- Identification of funding availability for each activity and, as appropriate, an agreement on the transfer of funds from the RTA to the local agency for those portions of the work to be so funded.

- Provision for adoption of specific land use and legal actions by the local governmental policy board to foster transit-supportive development.

- Process for reserving and acquiring right-of-way for the system and development of interim transit facilities.

- Provision for an effective citizen/inter-jurisdictional involvement program which includes technical, public information, policy and funding support.

8.0 The Recommended System

8.1 Selecting the Recommended System

Based on the extensive system planning effort conducted over the last two years, the JRPC recommends the combined Rail/TSM system described in general terms in this chapter of the Draft System Plan. The TSM component provides basic mobility for local communities, connecting neighborhoods and linking communities with nearby centers. It also links communities to the regional rapid transit system which connects regional centers. The plan recommends a substantial increase in bus service over the first ten years of its implementation to strengthen the ability to service basic mobility needs.

The recommended system includes the added capacity and service of a regional rail system to meet regional mobility needs, support growth management objectives, and help preserve environmental quality.

8.1.1 Mobility

The recommended Rail/TSM System provides the greatest increase among the alternatives in people-carrying capacity for major travel corridors where congestion is already acute. It provides this increased capacity without reducing the existing transportation system capacity for other vehicle users.

The recommended system provides direct access from throughout the region to major employment and commercial centers plus major institutions including colleges, universities and hospitals. It provides permanent speed and reliability for transit that cannot be promised with all-bus alternatives or rail systems using urban streets.

The Rail/TSM System provides a wide range of public transportation services tailored to meet a variety of mobility needs. By providing rail service along the regional system spine, bus service can be restructured to serve neighborhoods and communities better than it does today.

8.1.2 Growth Management

The Rail/TSM System is the system that most consistently meets with growth management objectives. The system would be implemented incrementally to serve both immediate and long-term needs. Bus

incrementally to serve both immediate and long-term needs. Bus services would increase immediately to serve existing development. Continued bus service expansion and restructuring, along with phased rail line implementation, allows the transit system to develop with local actions to shape new growth patterns.

The capacity and service quality of the Rail/TSM System affords the best opportunity to accommodate housing and employment growth without severe economic and environmental consequences. The system can help local land use authorities preserve people-oriented communities and open space by being able to move larger numbers of people conveniently among and within the region's urban centers where street capacity is already fully used.

8.1.3 Environmental Quality

The Rail/TSM system is the only alterative that significantly increases the current share of regional trips using transit. It is also the only alternative that provides enough added capacity to accommodate the expected increase in riders as a result of efforts guided by growth management and air quality legislation.

The recommended system presents the greatest potential benefits for air quality and energy conservation among the alternatives. Because of its higher capacity, it also presents the best environmental insurance policy for the future. In the event of energy shortages or other severe environmental conditions, this transit system has the capacity and reliability to accommodate significantly higher service demands compared to other alternatives.

8.1.4 General Overview of the Plan's Content

The following sections describe the general content of the recommended plan. The definitive details of the plan will be more thoroughly explored in subsequent phases of program development. The balance of the section addresses the proposed service area; the proposed comprehensive system of services; the types of service; the careful integration of system services and public access; transit station development; the TSM element; the intent to address and incorporate innovative emerging technologies; the HOV system component; and the regional rail system component.

8.2 Regional Transit System Draft Plan

8.2.1 Service Area

The Regional Transit District boundary shown in **Figure 8-1** is recommended to:

- establish representation on the RTP as prescribed by state law;
- collect local taxes to finance the Regional Transit System;
- provide regional transit services and facilities to support growth management goals.

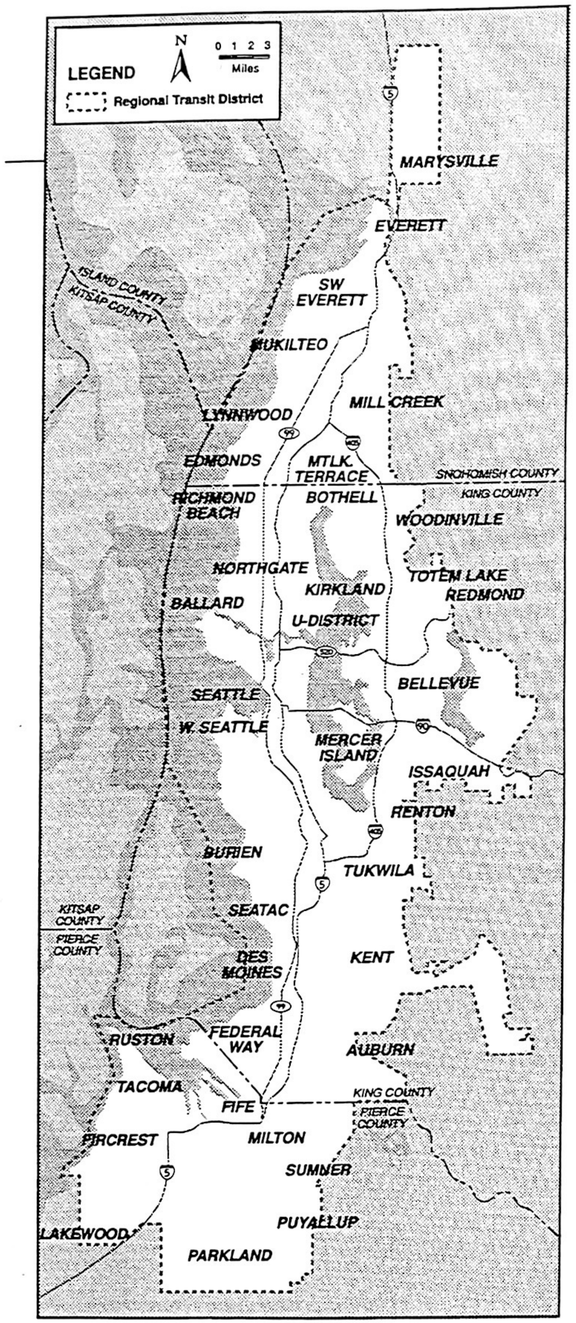
8.2.2 Comprehensive System of Services

This Regional Transit System Draft Plan recommends new regional transit services and facilities and supports improvements in local public transportation services and facilities in the region to substantially increase and improve service. The plan proposes an integrated system of services using many types of transportation.

The system focuses on new service to support both existing land use and development in centers designated for growth by regional and local growth management plans. Transportation facilities and services will ease access to, and encourage use of public transportation as an alternative to using cars.

The System Plan includes services tailored to serve diverse mobility needs, consistent with regional and community plans , using a variety of public transportation modes. Local jurisdictions and citizens will be involved in planning, reviewing and implementing services and designing facilities to ensure a balance between local and regional service needs.

By designing and providing services and facilities, the System Plan will give local and regional travel options to people who, by choice, age, physical circumstance or income, depend on transit as their primary means of travel.



District Boundary
System Plan
FIGURE 8-1

Regional Transit Project
KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY
pb1 f:\rtp\dec-tree.cdr 10-15-92

The RTA, local public transportation agencies and local jurisdictions will regularly review the transit and ridesharing market share to each major public transportation destination. The agencies will then develop action plans appropriate to each major market that increase transit and ridesharing market share within each county. The action plans will help achieve the System Plan's regional market share objectives.

8.2.3 Service

The following is a listing of the specific types of services proposed. The details of the service plans will be further developed during project-level planning.

- Community Feeder Services

  Improved local public transportation services are the basis for the success of the entire regional system. Local services will provide local mobility while linking and feeding the rapid transit system as shown on the subarea maps.

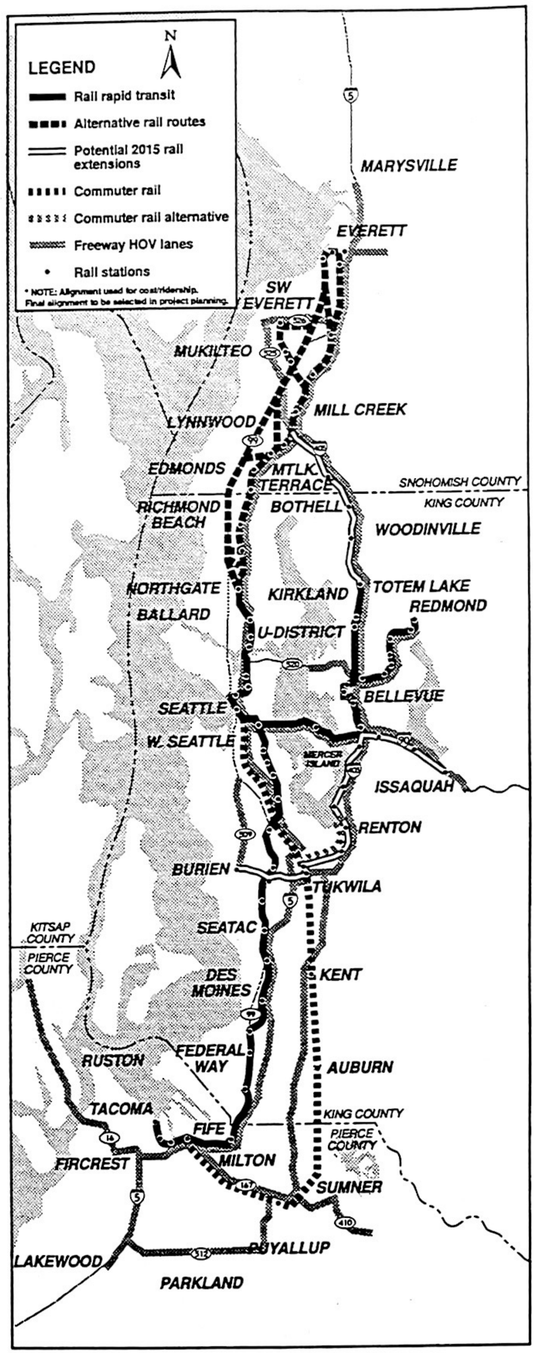
- Regional Services

  Regional services will link the region's major centers with frequent, fast, reliable two-way, all-day services using buses on HOV lanes and the regional rail system shown on **Figure 8-2** and the subarea maps.

