Final Technical Memorandum

Mode Growth Forecasts
Subtask 2C(c)

February 2, 2005

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Introduction

This technical memorandum presents recommended modal growth forecasts as the required deliverable under Task 2C(c) of the Oregon Transportation Plan update. The forecasts are based upon information from various planning and policy documents, including the 1992 *Oregon Transportation Plan* (OTP), modal plans for highway, public transportation and freight modes, and other studies that updated or compiled information on trends and forecasts for each mode.

The technical memorandum presents forecasts for highway passenger and freight, public transportation, air passenger and freight, rail passenger and freight, and water transportation (split into both inland barge and ocean marine components). Each modal section sets out a summary table of existing and recommended forecasts for a 2030 horizon year. These forecasts are extrapolated at a compounded growth rate and graphically depicted.

Summary of Findings

A summary of the recommended annual growth rates and the resulting year 2030 modal usage is displayed in Table 1. The data indicate that air passenger is projected to have the largest annual growth rate of the analyzed modes, followed by rail passenger and public transportation. All modes, except deep draft and shallow draft marine freight, are projected to have annual growth rates in excess of the projected annual population increase of 1.20 percent between 2000 and 2025.

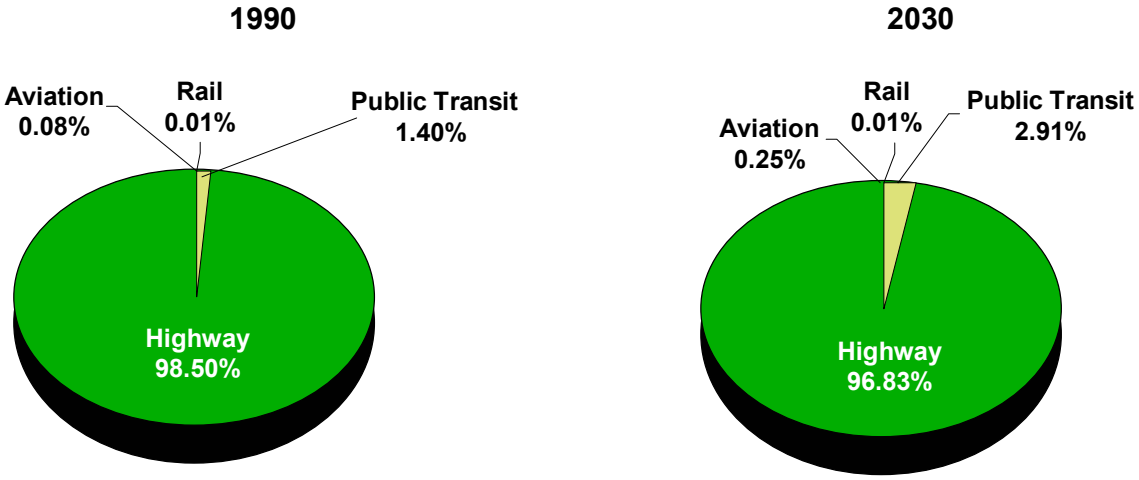
Table 1 – Summary Modal Growth Forecast Recommendations

Modal Element	Annual Growth Rate *(2004 to 2030)*	2030 Forecast
Highway – *billions of annual VMT*	1.35%	49.4
Light Vehicle VMT	1.35%	45.8
Trucks and Heavy Vehicle VMT	1.40%	3.6
Public Transportation – *millions of annual passengers*	3.16%	248.5
Air Passenger – *millions of annual enplanements*	4.24%	21.5
Air Freight – *thousands of annual tons*	3.90%	967
Rail Freight – *millions of annual tons*	1.73%	70.4
Rail Passenger (Intercity) – thousands of annual riders	3.6%	1,006
Deep Draft (Ocean) Marine Freight – *millions of annual tons*	0.97%	30.6
Shallow Draft (Barge) Marine Freight – *millions of annual tons*	0.29%	15.1

