Chapter 7
Forecasts and Analysis

Introduction

Forecasting and analysis is the heart of the technical planning process. Forecasts determine the conditions under which the planned improvements will be needed. The transportation forecasting process includes not just the demand for passenger vehicle trips, but also trucks, buses, non-motorized, rail, water, and air travel. In order to make these forecasts, it is necessary to determine the population and employment that is expected to occur in the planning year, in this case 2025. It is not only necessary to determine how much, but where and in what densities. For passenger cars it is also important to know how many people will be traveling in a vehicle at a time, known as average vehicle occupancy (AVO).

The forecasting process starts from a basis of existing data and builds towards a future condition. Data gathering can be very expensive but is one of the keys to useful forecasts. The term "accurate forecasts" will not be used here. Forecasting has been described as educated guessing, and indeed it is. When forecasts are accurate, it is because there was a lot of good data and a good measure of luck. The forecasts for Skagit County used in the previous plan, expected 40% population growth between 1990 and 2000. Only 29% occurred. This is an "error" of over 25%, a very significant deviation. Yet good data and the trends of the time made the forecasts reasonable.

In order to overcome some of the vagaries of the forecasting process, three population forecast scenarios were considered. These three scenarios are provided by the Washington State Office of Management and Budget (OMB) for use in growth management planning. They are termed the low, intermediate, and high forecasts. From them, three different 2025 Skagit Counties were imagined with different types and densities of growth and different transportation needs. These three population scenarios were then matched with three different transportation plans, which were analyzed separately, but against the same criteria.

Only one of the scenarios was actually forecast, meaning that a computer model was developed from commercially available software using land use assumptions. This was the medium growth scenario, which was based upon the adopted county-wide population forecasts. The low and high scenarios were projected (or factored) to create a set of scenarios. Because it was known that the median forecast would be used, the purpose of the low and high scenarios was to create "what if" pictures.

The analytical process entailed comparing future conditions against a set of criteria. Four terms are important here, those of criteria, measures of effectiveness, standards, and performance measures. Criteria are used to compare the alternatives against each other and against standards, where they exist. Criteria can also be thought of as categories of impacts. Measures of effectiveness (MOE) are the actual metric by which the criteria are evaluated. For instance, a criterion for environmental impacts may include an MOE for "wetlands impact", measured by acre. Thus, the criteria for wetland impacts have compared the alternatives against each other on this basis, with a possible unidentified and un-agreed upon standard of unacceptable limit that varies from individual to individual. Standards are established limits upon what is and isn't acceptable.

Standards are usually based upon some established measurement system, with the standard varying from agency to agency. For instance, traffic impacts are usually measured against a level of service standard established by the Transportation Research Board (TRB). These levels of service are noted as A – F, with A being excellent and F being very poor. However, TRB does not say what is acceptable and what is not. It is up to the Sub-Regional Transportation Organization (S-RTPO) and Metropolitan Planning Organization (MPO) to decide this. What's more, it is common practice to set one standard for rural conditions and another for urban.

Performance measures, on the other hand, are applied after the plan is complete. The performance measures are a tracking mechanism for the transportation system's operations, for the planning process, and for implementation. Tracking is usually a data intensive exercise (and therefore expensive) and should be done strategically.

Washington State legislation requires that least cost planning be incorporated into regional transportation plans. The Washington State Department of Transportation (WSDOT) provides guidelines that give maximum flexibility to the RTPOs in applying least cost planning.

Agency Involvement

The Regional Transportation Planning Organization and the Metropolitan Planning Organization are each directed by a Policy Board of elected officials from the county, cities, tribe, ports, Skagit Council of Governments (SCOG), and WSDOT. They were the decision making body for this plan and all substantive issues during the planning process. The technical advisory committee is made up of staff people from these same agencies. They provide recommendations to the Policy Board on substantive issues and make decisions on lesser technical issues. Each meets once a month in meetings open to the public.