  To the extent practical, regional service will initially be provided by express bus services between centers using the HOV system to support local land use plans and develop regional public transportation markets. Higher capacity rail lines will be added incrementally, replacing parallel, competing bus services.

- Immediate Implementation

  Service expansion and improvements will begin immediately after financing is approved and will continue to expand as rapidly as possible over a ten-year period.



Regional Rail and HOV System
System Plan
FIGURE 8-2

Regional Transit Project
KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY

- Coordination with Local Jurisdictions

  The public transportation agencies will work with local jurisdictions in implementing new public transportation investments to make sure there is consistency with local priorities for land use and public transportation.

- Service Development Guidelines

  - **Basic Mobility.** Local public transportation services will provide basic mobility within and between neighborhoods and communities. The services will also provide circulation within centers and access to rapid transit station.

  - **Balance Needs and Resources.** While designing and operating services and facilities, customer expectations and needs and system performance standards will be balanced with available resources.

  - **Appropriateness of Service.** The types and levels of service to provide and the vehicle technologies to be used will be based on the needs and characteristics of the communities and the purpose of the service.

  - **Other Commuter Services.** A combination of commuter-oriented services, including regular bus, subscription bus, vanpooling and carpooling will service peak-period transportation needs. Peak-period commuter needs not adequately met by other local and community services or the regional rapid transit system will also be served.

  - **Service Review.** The RTA and the local public transportation agencies will regularly review fares and feeder system development to make sure that local and regional services are integrated and avoid parallel, competing services.

- Transit Service Plans

  The local public transportation agencies are responsible for developing plans that illustrate how the community feeder and regional service would provide sufficiently frequent, convenient local service links to the rail system to make the rail system a viable alternative to drive-alone travel. The agencies will document how much the services would cost. Public transportation agencies will develop these plans for public review prior to completion of the final system financing plan. Public transportation agencies will demonstrate that the service plans are affordable within 22 percent of the revenues or, if not, will recommend a higher allocation level.

  Specifically, local public transportation agencies shall determine the amount of the funding increment necessary to dedicate funding for express bus service in the I-405 corridor prior to the adoption of the percentage of tax to be distributed to local public transportation agencies.

8.2.4 System Integration and Access

The following provides a general overview of the system integration and access provisions of the plan.

- Security and Comfort

  Safety features and security services will provide personal safety and security while using public transportation services and facilities. Investments will also be made in features and services that make the system comfortable and attractive to use.

- Access

  Convenient, safe access to the transit system will be provided for pedestrians, bicyclists, people with disabilities, and other public transportation service users through transit facility design and transit services promotion.

- Speed and Reliability Improvements

  Public transportation agencies will work with local jurisdictions to implement transportation improvements that significantly improve transit's speed and reliability. Improvements could include integrated signal systems and automated vehicle identification systems.

- Transit Corridors

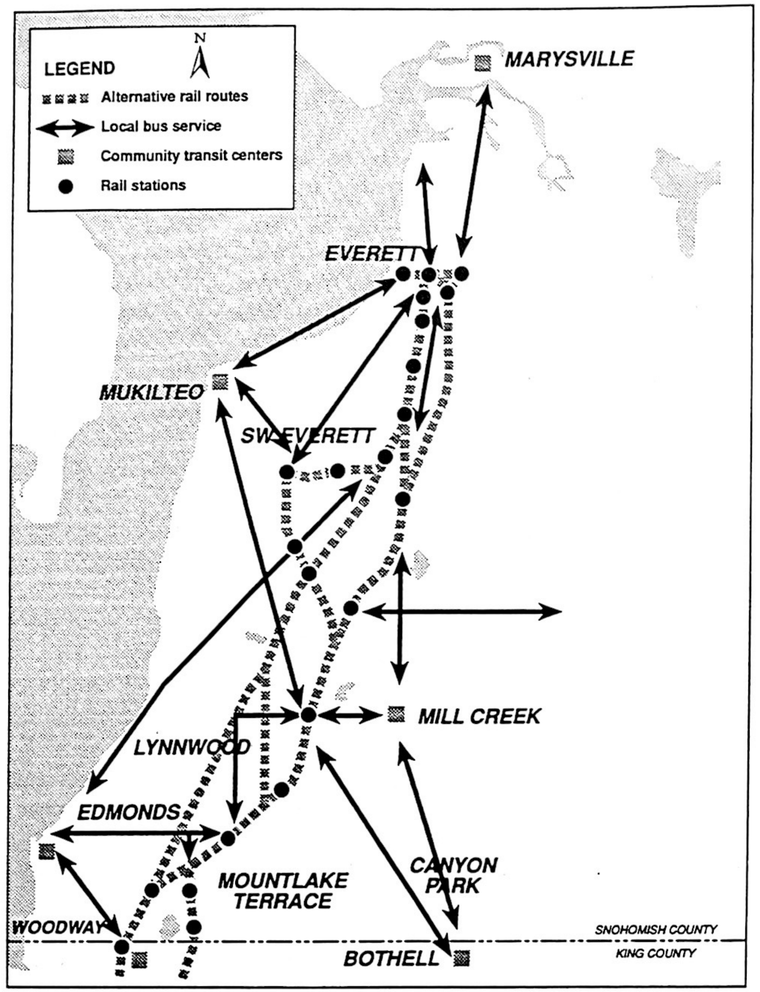
  Public transportation agencies will work with local jurisdictions and communities to combine frequent, reliable transit service with pedestrian-oriented improvements consistent with local plans:

  - *Locations*. Provide high-frequency service (at 5-15 minute intervals) to support and encourage clustered, pedestrian-oriented communities on major arterials in areas of mixed-use and transit-supportive development. Possible community transit corridors and centers are generally shown on **Figures 8-3 through 8-7**.

  - *Physical Improvements*. Finance physical improvements required to increase the security, convenience, reliability, capacity, speed, and environmental compatibility of transit services with communities.

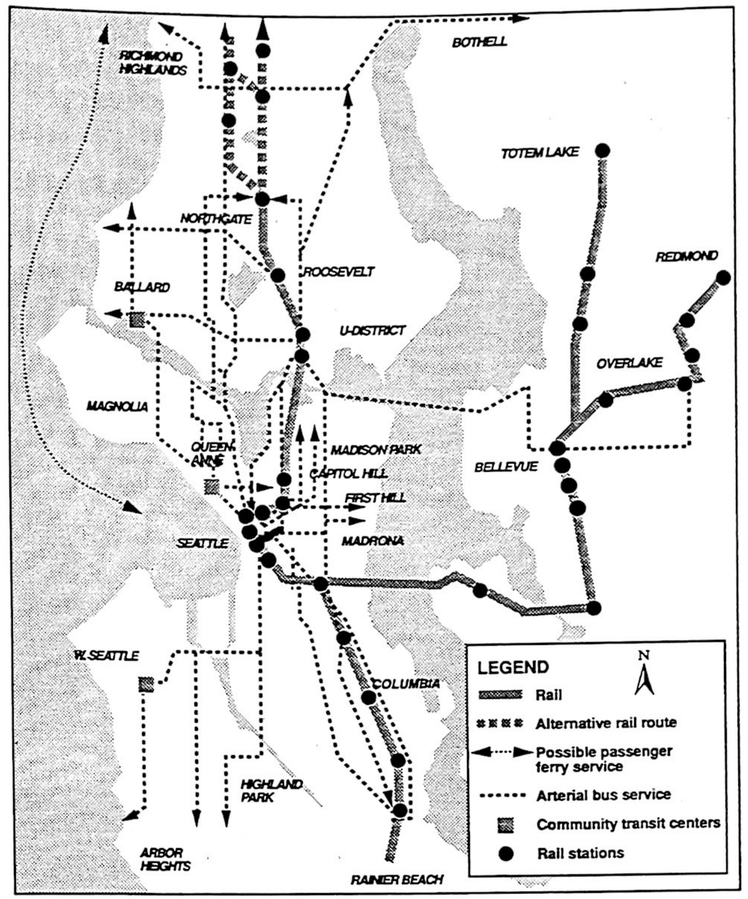
  - *Community Rail Service*. Evaluate, and implement where appropriate, surface light rail and/or other technologies in transit corridors and urban centers where high ridership, congestion levels and/or land use plans warrant this level of investment.