The relative share of passenger trips across the four primary passenger modes (air; heavy rail; public transportation, including light and commuter rail; and highway passenger VMT) was calculated for both 1990 and 2030 to observe trends in this time span. Mode data for the 1990 base year and 2030 forecast year (using the recommended growth rates in this technical memorandum) were converted to person trip to determine the modal shares.[1]

Figure 1 displays the calculated passenger travel mode shares in 1990 and 2030. Although the highway mode share is projected to decrease by nearly two percentage points between 1990 and 2030, the vast majority of passenger trips is projected to occur on the highway in 2030, as was the case in 1990. The bulk of the transferred trips would be taken up by public transit, with the air mode share also projected to increase slightly.

Figure 1 – Mode Share for Passenger Travel
Percent of Annual Person-Trips on Each Mode



Calculations were made using the 1995 Nationwide Personal Transportation Survey (NPTS) which may not entirely reflect trends through 2030, but were considered to be an approximate descriptor of travel characteristics. The 2001 National Household Travel Survey (NHTS) numbers, based upon trip purpose, were not found suitable for making aggregate calculations as required here.

[1] VMT from the highway mode for 1990 and 2030 were separated into passenger and freight trips based upon light-, medium-, and heavy-vehicle ratios from the Oregon Department of Transportation (ODOT) *Congestion Management Report*. (Light vehicles accounted for 93 percent of vehicle miles traveled (VMT) in 1990, and was decreasing at a rate of 0.037 percent per year.) Light-vehicle trips were assumed to be passenger vehicle trips in the absence of detailed information on freight or passenger trip percentages. These proportions were then converted into person trips using the following equation:

Number of person-trips = (Passenger Vehicle VMT ÷ Average Trip Length) x Vehicle Occupancy Rate

In absence of other more recent data, the 1995 NPTS was assumed to be representative of the average trip lengths (9.13 miles) and occupancy rates (1.6 persons per vehicle) through 2025.

Highway Passenger and Freight

Table 2 summarizes forecasts of highway VMT for the 1992 Oregon Transportation Plan (OTP) base case, the 1998-1999 *Oregon Highway Plan*, the Highway Cost Allocation Study, and ODOT's Office of Financial and Economic Analysis. These VMT forecasts include all vehicles traveling on public roadways in Oregon, including automobiles, light and heavy trucks, transit buses, emergency vehicles, motorcycles, and the like. Actual VMT estimates between 1990 and 2002 from multiple state and federal sources are also shown in Table 2. Finally, economic growth (proxied by general fund revenues) and population forecasts are shown in Table 2.

Figure 2 shows the recommended total VMT forecast over time in relation to other VMT forecasts and past trends. The 1992 OTP state trend line differs from the more recent forecasts and observations, showing steep increases over time, thereby, over-predicting VMT growth. At the other end of the growth spectrum is the Highway Cost Allocation Study with a 1.08 percent growth; however, this is a very short-term projection that appears to be overly influenced by economic conditions in 2001 and 2002.

Year-by-year VMT data reported by ODOT's Office of Financial and Economic Analysis shows a wide variation in VMT growth. While the overall observed trend between 1990 and 2002 was an average 2.0 percent annual growth, actual year-to-growth varied between -0.5 percent and +4.0 percent.

The VMT observations for the 1990 to 2002 time period exhibit a fairly tight annual growth rate band between 1.9 percent and 2.2 percent. This growth rate is barely above the annual average population growth rate of 1.87 percent achieved during the 1990s, suggesting that VMT per capita increased only slightly during a period of rapid economic expansion across the United States.

Although Oregon's general fund revenues are projected to grow at an average annual rate of 4.22 percent between the 1999 and 2007 biennium, the team believes that the trend toward stabilizing rates of VMT per capita in solidly in place in Oregon and elsewhere.[2] Given this trend and the projected annual population growth rate of 1.20 percent out to 2025, the team recommends that the annual VMT growth rate of 1.35 percent from the *Oregon Highway Plan* be adopted for use in the OTP update. This growth rate results in a forecast of 49.4 billion total VMT in 2030.

