the Washington State Department of Transportation is $3.13 billion, an eight percent decrease from the previous biennium. While the Washington State Transportation Commission had requested major increases in the state passenger rail program, the legislature, in an effort to balance competing highway, ferry, and public transportation needs, reduced funding. Legislative leadership indicates an interest in exploring enhanced state funding for rail programs as outstanding issues regarding future federal funding or rail programs are resolved.

The following are the major Washington State funding sources that could be applied to the Intercity Rail Passenger Program.

- **Transportation Fund.** The Transportation Fund was created by the 1990 Legislature. It was intended as a new general purpose transportation funding source not limited by the 18th Amendment to highway spending. The motor vehicle excise tax (MVET) is the source and the Fund is subject to legislative appropriation every two years. During the most recent two biennia, monies in the Transportation Fund were primarily dedicated to the Department of Transportation's Category C program to expand the capacity of state highways. Future allocations will be determined by legislative priorities, and the intercity rail program will be competing for funds from this source.

- **Transportation Improvement Board (TIB).** The TIB is an independent agency founded in 1988 that distributes funds through the Urban Arterial Trust Account (UATA) and the Transportation Improvement Account (TIA). Competition for funding is fierce and projects are ranked based on specific criteria. The UATA funds city and urban county road and street projects to reduce congestion, improve safety, and address geometric and structural problems. The TIA funds projects to alleviate congestion resulting from economic development and population growth.

The Central Puget Sound Transportation Account was transferred to the TIB in July 1995. This fund was created by the 1990 Legislature as a new funding source specifically for public transportation in the Central Puget Sound area. Funds are allocated in a competitive process by committee that includes representatives of cities, counties, transit, WSDOT, and other interests. During the just completed biennium, approximately $17 million was awarded to 18 projects. The largest award was $3.6 million, with most allocations in the $200,000 to $400,000 range. The applicant for these funds must be one of the local transit agencies, therefore if the commuter rail program is started, there may be an opportunity to match funds from this account with other passenger rail funds for rail improvements in the central Puget Sound area.

- **Proposed Intermodal Facilities Program.** A noteworthy development which is new within the state's Public Transportation and Intercity Rail Passenger Plan (which is currently in development) is a proposed Intermodal Facilities program. Under discussion currently within WSDOT is the issue that no existing program explicitly recognizes the need for significant new funding for facilities and improvements that address multimodal transportation. If a state interest could be demonstrated in the linking or hub function of intermodal facilities, then such a new program could potentially be created and funded with new monies.
- **Issuance of Bonding**. The issuance of bonds is an additional possibility to underwrite the revenue necessary for the development of the PNWRC.

Oregon. The Oregon Department of Transportation faces the same funding constraints as Washington with respect to the use of its major source of transportation funding, the gas tax. As a result, there is significant competition for resources among the non-highway transportation projects.

Local Government Support

Generally the opportunities for cost sharing with local governments are somewhat limited. However, in the case where joint use of facilities is possible, opportunities may exist where costs can be shared with local jurisdictions. The best example of this scenario is the proposed commuter rail development plan in the Puget Sound region. Projects which will add to the rail capacity in King, Snohomish and Pierce Counties will benefit both the intercity service and future commuter service and should be considered for joint local/state funding. However, the funding for commuter rail is contingent on a successful funding initiative for the Regional Transit Authority. After failing at the polls in March 1995, the RTA will make one more attempt to gain funding support in 1996.

Another potential opportunity to attract local funding may exist at station sites. Many of the communities along the corridor have been developing multimodal transportation centers which would provide connections between the intercity rail system and other local and regional transportation systems. WSDOT has been an active participant in the planning and development of intermodal transportation facilities. This participation has been contingent on the demonstration of a strong local commitment to these projects, including local ownership and operation of the facilities. In those instances where intermodal facilities have been developed, there has been a great deal of local initiative to develop cost sharing. These initiatives have included financial participation from local governments, transit districts, and Ports.

Freight Interests

Private Railroads. The private railroads, in particular the Burlington Northern Santa Fe, have an interest in making substantial investments in the corridor to maintain their capacity and meet the demands of shippers for freight movement. While the improvements identified in the PNWRC Options Report assume that the freight conditions are maintained as they would be without intercity rail, based on current practices, there will continue to be opportunities for joint financing of improvements where both passenger and freight rail users would clearly benefit.

One of the principle assumptions in the development of the PNWRC has been the establishment of a public/private partnership with the private freight railroads. Improvements designed for the enhancement of rail passenger service are assumed to be the responsibility of rail passenger interests, while improvements designed to address freight needs would be the responsibility of freight interests. Where improvements may reasonably benefit both freight and passenger interests, a cost sharing mechanism would need to be negotiated to equitably divide financial responsibility according to relative benefit.

Ports. In addition to the private railroads, the local port districts have an interest in the efficient movement of freight and, as such, could participate in projects where joint freight and passenger rail benefit exists. Port districts have a significant interest in the reliability and capacity of the freight rail system, since competitiveness is determined in large measure on their ability to offer fast and convenient transshipment opportunities. Therefore a project that could be demonstrated to provide significant joint benefits, could potentially be funded through a combination of public rail passenger funds, port funds and private railroad funds. The onus, however, will likely rest with the rail passenger interests to demonstrate the joint benefit and propose a joint funding program.

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