  - *Funding*. Provide funding to support planning and developing pedestrian-oriented and passenger access improvements on major transit streets, particularly in mixed-use and neighborhood commercial areas. Give top priority to projects with the highest pedestrian or passenger volumes, and in those areas where partnerships with the local community have been established.



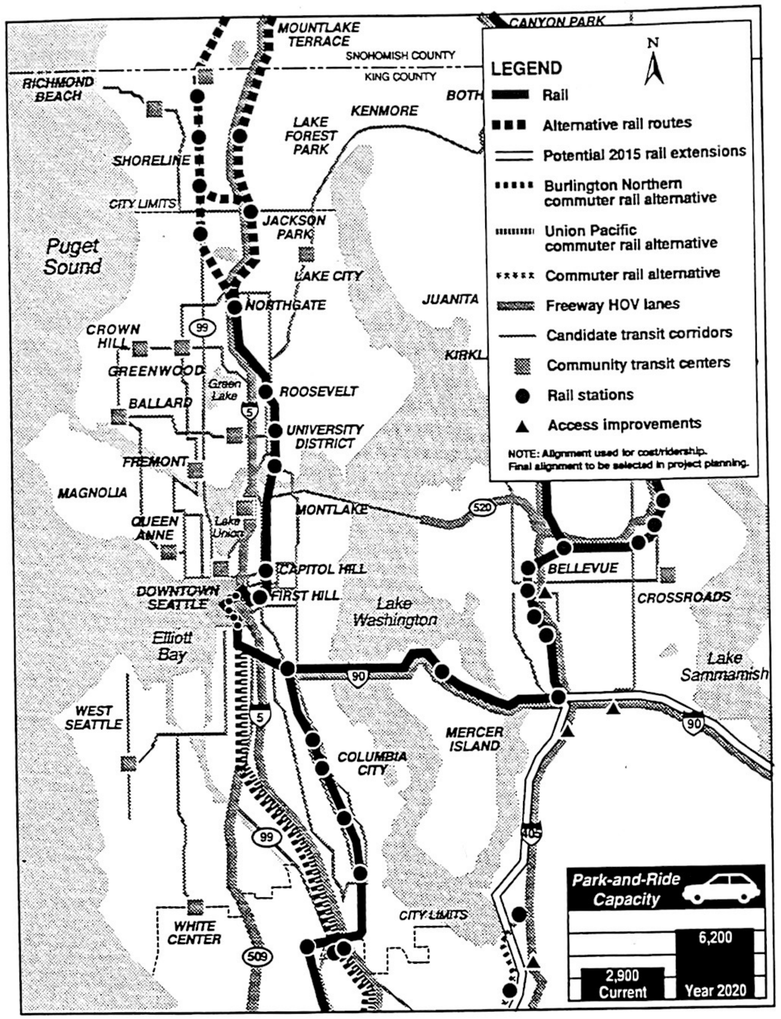
Regional Transit Project
KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY
pb1 f:\rtp\dec-trse.cdr 10-15-92

Snohomish County Community Service Concept
System Plan
FIGURE 8-3



Regional Transit Project
KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY
pb1 f:\rtp\dec-trse.cdr 10-15-92

Regional Service Concept
System Plan
FIGURE 8-4

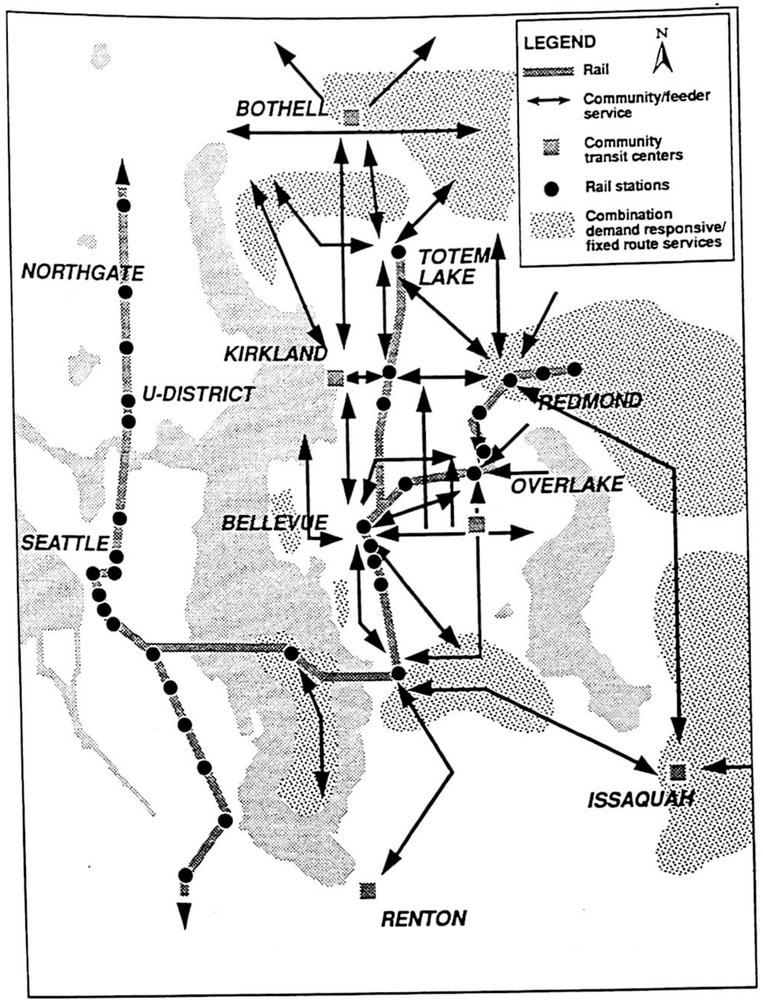


Regional Transit Project

KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY

Seattle/North King County Capital Improvements System Plan

FIGURE 8-5

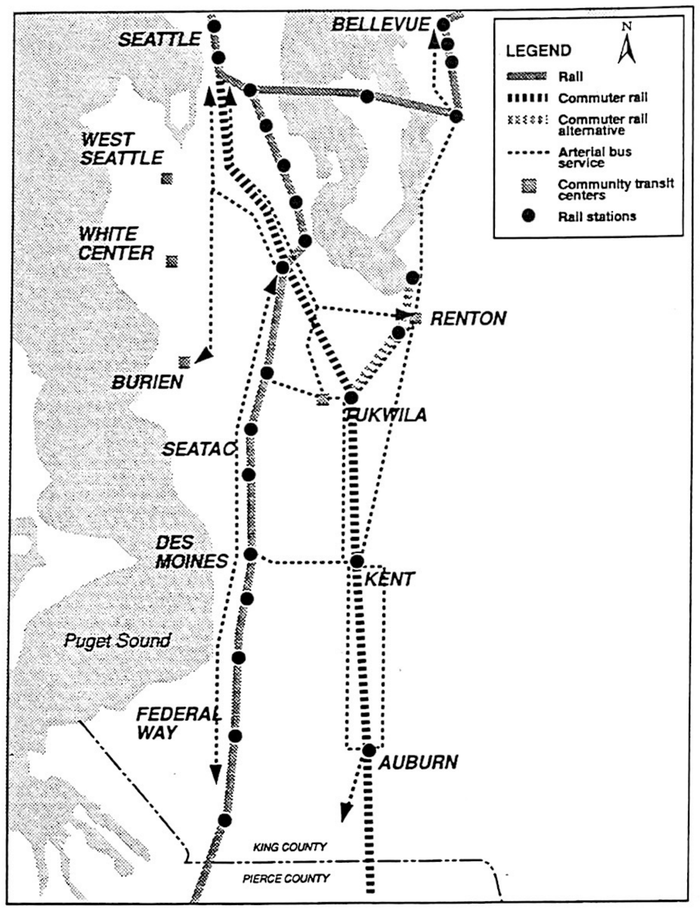


Regional Transit Project

KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY

East King County Community Service Concept System Plan

FIGURE 8-6



Regional Transit Project

KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY

pb1 f:\rtp\dec-tree.cdr 10-15-92

Regional Service Concept
System Plan
FIGURE 8-7

- *Community Transit Hubs*. Create secure passenger waiting areas, transit information and pedestrian facilities at key locations, particularly where major transit arterials cross. Focus transit services to support neighborhood commercial areas.

- System Integration

  - *Park-and-Ride Lots*. Provide feeder bus service to all regional rail stations to ensure full use of the transit system and include park-and-ride lots, where appropriate, to adequately serve projected need. Work with local jurisdictions and the private sector to integrate or incorporate park-and-ride facilities with adjacent development.

  - *Transit Priority*. Provide preferential access and layover space for transit vehicles at park-and-ride lots and rapid transit stations appropriate to the facility's location and scale.

  - *Integration Between Transportation Modes*. Provide easy access between buses, rapid transit, ferries, shuttles, circulators, intercity rail lines, taxis and airports, by coordinating facility design, simplifying service connections and using common fare and transfer policies.