Each of these agencies supported the planning process by supplying data from their own planning and monitoring processes, greatly enhancing the process while helping to make it cost effective. Because each agency has its own planning process with its own schedule, the dates for data are not always aligned. Where it was necessary to have them in alignment, straight-line projections were applied, unless otherwise noted.

Standards

The standards that are most relevant to producing this plan are for roadway design, level of service, and transit service. Standards often come from a common source, but the selected levels vary. Table 7-1 shows level of service standards for the various agencies. As can be seen, most use the Highway Capacity Manual (HCM), but apply it differently. The American Association of State Highway Transportation Officials "A Policy on Geometric Design of Highways and Streets" (known as the AASHTO Green Book) is a common source for design standards.

Table 7-1
Level of Service Standards

Agency	Standards	Comments
Skagit County	LOS C, except LOS D for road segments which have > 7,000 ADT, are not federally functionally classified as a Local Access Road, and are designated as a county Freight and Goods Transportation Route.	LOS C except for major state and Federal routes
Mount Vernon	o Arterial D o Collectors C o Various exceptions	1994 HCM
Burlington	C Except on Burlington Blvd. where it is D	1985 HCM
Sedro-Woolley	o Principal arterials – D o Secondary arterials – C o collectors -C	HCM
Anacortes	C except the South March Point Annexation area, which is D	1998 HCM
LaConner	C	HCM
Concrete	C	HCM
Lyman		
Hamilton		
WSDOT	Urban 10, Rural 6	Congestion Index

Criteria

In evaluating the scenarios for this plan, a set of criteria were developed. The criteria were selected to cover a range of concerns, transportation performance, the environment, social impacts, and finances. Each criterion defined an area of concern. The actual measurement was defined as a measure of effectiveness (MOE). It was important that each criterion help inform individuals and agencies as to the effects of increased travel and infrastructure to support the growth.

The methods used for measuring the MOE are understandably approximate in most cases when applied to a regional transportation plan. The important thing for accuracy is that the methodology provide for good comparisons between the alternatives and that areas of potential inaccuracies be identified. The criteria and MOEs selected were:

Table 7-2
Criteria and Measures of Effectiveness

Criteria	Measurement
Congestion	Miles of freeway/arterial below level of service standards
Inter-modal connectivity	Number of new connections
System usage	Vehicle miles traveled
Cost effectiveness	Benefit-cost ratio
Displacements	Acres impacted
Air quality	Emissions as measured from the model
Wetland impacts	Acres impacted by alternative
Floodplain impacts	Acres impacted by alternative
Consistency with local plans	Proposed projects not in existing plans

These measurements provided information about the relative impacts of growth in the county for different levels of growth, as they pertain to the needed transportation improvements at those levels. This information was available at the public meetings held in January of 2005 and on the SCOG website.

Performance Measures

A set of performance measures was adopted at the end of the planning process. These performance measures will provide feedback on the planning process in the S-RTPO and MPO in upcoming years. The performance measures are keyed to the policies and goals. Key considerations in selecting the performance measures were their relationship to the agency's mission and the ability of the staff to provide the measurements in a timely manner. The measurement and reporting will be timed to the preparation of the Unified Planning Work Program (UPWP) so that performance can be reflected in the priorities for the upcoming year. The performance measures are discussed in Chapter 10.

Benefit Cost Analysis

A benefit cost analysis is a key element of least cost planning. No methodology has been developed for rural transportation regional plans so one was proposed for this plan. However, reliable data in almost every area makes application of the methodology impractical. Establishing the social costs of motor vehicle use has been studied by numerous researchers but has not resulted in any agreement amongst them and the differences are great. Social costs are costs such as air pollution, noise impacts, etc. Not only are the results of such analyses not in agreement, but the methodologies are different from one researcher to the next and from one type of cost to the next for the same researcher. These methods include cost of damage, cost of mitigation, stated preference surveys, revealed preference surveys, and macroeconomic analysis. In many cases little data is available, and much of it is from large metropolitan areas. Mark Delucchi, University of California, Davis, and one of the most respected researchers in this area provides some relief with his often cited statement, "Indeed, it is obvious to me that the total social benefits of motor-vehicle use vastly exceed the total social costs".