In general, the passenger vehicle VMT seems to be decreasing in percentage composition since 1990, and it is believed that this trend will continue. Forecasts for passenger and heavy vehicle VMT were made by multiplying the total VMT forecasts by the projected change in heavy/light vehicle composition. This resulted in the suggestion of an annual growth rate of 1.35 percent for passenger and 1.40 percent for heavy vehicle VMT with a percentage split of 92.8 percent and 7.2 percent, respectively, in 2030.

[2] The fact that VMT grew at an annual rate of 1.9 percent annual rate at the same time (1990 to 2002) that Oregon's general fund grew at a 5.7 percent annual rate further strengthens this observation.

Table 2 – Highway Forecast Summary (VMT in Billions; Population in Millions)

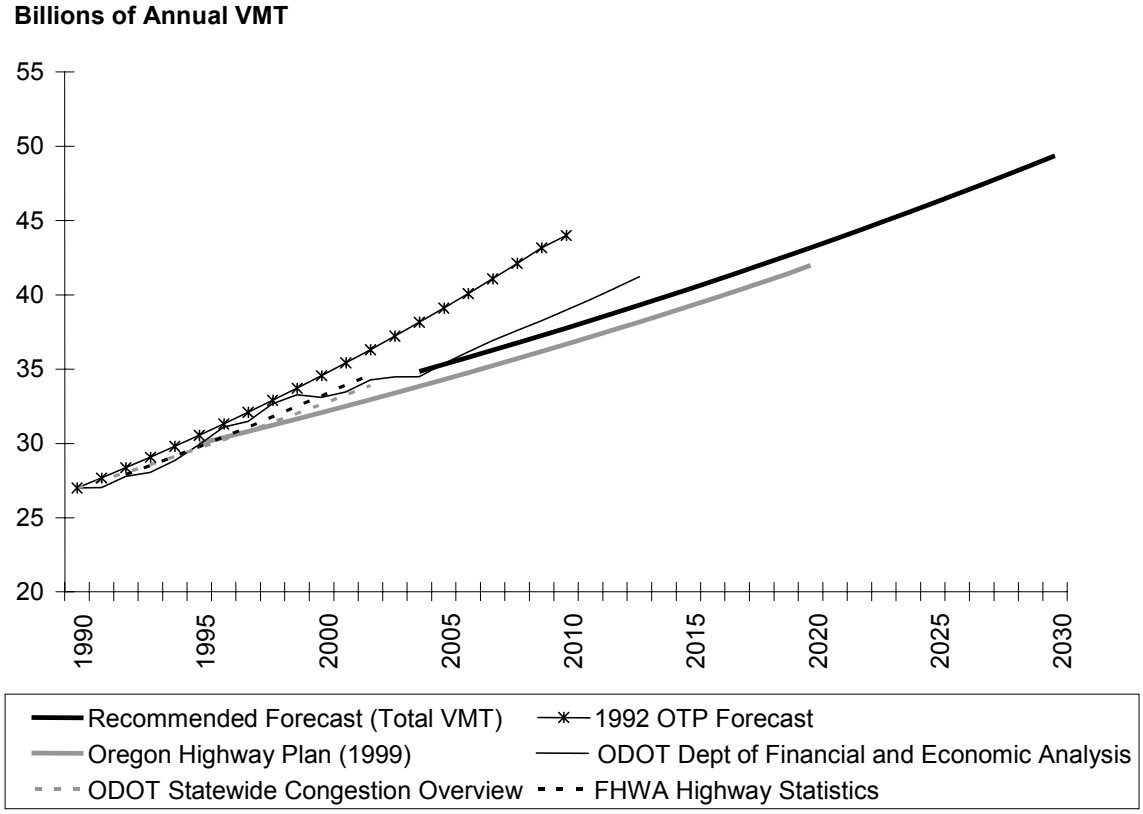
Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – billions of annual VMT					
State	27 *(1990)*	44 *(2010)*	2.5% (1990-2010)	33.92 *(2002)*	1.9% *(1990-2002)*
Metro	9 *(1990)*	16 *(2025)*	2.9% (1990-2025)		
Oregon Highway Plan (1998-1999) – billions of annual VMT					
State	30 (1995)	42 *(2020)*	1.35% (1995-2020)		
Other VMT Forecasts – billions of annual VMT					
Office of Economic Analysis: 2003 Highway Cost Allocation Study	33.7 *(2001)*	34.8 *(2004)*	1.08% (2001-2004)		
ODOT Office of Financial and Economic Analysis (2004)	27.01 *(1990)*	41.23 *(2012)*	1.80% (2002-2012)	34.5 (2002)	2.0% *(1990-2002)*
ODOT Statewide Congestion Overview – billions of annual VMT					
Highway Passenger VMT	25.1 *(1990) (93.0% of total)*			31.5 *(2002) (92.9% of total)*	1.91% *(1990-2002)*
Highway Medium and Heavy Truck VMT	1.9 *(1990) (7.0% of total)*			2.4 *(2002) (7.1% of total)*	2.0% *(1990-2002)*
FHWA Highway Statistics – billions of annual VMT					
Total (Table VM-2)	27.9 (1992)			34.6 *(2002)*	2.2% *(1992-2002)*
Light Vehicle (passenger cars and other 2- axle 4-tire vehicles)				31.8 (91.9% of total)[1]	
Heavy Vehicle (single-unit 2-axle 6-tire or more and combination trucks)				2.8 (8.1% of total)[1]	