  - *Bicycles*. Provide bicycle transport on buses and rapid transit vehicles, while maintaining operating safety, service quality, and passenger comfort. Provide safe and convenient bicycle access within at least one quarter of a mile of rapid transit stations and park-and-ride lots. Provide weather-protected storage for bicycles at rapid transit stations and park-and-ride lots. Where practical, include improvements for safe bicycle travel on arterials as part of HOV investments and within rapid transit corridors.

8.2.5 Transit Stations

Transit agencies, communities and local governments will work together to site and design transit stations and plan areas around those stations to assure consistency with local growth management plans and community objectives.

- Station Areas

  Transit, pedestrian, and bicycle improvements will be integrated with the local community and the existing transportation system within one-quarter to one-half mile of the rapid transit stations. General station locations are shown on **Figure 8-2**.

- Land Use Consistency

  Funds will be provided to help local jurisdictions and communities plan the areas surrounding stations.

- Design Elements

  Flexibility will be encouraged in transit facility design to maximize the station's compatibility with the surrounding community while providing the following standard features for transit customers:

  - route and schedule information
  - consistent signs
  - conveniences appropriate to location and scale
  - pedestrian-friendly design and access for people with disabilities
  - bicycle access and storage

- Collection and Distribution Systems

  Opportunities will be pursued with private developers and local jurisdictions to jointly develop and run systems such as peoplemovers or shuttles, expanding transit station service areas.

- Joint Development

  Opportunities will be pursued with private developers, local governments, property owners, major institutions, and businesses to jointly develop transit facilities and their surrounding areas as appropriate to support increased transit use and community, economic, social and cultural objectives.

8.2.6 Transportation Demand Management

To achieve the full benefits of the system plan requires extensive efforts by local transit agencies, the RTA, the PSRC, the WSDOT, local governments and the private sector. The agencies will ease and promote public transportation use and other options that minimize the number of SOV miles traveled per person.

- Partnership to Encourage Public Transportation Use

  Public transportation agencies will work with employers and local jurisdictions to match high quality transit services with economic incentives to use transit and promote ridesharing and other options to reduce commute trips. Agencies will take specific actions with employers and local jurisdictions to achieve state mandates to reduce commute trips to sites of 100+ employees 15 percent by 1995, 25 percent by 1997, and 35 percent by 1999, as identified in the state Commute Trip Reduction Law.

- Parking Policies

  Public transportation agencies will work with regional and local jurisdictions to develop parking policies that encourage transit use over auto use, and reduce growth in per person vehicle trips, especially in urban centers.

- Demand Management

  While allocating new services, priority will be given to those areas undertaking significant demand management measures to reduce per-person trips and/or transit/HOV-supportive land-use actions.

- Congestion Pricing

  The potential for, and the policy implications of charging fees for using roadways as a means to allocate transportation resources should be explored to reduce growth in traffic congestion and associated environmental impacts, and help pay for new public transportation facilities or services, including HOV facilities.

- Priority Investments

  Investments will be made, on a priority basis, in facilities which support developing transit supportive land-use patterns and in areas where land-use policies encourage concentrating new population or employment. Priorities will be based on an evaluation of the extent to which local jurisdictions:

  - Take actions that reduce the supply of and/or increase the cost of parking
  - Take actions that provide priority treatment for HOVs
  - Adopt policies or programs that will give preference to non-motorized modes of transportation
  - Take land-use actions that result in increased population or employment densities.

8.2.7 Innovation and Emerging Technology

To maximize opportunities for meeting short- and long-term transportation needs, transportation agencies should be flexible in considering new ideas and take advantage of innovations in service and technology.

- Service Innovation

  Emerging innovations in transit service will be monitored and new ideas to improve cost-effectiveness and/or responsiveness to people's needs will be tried, (e.g. non-motorized transportation options, demand-responsive public transportation services, and privately financed and operated services).

- Vehicle Innovation

  Emerging technology innovations will be monitored (alternative fuels, quieter equipment, lightweight vehicles, energy efficiency and comfort features) and new ideas to improve cost-effectiveness, reduce adverse environmental impacts and increase rider comfort will be tested.

- Low-Density Areas

  Agencies will work with the private sector to encourage providing privately supported or operated services that extend the market area of the public transportation system in areas where population or employment densities are low or geographically isolated.

- Ferries

  Agencies will work with WSDOT and the private sector to explore using ferries to supplement the public transportation services provided by local transit agencies and the RTA.

8.2.8 Regional High-Occupany Vehicle System

The regional HOV system is a critical element of the public transportation system. It provides a speed advantage to all HOVs and increases schedule reliability for transit. Rapid completion of the HOV system will help transit and other HOVs achieve system plan market share objectives.

- System Completion

  A high priority should be placed on completing the freeway and state route HOV system generally shown in **Figure 8-2** by the year 2005.

- Design Standards

  Features such as ramp meters and queue bypass lanes for HOVs should be included as standard freeway design. Where practical, "Intelligent Vehicle Highway Systems" features (such

as electronic signs and braking systems) should be used to improve transit safety, reliability and speed.

- Park-and-Ride Lots

  Park-and-ride lots will be built to support HOV-lane use by transit and rideshare vehicles. Transfer stations will be designed for easy connections between transportation modes. The transfer stations will provide safe access for pedestrians, bicyclists and people with disabilities. Opportunities will be sought to include compatible public and private joint development.

- Access

  Appropriate bus and carpool access will be provided to HOV lanes from adjacent communities and park-and-ride lots. HOV access improvements should have priority for locations where freeway capacity is constrained and rail transit lines are not recommended until after 2015.

- New Versus Converted Lanes

  Generally, HOV lanes will be added to the existing general purpose traffic lanes. Where freeway capacity is sufficient to allow converting a general purpose lane to an HOV lane, such conversions will be pursued before capacity becomes a constraint in the corridor. Where capacity constraints do exist, converting general purpose lanes to HOV lanes on a case-by-case basis may be considered.

- Vehicle Occupancy Standards

  The minimum occupancy per vehicle for use of HOV lanes should be based on maintaining 45 mph speeds in the HOV lane at least 90 percent of the time during peak-use hours.

- Incident Management

  Public transportation agencies will work with WSDOT, the Washington State Patrol and local law enforcement officials to rapidly respond to traffic incidents that impede the flow of the

region's principal highways and arterials, especially those affecting HOV lanes and other major transit routes.

- Upgraded HOV Segments

  Where freeway capacity is constrained, and rail transit lines are not recommended until after the year 2015, investments should be made in HOV facilities that ensure maximum bus speeds and reliability over the long term. Provisions will be made to develop the left side HOV lanes with direct HOV access. Additional features will be considered including barrier separation to ensure maximum bus speeds and reliability.

- Arterial HOV Lane Analysis

  The potential for arterial HOV lanes and HOV lanes or transitways on or adjacent to state routes such as SR 522 requires further analysis to assure that regional travelsheds that will not be served by rail are a part of the regional strategy. The additional studies will be undertaken as part of the continuing coordinated program development effort.

8.2.9 Regional Rail Transit System

- Rail Network and Phasing

  The rail system generally shown in **Figure 8-2** will be planned, designed and built by the year 2015. The first segments will be scheduled to open by the year 2001. The final system plan will identify those segments to be completed by 2005. These general phasing approaches are being evaluated:

  - Construct as much of the central portion of the system as possible by 2005

  - Construct as much of one corridor as possible by 2005, while delaying the implementation of other facilities in the system plan

- Construct operable portions of the system in each of the three counties by 2005

- Construct the full system before 2015 assuring regional equity.

- Post-2015 Extensions

  Financial capacity will be retained to build and operate rail system extensions and upgrades after the year 2015. Implementation of extensions and upgrades will be based upon actual development patterns, current growth management plans and actions, and updated travel forecasts.

  Prior to 2015, these corridors shall be served by regional express bus services to support local land-use plans and develop regional travel forecasts.

- Reserve Right-of-Way

  Public transportation agencies will comply with the state-mandated right-of-way review process to be managed by the PSRC. As alignments and station areas are planned for the regional rail system, including the post-2015 rail system extensions, right-of-way will be reserved through purchase where legally feasible. As appropriate, acquired sites will be used for interim and supporting bus service during rail planning and construction.

- Rail Transit Markets

  Markets to be served by the regional rail system are shown in **Figure 8-2**. In Snohomish County, more analysis and public review are underway to determine which alternative alignments best serve that county's markets. In Pierce County, the Lakewood area is being re-evaluated for possible inclusion as a rail transit market. In Renton, commuter rail service will be evaluated for implementation prior to regional rail service.

- Characteristics

  To achieve the system objectives to the greatest extent feasible, the regional rail system will generally have the design and performance characteristics shown in **Table 8.1**.

- Station Location/Design

  Final alignment and station location and design will be determined on a segment by segment basis, after detailed planning, including community involvement and environmental review. This process will assure compatibility with the community and appropriate levels and combination of pedestrian, bicycle, bus and park-and-ride access. The analysis and environmental review of station locations and alignment selection will be conducted with local jurisdictions, and other agencies. Funding will be provided as appropriate to support technical and community participation in the siting, design and community integration of facilities and services.