Mr. Delucchi's statement leads one to believe that social costs can be ignored when doing benefit cost analysis for highway projects and focusing on the direct costs and benefits. That is, unless one wants to justify these projects on the basis of social benefits, but this would bring us full circle to the problem of the unreliability of the analytical methods. An additional handicap in this type of analysis is the lack of data even comparable to that of motorized vehicles on many other modes. This leaves an analysis of the direct engineering factors, which requires far too much information and analysis for a rural/small urban area regional plan, especially for estimating accident costs and benefits over twenty years.

The best way to approach this problem appears to be to ensure that the projects selected have a good mix of modes, public support, and demonstrated need. When these projects reach the design stage and more information is available, benefit cost analyses can then be developed to support decisions to fund and build them.

The Alternatives Considered

The draft scenarios for the plan were based on the concept of using the low, intermediate, and high Growth Management Act (GMA) population forecasts from the state. For the sake of the plan, the low growth alternative matched the GMA forecast low growth scenario, while the high growth alternative matched the GMA intermediate forecast, and the medium growth alternative matched the adopted county plan, in between the GMA low and intermediate forecasts.

Transportation emphasis areas were then chosen for each of these growth scenarios. Those strategies are:

Low Growth
- Freight
- Intelligent Transportation Systems (ITS)
- Transit (and other) accessibility
- Safety in existing programs
- Transportation demand management (TDM) & short headways in high use transit corridor

Intermediate Growth
- Low growth alternatives
- Safety
- Capacity
- Extension of existing routes/gaps

High Growth
- Low and intermediate alternatives
- New routes & programs

Project lists were then put together representing each emphasis area, but not restricted to them. In addition to the alternatives listed above, a list of placeholders was developed at intersections that were predicted to have unacceptable levels of service in 2025, and with no otherwise identified projects to address deficiencies.

Cost Estimates

Each agency developed cost estimates for projects within its jurisdiction. In some cases these cost estimates have been refined by engineering analysis, but in others they are planning level estimates. Planning level estimates are generally made with a limited amount of information and can change significantly when the project gets closer and more information is available. Changes in cost estimates are usually upwards when factors previously unknown become known, but they can sometimes be lower. Cost estimates can also change as a result of changing and unanticipated conditions such as new regulations and technologies.

For this plan most of the cost estimates for intersection improvements used a plug-in value based on the traffic levels at the intersections with unacceptable levels of service. While this will result in large errors project to project, it is hoped that they average out. The cost estimate for intelligent transportation systems (ITS) is not based on specific projects, but is just a

reasonable set-aside for these types of projects. No inflation factors were used so all values are in 2005 dollars.

Least Cost Planning

State legislation requires that regional transportation plans updated after July 1, 2000 incorporate least cost planning. While no specific methodology is defined, the state did work with the Federal Highway Administration to produce a report entitled "Least Cost Planning: Principles, Applications and Issues". The principles of least cost planning identified in the report are:

- An emphasis on developing system-level plans
- Consideration of all alternatives, including demand management approaches
- Explicit accounting for uncertainty in the estimation of benefits and costs
- Public involvement in the decision-making process
- Coordination amongst jurisdictions
- Monitoring and updating plans to reflect new information about demand for different facilities and the cost-effectiveness of different approaches.

Regional plans are the ideal system-level plan for this type of application. They are multi-jurisdictional and usually include redundancies in the system across modes. For this plan systems-level planning is best reflected in the interconnectivity of the highway system, the non-motorized system, the transit system, and ITS elements. Each of these systems also has important inter-regional aspects. The ferry system, the rail system, and air transport system are best understood at the inter-regional level.

The range of alternatives defined in this plan is not concentrated on any one mode. If fully implemented, no system will experience more growth than the transit system.