TABLE 8.1

REGIONAL RAIL SYSTEM CHARACTERISTICS

RAPID TRANSIT SYSTEM	
Maximum Speed	55–70 MPH
Average Speed	35–40 MPH
Frequency	2 to 10 Minutes Daytime
Power Source	Electricity
Train Capacity	4–Car Train, at 140/Car, or 560 Passengers
Peak Hour, Peak Direction Capacity	22,000
Station Spacing	1.5 to 2 miles, closer in high transit volume areas.
Right–of–Way	Primarily exclusive of other traffic; mixed traffic segments may be considered in Tacoma, Everett or in other areas where the reduced performance does not significantly degrade the regional system's performance.
Alignments	Maximize pedestrian access to the system and minimize redundancy with the WSDOT HOV system.
COMMUTER RAIL LINE	
Maximum Speed	79 MPH
Average Speed	35–55 MPH
Level of Service	Opening service at 30–minute frequency in peak period, rising to 15 minutes with off–peak service added; 32 trains at startup, rising to 64, if ridership warrants.
Power Source	Initially diesel/electric, with ability to convert to alternative fuels or all– electric in future.
Train Capacity	3 to 5 car trains with capacity for 375 to 1,000 passengers.
Peak Hour, Peak Direction Capacity	4,000 Maximum
Station Spacing	About 5 miles, closer in high employment centers.
Right–of–Way	Sharing freight tracks, with signalized grade crossings.
Implementation	Phased implementation of service and related capital investments will be developed in conjunction with a procurement process and negotiated agreement.

9.0 Financial Plan

9.1 Purpose of the Financial Plan

The Regional Transit System Draft Plan adopted by the JRPC on September 18, 1992 describes a major service expansion and capital investment in rail and transportation system management facilities in the region. At the system planning phase of project development, the purpose of the financial plan is to analyze alternative approaches to achieving two financial goals in the implementation of the recommended system: feasibility and equity. During the AA/DEIS phase, a more detailed analysis will be conducted. Outlines of the *Financial Methods Report* and *Financial Results Report* to be generated in the AA/DEIS phase are attached as Appendices A and B, respectively.

This chapter is organized into five major sections. These include: the cost of the system; evaluation of potential funding sources; financial equity; financial analysis; and the recommended financial plan.

9.2 The Cost of the System

The costs of the capital investment in alternative regional systems and of their operation and maintenance were estimated and refined during the system planning process. The costs of system development, operation, and maintenance are the primary inputs to the financial models necessary to determine the total financial capacity (or total revenue yield) required from various revenue sources. These costs and their phasing over time determine the annual commitment and cash flow levels defining the financial capacity which will be needed annually over the life of the project.

Based on the evaluation of the No-Build, TSM, Transitway/TSM and Rail/TSM 2020 System Planning Alternatives, the JRPC has selected the Rail/TSM Alternative as most responsive to the region's needs. A preliminary refinement of the $11.4 billion 2020 Rail/TSM Alternative using the alternative refinement and phasing criteria discussed in Chapter 7.0, resulted in the general scope for the RTP reflected in the Regional Transit System Draft Plan summarized in Chapter 8.0. The following sections provide a general description of the scope of the project to be financed. **Table 9.1** reflects a summary of the following narrative.

The Transitway/TSM Alternative built on the TSM Alternative, and its major service additions. However, some projects included within the TSM Alternative were not included in the Transitway/TSM Alternative due to the duplication of function by the transitway and related improvements. Other TSM projects were modified to complement the collection and distribution functions of the transitway system. These projects are described in the corridor-specific descriptions in Section 4.0.

3.2.1.4 Rail/TSM Alternative

This alternative was designed as an electric light rail transit (LRT) system, operating primarily on an exclusive, grade-separated right-of-way. The rail system provided greater capacity than a conventional bus system but had a lower capacity than a heavy rail system. For purposes of evaluation, it was assumed that the rail system would operate with steel wheels on steel rails and would draw power for its electric propulsion system from overhead catenary. The rail vehicles would be propelled by conventional, rotary electric motors.

The description in Section 4.0 portrays the Rail/TSM Alternative in terms of the general areas and activity nodes served, the general pattern of feeder bus service, and the support facilities required. Although the description refers to specific potential rights-of-way and facility locations, the actual evaluation of specific alignments and facilities will occur following adoption of the System Plan and be subject to project-level environmental work. The alignments and facility locations described as part of this alternative are illustrative of the alternative for purposes of system evaluation. They are not precise, preferred or proposed alignments or facility locations.

In addition to the corridor-specific facilities described in Section 4.0, the Rail/TSM Alternative would require development of rail car maintenance and storage facilities. The system would probably incorporate a primary maintenance and storage facility in the Duwamish industrial area of Seattle as well as outlying light maintenance and storage facilities in each of the three principal corridors.

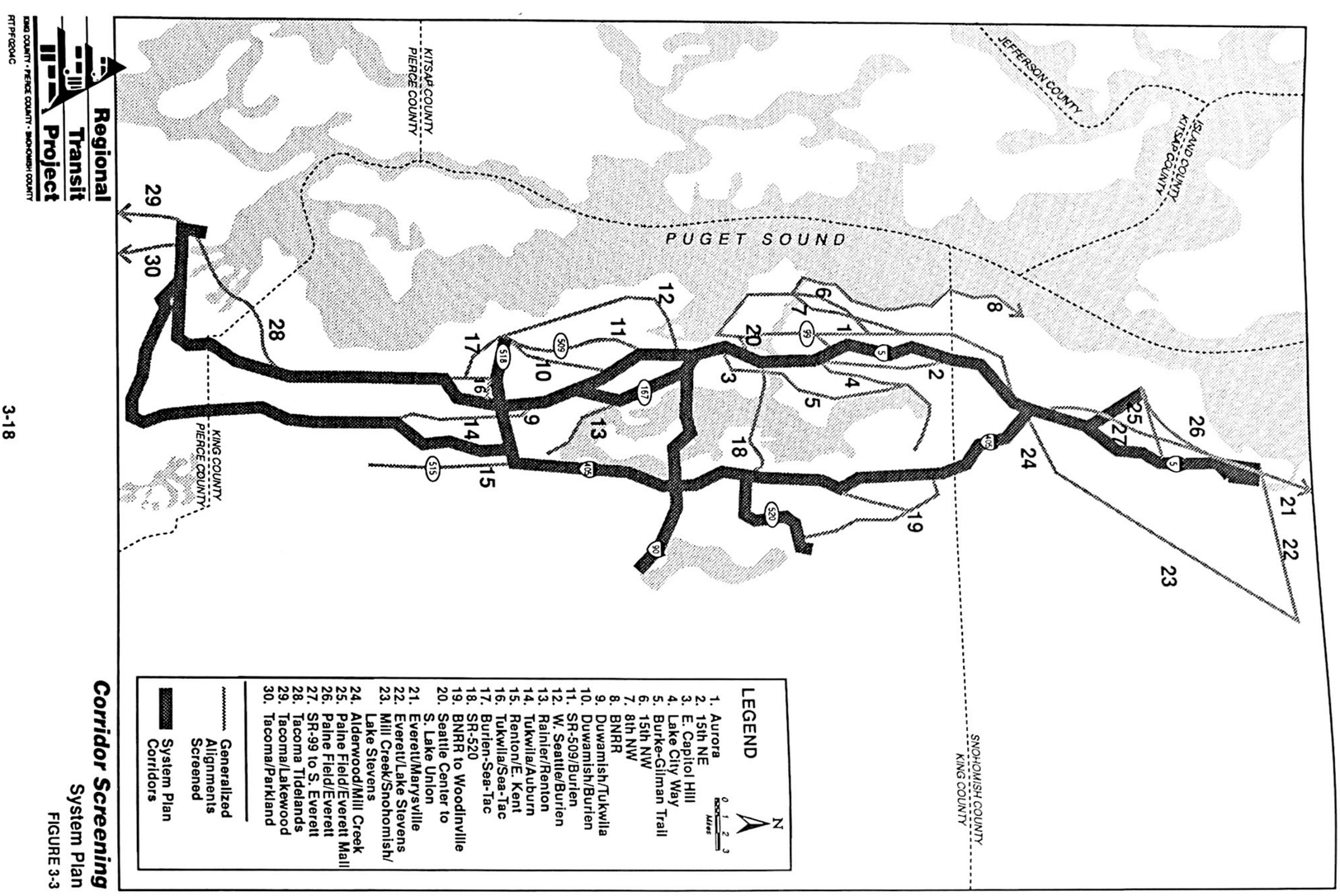
For the purposes of the RTP, it was assumed that any rail system chosen would have operating characteristics similar to the light rail systems that have been built in several cities, including San Diego, Portland, and Vancouver, B.C., and that it would have similar environmental impacts. A major advantage of evaluating conventional light rail is that it has been used extensively in other North American cities, and the advantages and disadvantages of the technology have become apparent. Few other rail technologies, such as monorail or maglev, have been used on a city-wide basis for intra-urban (within city) transportation. For this reason, these technologies have not been tested on crucial issues, such as branching tracks, crossing lines, and carrying large passenger loads between urban stations.

In addition, some of the facilities that would be used by a rail system, including the Downtown Seattle Transit Tunnel and the I-90 floating bridge, were specifically designed to accommodate a light rail system. Other technologies would be more difficult or impossible to accommodate on these facilities. A report prepared for Metro titled *Rail Transit Technology and Design Guidelines*, Gannett-DeLeuw, August 1990, concluded that light rail would be the easiest technology to implement in the Seattle area.