Uncertainty of costs and benefits is identified throughout the document as analytical methods are discussed. Any planning process incorporates assumptions about the future. It is usually fairly easy to make good predictions over short periods of time, but even then, abrupt changes from trends or expectations will result in deviations, some of considerable consequence. Over the 20 year planning horizon addressed here, there will be many unexpected events of large impact, but even small changes will have significant impacts when applied over those longer periods of time. An act of terrorism is an example of an act that can have immediate and possibly large impact. Foreign competition in an import local industry is something that can be felt gradually, but become significant over time. Each can affect the demand for transportation services.

Public involvement was an important part of the development of this plan. Six public meetings provided the opportunity for the public to meet with project staff on a one-on-one basis, but the distribution of the newsletter to all mail boxes in the county provided the best coverage. The website at the Council of Governments was available on an on-going basis, as was the staff themselves.

Coordination with jurisdictions occurred throughout the planning process with monthly meetings of the technical advisory committee and the policy board, as well as additional meetings when deemed necessary.

Monitoring will occur through tracking of the performance measures identified earlier in this chapter. That tracking will occur each year in conjunction with the unified planning work program so that the results can be reflected in the activities of the planning agency.

Results

Table 7-1 provides a level of service analysis for the freeway facilities on Skagit County for 2025 assuming the same highway system that exists in 2005. The No-Build column shows the level of service without the proposed improvements and the build with additional lanes. All sections would be at an acceptable level of service with the improvements. Table 7-2 shows the level of service at

Table 7-1
Interstate 5 Level of Service Analysis for 2025 – No Build

Section	No-Build	Build
SR 534 to Old 99	C	C
Old 99 to Anderson Road	E	C
Anderson Road to Kincaid Street	D	C
Kincaid Street to College Way	E	C
College Way to George Hopper Interchange	E	C
George Hopper Interchange to SR 20	D	D
SR 20 to SR 11	D	C
SR 11 to Cook Road	D	C
Cook Road to Bow Hill	D	C
Bow Hill to County Line	C	C

signalized intersections for three different conditions. The 2005 analysis is for the highway system as of the end of 2005. Because these values are taken from a

computerized model of the transportation system, there may be some variation with values derived from field evaluations.
The column labeled 2025 provides values for the same intersections in 2025 NB (no build) without the projects identified in this plan being built. The last column, 2025 P (Plan) shows the level of service after the proposed projects are incorporated into the model. All projects with levels of service E or F have projects proposed in this plan, but the actual design is unknown and is not reflected in the model. It is hoped that the proposed projects would bring all of the intersections up to an acceptable level of service.

Table 7-2
Signalized Intersection Level of Service Analysis

Intersection	Location	2005	2025 NB	2025 P
SR20 Spur & Ferry Terminal Rd	Anacortes	A	A	A
12th St (SR20 Spur) & D Ave	Anacortes	A	A	A
12th St (SR20 Spur) & M Ave	Anacortes	A	C	C
Commercial Ave (SR20 Spur) & 12th St	Anacortes	A	A	A
Commercial Ave & 6th St	Anacortes	A	A	A
Commercial Ave & 8th St	Anacortes	A	A	A
17th St & Q Ave	Anacortes	A	A	A
Commercial Ave (SR20 Spur) & 17th St	Anacortes	A	D	D
Commercial Ave (SR20 Spur) & 22nd St	Anacortes	A	C	C
Commercial Ave (SR20 Spur) & 32nd St	Anacortes	A	C	C
SR20 Spur & R Ave	Anacortes	A	C	B
SR20 & SR20 Spur	Anacortes	A	E	C
SR20 & March's Point Rd	Anacortes	A	E	C
SR20 & Reservation Rd	Anacortes	A	E	C
SR20 & La Conner Whitney Rd	Skagit County	A	E	C
SR20 & Best Rd	Skagit County	A	D	C
SR20 & Memorial Hwy (SR536)	Skagit County	C	D	D
SR20 & Avon Allen Rd	Skagit County	A	D	C
Memorial Hwy (SR536) & Avon Allen Rd	Skagit County	A	B	A
Division St (SR536) & Wall St	Mount Vernon	A	C	A
Division St (SR536) & Freeway Dr	Mount Vernon	A	D	C
1st St & Gates St	Mount Vernon	A	B	B
2nd St & Montgomery St	Mount Vernon	C	F	F
2nd St & Gates St	Mount Vernon	A	C	C
2nd St & Kincaid St	Mount Vernon	A	B	A
3rd St (SR536) & Montgomery St	Mount Vernon	A	A	A
3rd St (SR536) & Kincaid St	Mount Vernon	A	C	C
Kincaid St (SR536) & I5 SB ramps	Mount Vernon	B	E	D
Kincaid St (SR536) & I5 NB ramps	Mount Vernon	B	F	D