It is unlikely that adverse impacts of a different type of rail technology would be significantly less than those of conventional light rail. For these reasons, it was not considered necessary to discuss different rail technologies in this System Plan. If a different type of rail technology is chosen, differences in its environmental impacts would be considered as part of subsequent project-level environmental review.

3.2.2 Screening of Rapid Transit Corridors and Alignments

The Puget Sound Council of Governments began assessing potential regional rapid transit alignments in 1982. The generalized alignments identified in the System Plan were evaluated and screened from a larger number of possible alignments. Each stage in the screening process has included public meetings and involvement to ensure that the alignments were reasonable and met with public approval. RTP did not reevaluate all possible alignments for rapid transit. Rather, it built on earlier analyses in developing a set of reasonable alternatives for further study and environmental review. The evaluation process included several separate studies (**Figures 3-3, 3-4 and 3-5**):

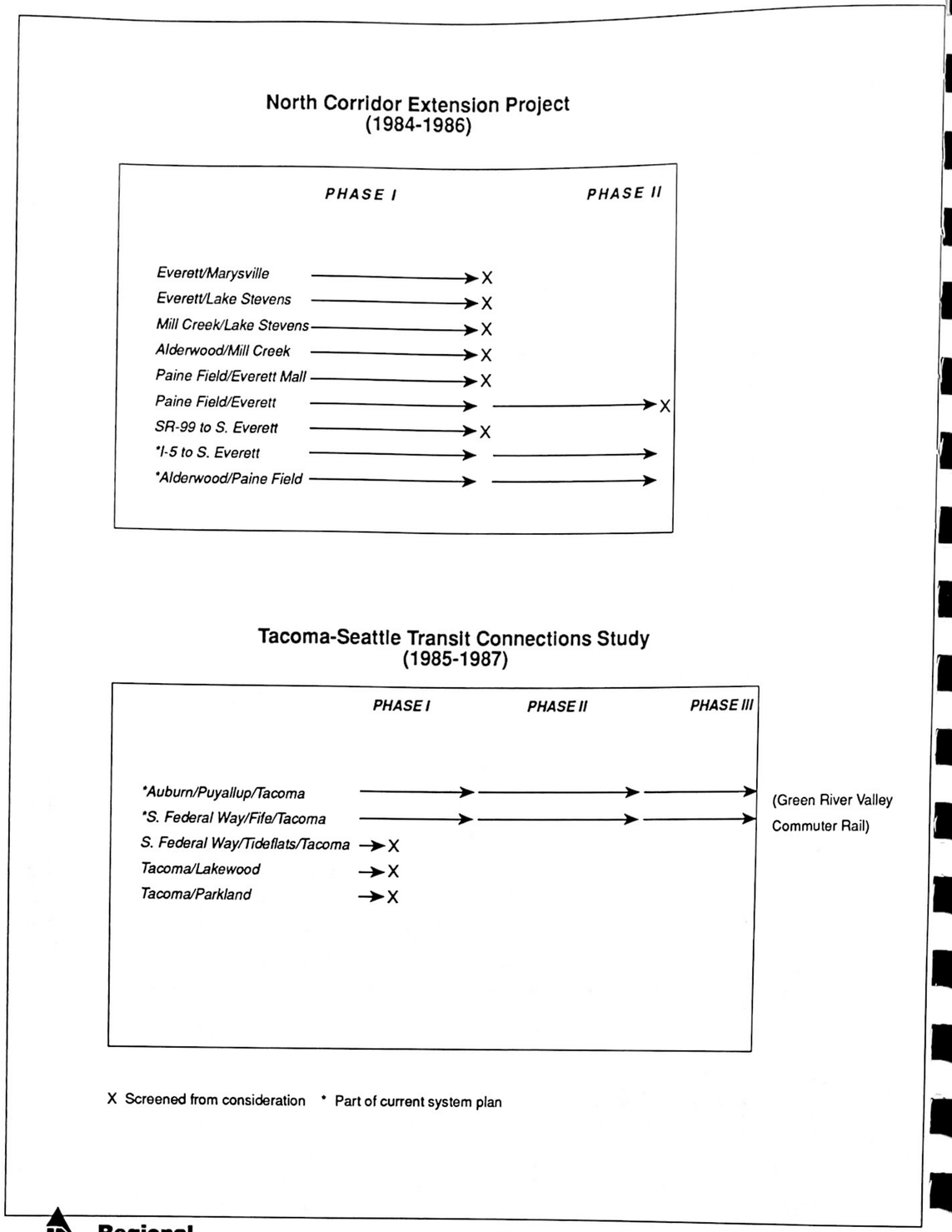


Corridor Screening
System Plan
FIGURE 3-3

North Corridor Alternatives Analysis (1982-1983)		Multi-Corridor Analysis (1984-1986)		Metro 2000 (1990-1991)		Regional Transit Project (1991-) (Including special studies)
PHASE I	PHASE II	PHASE I	PHASE II	1ST SCREENING	2ND SCREENING	
NORTH CORRIDOR						
*I-5	→	→	→	→	→	→
Aurora	→	→	X	→	X	(Rhododendron Line Report)
15th NE	X	X		*W Capitol Hill/ U. District	→	→
E. Capitol Hill	X			→	X	(Ballard-Laurelhurst Study)
Lake City Way	X			→	X	
Burke-Gilman Trail	X			Seattle Center/ S. Lake Union	X	
15th NW	X					
8th NW	X					
BNRR	X					
SOUTH CORRIDOR						
Duwamish/Tukwila		→	→	→	X	
*Duwamish/Sea Tac		→	→ X	→	→ X	→
Duwamish/Burien		→	X			
SR-509/Burien		→	→ X	→	→ X	
W. Seattle/Burien		→	X			
*Rainier/Duwamish		→	X			→
Rainier/Renton		→	X	→	→ X	(Rainier Urban Rail Report)
Tukwila/Renton		→	→ X			*Burien/Renton →
Tukwila/Auburn		→	→ X	*Green River Valley Commuter Rail	→	→
Renton/E. Kent		→	→ X			
Burien/Sea-Tac Airport		→	→ X	→	→ X	*Burien/SR-99/SeaTac →
Tukwila/Sea-Tac Airport		→	→ X		Burien/SeaTac (Airport bypass) → X	
EAST CORRIDOR						
*I-90		→	→	→	→	→
SR-520		→	→ X	→	X	
				BNRR to Woodinville & Bothell	→ X	
				*Bellevue/Renton	→ X	→

X Screened from consideration * Part of current system plan

King County Corridor Screening History
System Plan
FIGURE 3-4



Regional Transit Project
KING COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY
RTPF0204D.ai

Snohomish and Pierce County Corridor Screening History
System Plan
FIGURE 3-5

- *The North Corridor Alternatives Analysis* (1982-1983) considered alignments between downtown Seattle and south Snohomish County.
- *The Multi-Corridor Analysis* (1984-1986) considered potential alignments from downtown Seattle to Federal Way and east King County and further screened and evaluated alignments considered in the North Corridor Alternative Analysis.
- *The North Corridor Extension Project* (1984-1986) considered rapid transit feasibility in Snohomish County. The analysis was further refined between 1986 and 1990.
- The Tacoma Seattle Connections Project (1985-1986) considered extensions of South Corridor alignments into Pierce County.
- Metro 2000 (1990) screened rail and busway alignments for 2010.
- Regional Transit Project (1991 to date) expanded Metro 2000 to 2020.

3.2.2.1 North Corridor Alternatives Analysis

The purpose of the North Corridor Alternatives Analysis was to determine the feasibility of transportation improvements, including rapid transit, in King County's North Corridor and to assess their costs and benefits. Screening was done by the Transportation Alternatives Analysis Steering Committee, an interagency committee of the PSCOG and Metro. Eight alignments were considered in the initial phase (PSCOG-Metro 1983). Three were carried into the second phase, and two survived that screening.

Public Involvement

Project staff met with many business and community organizations, public agencies, and special interest groups. Community forums were held. Newsletters, brochures, fact sheets, and reports that were at the meetings were accompanied by a response form. Results of the questionnaires and meeting comments were presented to the Transportation Alternatives Analysis Steering Committee (PSCOG-Metro 1982).

Evaluation Criteria

- *First Phase (1982)*

  Alignments were evaluated for:

  - cost
  - accessibility to a feeder bus network
  - impacts of construction
  - service to activity centers
  - distance from center of transit demand

- *Second Phase (1983)*

  Alignments were evaluated for the following characteristics:

  - capacity
  - service growth potential
  - transportation plan compatibility
  - costs
  - land use and traffic impacts
  - achievable
  - potential for incremental development
  - maximum use of public right-of-way

Alignments Considered

Alignments considered included:

- I-5 from downtown Seattle to Lynnwood ("I-5"). This alignment would directly serve the Seattle CBD, University District, Northgate, and Alderwood Mall.

- Aurora Avenue/Interurban from Seattle CBD to Lynnwood ("Aurora"). This alignment was proposed to promote development of the Aurora corridor.