2nd St & Blackburn Rd	Mount Vernon	A	A	B
Division St & 15th St	Mount Vernon	A	C	B
Division St & 18th St	Mount Vernon	A	B	A
Division St & Laventure Rd	Mount Vernon	A	A	A
Division St & 25th St	Mount Vernon	A	A	A
4th St & Fulton St	Mount Vernon	A	D	C
Freeway Dr & Cameron Way	Mount Vernon	A	A	A
4th St & Fir St	Mount Vernon	A	D	D
Fir St & 18th St	Mount Vernon	A	C	B
Fir St & Laventure Rd	Mount Vernon	A	A	A
Riverside Dr & Roosevelt Ave	Mount Vernon	A	D	D
Riverside Dr & Commercial St	Mount Vernon	A	A	A
Riverside Dr & Pacific Pl	Mount Vernon	A	E	E
College Way & Freeway Dr	Mount Vernon	A	B	E
College Way (SR538) & Riverside Dr	Mount Vernon	C	E	E
College Way (SR538) & Market St	Mount Vernon	A	E	E
College Way (SR538) & NB I-5 ramps	Mount Vernon	E	F	F
College Way (SR538) & SB I-5 ramps	Mount Vernon	B	E	F
College Way (SR538) & Continental Pl	Mount Vernon	A	D	D
College Way (SR538) & 18th St	Mount Vernon	A	D	D
College Way (SR538) & Laventure Rd	Mount Vernon	A	D	D
College Way (SR538) & Martin Rd	Mount Vernon	A	A	A
Burlington Blvd & Whitmarsh Rd	Burlington	A	D	C
Burlington Blvd & George Hopper Rd	Burlington	A	C	C
George Hopper Rd & Costco Dr	Burlington	A	A	A
George Hopper Rd & I-5 NB ramps	Burlington	A	B	B
George Hopper Rd & I-5 SB ramps	Burlington	A	A	A
Burlington Blvd & Costco Dr	Burlington	A	E	E
Burlington Blvd & Pease Rd	Burlington	B	F	F
Burlington Blvd & Cascade Mall Dr S	Burlington	A	C	C
Burlington Blvd & Cascade Mall Dr N	Burlington	A	C	C
Burlington Blvd & Gilkey	Burlington	A	C	C
Burlington Blvd & Sharon Ave	Burlington	A	B	B
Fairhaven Ave & Spruce St	Burlington	A	C	C
SR20 & Burlington Blvd	Burlington	C	E	F
Burlington Blvd & Fairhaven Ave	Burlington	B	D	D
Burlington Blvd (SR20) & Avon Ave	Burlington	A	C	C
SR20 & Haggen Dr	Burlington	A	C	D
SR20 & I-5 NB ramps	Burlington	C	E	E
SR20 & Goldenrod Rd	Burlington	B	E	E
Burlington Blvd & Old Hwy 99 N	Burlington	A	C	B
Burlington Blvd & I-5 NB ramps	Burlington	A	D	A
Bow Hill Rd & Dark Lane	Skagit County	A	A	A
Cook Rd & Old Hwy 99 N	Skagit County	A	A	A
Cascade Hwy (SR20) & Collins Rd	Skagit County	B	C	C

SR9 & State St	Sedro-Woolley	A	C	A
Cascade Hwy (SR20) & Rhodes Rd	Sedro-Woolley	A	B	B
Cascade Hwy (SR20) & State St	Sedro-Woolley	A	B	B
Cascade Hwy (SR20) & SR9	Sedro-Woolley	A	C	B
Cascade Hwy (SR20, SR9) & Ferry St	Sedro-Woolley	A	B	C
Moore St (SR20) & SR9	Sedro-Woolley	A	D	B
SR20 & Fruitdale	Sedro-Woolley	NA	B	A
College Way (SR538) & Urban Ave	Mount Vernon	NA	E	E
Hoag Rd & Urban Ave	Mount Vernon	NA	D	C
SR20 & Thompson Rd	Anacortes	NA	D	C
SR20 & Reed St	Sedro-Woolley	NA	NA	A
Cook Rd & Trail Rd	Sedro-Woolley	NA	NA	A

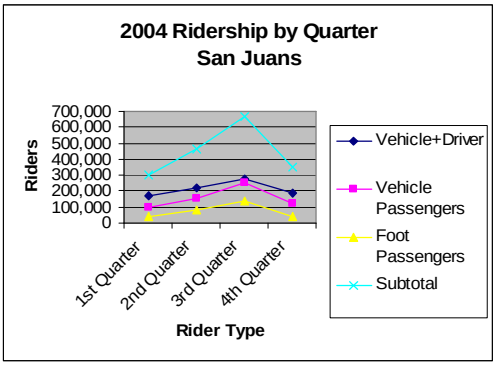
Level of service analyses were also conducted for two-lane rural highways; urban streets, and multi-lane highways other than freeways. Less precise methods than those for the tables above were used, but adequate for identifying needed improvements for 20 years.

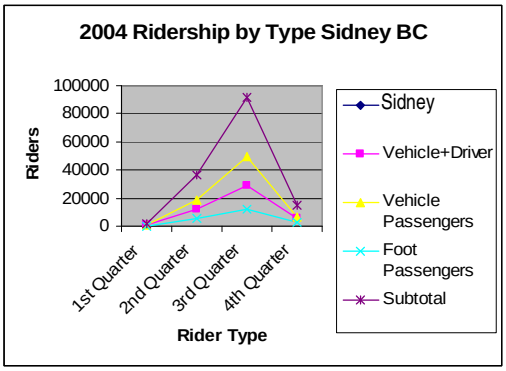
Washington State Ferries

The Washington State Ferry system provides service to the San Juan Islands and British Columbia at Sidney via a ferry terminal in Anacortes. These services are particularly popular during the summer, resulting in impacts to the highway system, especially between Anacortes and Interstate 5. Table 7-3 below summarized the service for 2004 by quarter with graphics to show how the calendar quarters differ in demand levels.

Table 7-3
Washington State Ferry Ridership 2004

2004 Ridership	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
San Juans				
Vehicle+Driver	166,928	223,008	279,846	184,506
Vehicle Passengers	97,246	158,482	249,320	118,768
Foot Passengers	36,690	81,712	136,588	44,510
Subtotal	300,864	463,202	665,754	347,784
Sindey				
Vehicle+Driver	775	12,044	29,220	5,552
Vehicle Passengers	1,138	18,637	49,453	6,906
Foot Passengers	397	5,799	12,587	2,936
Subtotal	2,310	36,480	91,260	15,394
Total	303,174	499,682	757,014	363,178





Guemes Island Ferry

Skagit County is one of four counties in the state of Washington that operates its own ferry system. The Guemes Island ferry connects Anacortes with Guemes Island, a largely residential island. The ferry operates on four schedules, Monday – Thursday, Friday, Saturday, and Sunday. Fridays have the most runs with 24 between 6:30 a.m. and midnight. It takes about 25 minutes for a roundtrip.