- Eastlake/15th NE/I-5 from Seattle CBD to Lynnwood ("15th NE"). This alignment would serve University District, Northgate, and Alderwood Mall.

- Capitol Hill/Montlake/University District/Lake City Way ("Forward Thrust East"). This alignment was part of the 1970 Forward Thrust proposal.

- Capitol Hill/Montlake/University District/Burke-Gilman Trail ("Burke-Gilman"). This alignment used right-of-way along the Burke-Gilman Trail.

- Elliott/15th NW/Interurban to Lynnwood ("Forward Thrust West").

- Elliott/15th NW/Interurban ROW to Lynnwood ("Forward Thrust West Variation").

- Burlington Northern, Seattle to Edmonds ("Burlington Northern ROW"). This alignment was thought to have relatively available right-of-way.

Recommendations

- *First Phase*

  The I-5, Aurora, and 15th NE alignments were recommended (PSCOG-Metro 1983). All had good feeder bus connections. The I-5 and 15th NE alignments served major activity centers and were near the center of transit demand. Aurora was considered to have good development potential.

  Forward Thrust East was dropped because of cost, construction impacts, and inadequate bus feeder potential. Burke-Gilman was dropped for similar reasons, and because of existing use of the trail. Forward Thrust West and its variation were screened out because of cost and limited bus feeder potential. The Burlington Northern ROW was screened out because it served no major activity center and was far from the center of transit demand.

- *Second Phase*

  I-5 was recommended because it was in the center of transit demand, served the University District and Northgate, and

would have minimal neighborhood impacts. However, it would likely take I-5 capacity.

Aurora was recommended for further study because it would have moderate neighborhood impacts, traffic impacts, and cost, and would leave HOV capacity on I-5. However, the corridor did not serve two major activity centers (University District and Northgate) and would not efficiently serve neighborhoods east of I-5.

The hybrid Aurora/I-5 alignment was developed for further study because it would reduce the Aurora alignment's neighborhood and traffic impacts, while serving Northgate and avoiding impacts on I-5 capacity. However, it would have major construction impacts on north Green Lake neighborhoods and would not serve the University District.

The 15th NE alignment was screened out because it would have severe neighborhood impacts and a very high cost.

3.2.2.2 Multi-Corridor Project

The Multi-Corridor project evaluated rapid transit in the North, South, and East Corridor Study Areas in King County under the policy guidance of the PSCOG-Metro Multi-Corridor Steering Committee. The North Corridor Alternatives Analysis was considered in evaluating North Corridor alignments. However, Aurora Avenue was not studied, due to lack of service to the University District.

Public Involvement

Project staff met with about 50 organizations, agencies, and interest groups during the Multi-Corridor Project. Fourteen forums were held in downtown Seattle, University District, north Seattle, Bellevue, Renton, Tukwila, Kent, Federal Way, and Shoreline. Results of questionnaires and comments from meetings and forums were presented to the Multi-Corridor Steering Committee (PSCOG-Metro 1986).

Evaluation Criteria

- *Phase I*

  Phase I sought to identify all possible alternatives and screen out the least promising. Criteria for evaluation (PSCOG-Metro 1985) included:

  - Directness of service to potential transit users
  - Directness of service to areas with highway capacity deficiencies
  - Connections to and between major activity centers
  - Compatibility with local plans

- *Phase II*

  Phase II analyzed the remaining alignments. Evaluation criteria included:

  - transit ridership
  - cost-effectiveness
  - maximizing operational safety and highway capacity
  - affordability
  - connections to and between activity centers
  - compatibility with land use plans
  - development opportunities near transit facilities
  - transit trips to major activity centers
  - transit service schedule reliability
  - significant environmental impacts

Generalized Alignments Evaluated

- *North Corridor*

  An I-5 alignment and one detouring to the University of Washington campus were evaluated.

- *East Corridor*

  While alignments past Bellevue were evaluated, the main analysis focused on whether to serve downtown Bellevue by using SR 520 or I-90.

- *South Corridor*

  Because of the number of variations considered, it is easiest to discuss the South Corridor analysis in terms of links between centers that were considered. These included:

  - Seattle CBD/Duwamish employment centers to Tukwila
  - Seattle CBD/Duwamish employment centers to Sea-Tac Airport
  - Seattle CBD/Duwamish employment centers to Burien
  - Seattle CBD to Burien via SR 509
  - Seattle CBD to Burien via West Seattle
  - Seattle CBD/Rainier Valley to Duwamish employment centers
  - Seattle CBD/Rainier Valley to Renton
  - Tukwila to Renton
  - Tukwila to Auburn
  - Renton to East Kent
  - Burien to Sea-Tac Airport
  - Tukwila to Sea-Tack Airport

  In Phase I, only options to Sea-Tac Airport, Tukwila, and Renton were considered in detail, although extensions further south were discussed. In Phase II, extensions to Federal Way, Auburn, and east Kent were added.

Recommendations

- *Phase I*

  Only East and South Corridor options were evaluated in Phase I.

East Corridor

Alignments not serving downtown Bellevue were dropped due to low ridership and lack of services to the largest Eastside activity center. Both SR 520 and I-90 alignments were recommended for further analysis.

South Corridor

The Duwamish/Tukwila, Tukwila/Renton, and Tukwila/ Sea-Tac Airport links were carried forward because they would supplement highway capacity. The Duwamish/Sea-Tac Airport and Sea-Tac Airport via SR 509/Burien links were carried forward because they would serve major employment centers.

The Duwamish/Burien, West Seattle/Burien, Rainier/Renton and Rainier/Duwamish links were screened out because they would be too circuitous and slow for extensions into south King County. In addition, the analysis concluded that Rainier Valley links were too far east to allow efficient feeder bus service to western portions of the corridor.

- *Phase II*

  North Corridor

  An I-5 alignment and the alignment serving the University campus were recommended for further analysis (PSCOG-Metro 1986).

  East Corridor

  The SR 520 crossing was dropped because of low ridership, lower feeder bus potential, higher cost, and lower cost-effectiveness compared to I-90.

South Corridor

An option serving the Duwamish area, Tukwila, Sea-Tac Airport, and Federal Way was selected because of ridership, bus feeder potential, and cost-effectiveness in serving the densest portions of the corridor.

3.2.2.3 North Corridor Extension Project (NEXT)

The NEXT project was a joint project of SNO-TRAN, Community Transit, Everett Transit, and PSCOG. The project started station area preplanning following a finding of feasibility in 1986. Four station area studies (1987-90) from Mountlake Terrace to Everett refined alignment and station options.

Public Involvement

Public involvement included the NEXT Newsletter; public meetings; group briefings; and regular presentations to city councils and planning commissions. Advisory committees of local government staff, local businesses, and elected officials also participated.

Evaluation Criteria

- *First Phase (1984-1986)*

  Alignments were evaluated for (SNO-TRAN 1986):

  - Development at stations
  - Environmental review
  - Ridership and capacity measures
  - Cost-effectiveness
  - User benefits
  - Feasibility
  - Public support.

- *Second Phase (1986)*

  Alignments were evaluated using the following measures:

  - Jobs/population within one-half mile
  - New employment/housing within one-half mile

  - Housing/businesses displaced
  - Roadway/traffic impacts
  - Construction impacts
  - Various environmental impacts
  - Pressures to change land use
  - Transit ridership/mode split
  - System capacity
  - Cost
  - Travel time savings
  - Quality of service
  - Availability of rights-of-way

Alignments Considered

Alignments considered included:

- *I-5 to Alderwood Mall* - This alignment from the North Corridor Alternatives Analysis was reexamined.

- *I-5/SR 99* - This set of alignments studied I-5 to Lynnwood and from Lynnwood north to Everett via Paine Field, Everett Mall (I-5), and SR 99.

- *Downtown Everett via I-5* - This alignment included a branch to Paine Field.

- *Paine Field via I-5/SR 526 and via SR 525* - This set of alignments did not serve downtown Everett, ending at southwest Everett/Paine Field.

- *Everett Mall/I-5, SR 99, SR 525/526*

- *Mill Creek via I-5 and 164th SW* - This alignment focused on southwest Snohomish County.

- *Marysville via I-5* - This alignment extended north to Marysville.

- *Lake Stevens via I-5/SR 2 and SR 9* - One alternative used I-5 to Everett and then SR 2. The other alternative used SR 9 from Alderwood.

Recommendations

- *First Phase (1985)*

  Four alternatives were recommended for further study:

  - two "build" alternatives to downtown Everett via I-5 or Paine Field
  - an all bus TSM Alternative
  - a "No-Build" Alternative

- *Second Phase (1986)*

  Analysis of four alternatives and variants produced this recommendations:

  - The preferred alternative was rail in the I-5 corridor to downtown Everett.
  - Additional study of Paine Field and east King County access was called for.

3.2.2.4 Tacoma-Seattle Transit Connections Study (Tac-Sea)

The Tacoma-Seattle Transit Connections Study was a joint project of Tacoma, Fife, Pierce Transit, Pierce County, WSDOT, and PSCOG. The objective was to develop a mid- and long-range plan for improved transit service between King and Pierce Counties.

Public Involvement

A citizens committee made up of business and public representatives provided input throughout the study. Community involvement also included a project newsletter, public meetings, attitude surveys, news releases, and presentations to community groups.

Evaluation Criteria

- *Phase I (1985-1986)*

  High-capacity transit alternatives were evaluated by the following measures:

  - potential transit ridership
  - potential availability of lower cost right-of-way
  - economic development potential

- *Phase II (1986)*

  Alignments to the Puyallup River were evaluated, mainly on the basis of cost.

- *Phase III (1986-1987)*

  There was no analysis of specific corridors or alignments in this phase.

Alignments Considered

Generalized alignments considered included:

- Green River Valley through Puyallup to Tacoma.
- South Federal Way to Tacoma on I-5, SR 99, or the Interurban and 20th Street E.
- South Federal Way to Tacoma on SW 348th and the new SR 509.
- Tacoma to Lakewood using I-5 or Tacoma Way South and I-5.
- Tacoma to Parkland using SR 7.

Recommendations

In Phase I, the "I-5 corridor," including I-5, SR 99, and SR 509, was preferred over the Green/Puyallup River valley because of links to the preferred corridor in King County and higher ridership and population

concentrations. The study concluded that transit ridership south of Tacoma Mall would not justify rail. Phases 2 and 3 made no further alignment recommendations.

3.2.2.5 Metro 2000

Metro 2000 considered the recommended Multi-Corridor alignments, many alignments that had been dropped, and a few that had not been previously considered. Alignments were evaluated for both busway and rail lines. The Metro Council's Planning Subcommittee made screening decisions.

Public Involvement

Metro 2000 public involvement is described in Section 1.9. Alignment and corridor recommendations included input from meetings with the public, jurisdictions, and community and interest groups.

Evaluation Criteria

The criteria for evaluation of alignments (Metro 1990a) included:

- potential for growth and development along the corridor
- enhancement of mobility along the corridor
- efficiency of alignments along the corridor
- practicality of the alignment
- potential ridership
- cost-effectiveness
- community support
- possible advantage in financing
- environmental considerations
- consistency with Vision 2020 Plan

General Alignments Evaluated

- *North Corridor*

  North Corridor screening considered the Aurora, I-5, and Lake City Way corridors. Variations of the I-5 alignment served Capitol Hill/University District and Seattle Center. The Aurora and Lake City Way alignments were only considered for busways.

- *South Corridor*

  Phase I screening considered many Multi-Corridor links, including:

  - Duwamish/Tukwila
  - Duwamish/City of SeaTac
  - SR 509/Burien
  - Rainier/Renton
  - Burien/Sea-Tac Airport.

  In addition, a link from Burien to SeaTac bypassing Sea-Tac Airport, a commuter rail line from downtown Seattle to Auburn, and the SR 99/I-5 corridor south of SeaTac were added. Phase II added a Rainier Valley/ Duwamish industrial park.

- *East Corridor*

  Most of the recommended Multi-Corridor alignments were considered through Phase II, as well as variations. Added alignments linked Woodinville and Bothell to Totem Lake or Redmond on BNRR right-of-way and Bellevue to Renton in the I-405/BNRR corridor.

Recommendations

- *First Screening*

  <u>North Corridor</u>

  The I-5 alignment and its west Capitol Hill/University District variation were recommended because of compatibility with the downtown transit tunnel, high ridership, and service to activity centers. The Seattle Center link was considered incompatible with the downtown transit tunnel and too expensive. An east Capitol Hill variation was dropped because of excessive grades, transit tunnel incompatibility, high cost, and circuitous routing (Metro 1990b). Aurora was screened out because it would not serve major activity centers, conflicted with the transit tunnel, and would have major traffic impacts. Lake City Way was

screened out because it would not serve Northgate or the I-5 travel corridor and would have major traffic impacts.

South Corridor

Most of the alignments were recommended for further study. The Duwamish/Tukwila/Sea-Tac Airport corridor was screened out due to limited right-of-way and circuitous routing (Metro 1990b).

East Corridor

The I-405/BNRR corridor between Bellevue and Renton was screened out due to very low transit demand. The Woodinville/Totem Lake or Redmond alignment was dropped due to low densities, proximity to agricultural land and the urban growth boundary, and lack of service to the I-405 corridor (Metro 1990b).

- *Second Screening*

The second screening revealed that busways would, in general, be more expensive and have lower capacity and ridership than comparable rail lines (Metro 1990c) (see Section 2.5.1). The busway option was dramatically scaled back and designed to be a lower cost, possibly more flexible alternative to a rail system (the Transitway/TSM Alternative). Rail corridors were analyzed as described below.

North Corridor

Both alignments were carried forward for further analysis (Metro 1990c).

South Corridor

Recommended options assumed a commuter rail line in the Green River Valley. The first, Duwamish/SeaTac/Federal Way, directly served major activity centers at a relatively low cost, with good extensions to Tacoma. The second, Rainier Valley/SeaTac/Federal Way, served a major residential transit

market, helped to alleviate Rainier Valley traffic congestion, and had positive lane use impacts (Metro 1990c).

SR 509 to Burien and beyond was screened out for the following reasons:

- difficulties in crossing the Duwamish River at the First Avenue South Bridge
- failure to serve the Boeing Field employment center without serving a high-density residential area (e.g., Rainier Valley)
- more costly service and increased travel times to Sea-Tac and beyond
- more difficult bus connections without compensating ridership
- the ability of TSM to solve this corridor's transit problems.

The Rainier/Renton corridor was dropped because of more circuitous routing to south King County and Pierce County than the Rainier/Duwamish link and because it would be even more expensive than the Rainier Valley option.

East Corridor

All the alignments and variations were recommended for further study (Metro 1990c).

3.2.2.6 Regional Transit Project (RTP)

The RTP expanded Metro 2000 to serve major centers in King, Pierce, and Snohomish Counties by the year 2020. Metro 2000 alignments were extended past their previous termini using NEXT and Tac-Sea recommendations and some previously screened alignments were reexamined for their potential in a 2020 system. Alignment decisions will be made by the Joint Regional Policy committee (JRPC).

General alignments added or extended by RTP include:

- I-5/SR 99 from Lynnwood to Everett
- SR 99 in Everett
- Airport Road and I-5 to Paine Field

- I-405 from I-5 in Snohomish County to Totem Lake
- I-90 from I-405 to Issaquah
- BNRR/I-405 from Bellevue to Renton
- BNRR/I-405/SR 518 from Renton to Burien
- I-5/SR 99 from Federal Way to Tacoma
- Extension of commuter rail to Tacoma.

These extensions were considered necessary to complete a regional system.

The RTP studied two corridor alignment options for the North and South Corridors in Seattle. In the North Corridor, RTP compared an alignment serving First Hill and Capitol Hill with direct service to the University District with one serving south Lake Union, crossing the Ship Canal on the I-5 express lanes, and connecting to a people mover serving the University of Washington campus. In the South Corridor, the RTP compared two alignments serving Rainier Avenue and south Boeing Field (one on Rainier Avenue and the other on Martin Luther King, Jr. Way) with an alignment serving the Duwamish Industrial area. Based on the size of markets served and ridership projections, the JRPC has recommended the North Corridor Capitol Hill alignment and the South Corridor Rainier Avenue/Martin Luther King, Jr. Way alignment and included them in the draft System Plan.

3.3 Transportation Modeling

A key ingredient in the evaluation process is the result of the transportation modeling process. The modeling process estimates future patronage for each of the alternatives under consideration. It also provides information that is used to produce operating and maintenance costs, farebox revenues, and various measures of traffic and environmental impacts.

Details of the transportation modeling process can be found in the *Travel Forecasting Methodology Report*, PBQD, October 1991. This section provides a summary of the process and highlights the key policy assumptions that are made in the modeling efforts.

3.3.1 Summary of the Process

There are two basic approaches to transportation modeling: synthetic methods and incremental methods. Both of the methods make use of

adopted population and employment forecasts for various parts of the region and of specific travel information such as that provided by Metro's 1985 On-Board Transit Survey.

The synthetic method utilizes a linked set of computer models to: 1) estimate the number of trips made, 2) predict the origin/destination patterns of those trips, 3) estimate the travel mode that will be used, and 4) predict the number of trips that will use specific links in the highway system. The synthetic approach builds up a travel forecast from essentially a zero base.

The incremental approach relies less on models and on empirical data. Rather than beginning from "scratch," this approach starts with existing travel patterns and socioeconomic conditions and predicts future transit patronage based upon "incremental" changes in those factors that influence trip-making and mode choice. The incremental approach was used for the RTP system planning efforts. The transportation modeling process employed is shown in **Figure 3-6.** The key steps in the process are:

- Develop Forecasting Methods: The basic approach is defined, and the models are developed.
- Validation: The models are tested to ensure that they can accurately predict patronage. The models are revised so that they can replicate 1985 travel patterns.
- Model No-Build Option: This option is coded and run through an interactive patronage forecasting process. In that process the transit service provided is balanced with the number of expected patrons.
- Model "Build" Alternatives: Service and patronage projections are made for each of the other alternatives.
- Analysis: The results of the patronage forecasts are analyzed and documented.
- Develop Inputs: Input information is provided to others for use in the evaluation of alternatives.