Table 2 – Highway Forecast Summary (VMT in Billions; Population in Millions) (continued)

Revenue Forecast – millions of 2000 dollars					
Department of Administrative Services Economic Forecasts: General Fund Revenue Forecast	8,737 (1999-2001)	13,217 (2007-2009)	4.22%		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[2]	4.56 *(2025)*[3]	1.36% (1990-2025)	3.42 *(2000)*[2]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended VMT Forecast – billions of annual VMT	**34.8 (2004)**	**49.4 *(2030)***	**1.35% (2004-2030)**		
Recommended Passenger VMT Forecast		**45.8 (2030 – 92.8% of total)**	**1.35%**		
Recommended Freight VMT Forecast		**3.6 (2030 – 7.2% of total)**	**1.40%**		

n/a – Data not available from this source.
[1] Percentages imputed from "Total Rural and Urban" VMT is Highway Statistics 2002, Table VM-1.
[2] Bureau of Census compiled by Oregon Office of Economic Analysis (http://www.oea.das.state.or.us/DAS/OEA/docs/census2000/OR_county_place_1990-2000.pdf).
[3] Oregon Office of Economic Analysis Long-Term Demographic Forecast (http://www.oea.das.state.or.us/DAS/OEA/demographic.shtml#Long-term%20Population%20Forecast).

Figure 2 – Alternative Forecasts of Highway VMT



Public Transportation

Table 3 summarizes forecasts of annual passenger trips from the 1992 OTP base case and the 1997 *Oregon Public Transportation Plan* (Scenario 3). Annual weekday boardings from Portland Metro's *2004 Federal Update to the Regional Transportation Plan* (RTP), as well as population forecasts and recent observations are also included in Table 3. Actual growth is shown in comparison to the forecast growth rate for the OTP forecasts.

In general, both statewide and Portland transit growth rates have been higher than forecast in the OTP base case. (The OTP "preferred policy" had much higher forecasts, which were dependent on investment levels.) However, these past growth trends were likely strongly influenced due to opening of two light-rail lines in Portland during that time. Transit ridership projections from the Metro RTP reflect that Portland's transit market is maturing, with an average annual growth rate that is less than that predicted in the 1997 Oregon Public Transportation Plan, and only marginally above the rate predicted in the 1992 OTP Base Case. Figure 3 illustrates these relationships.

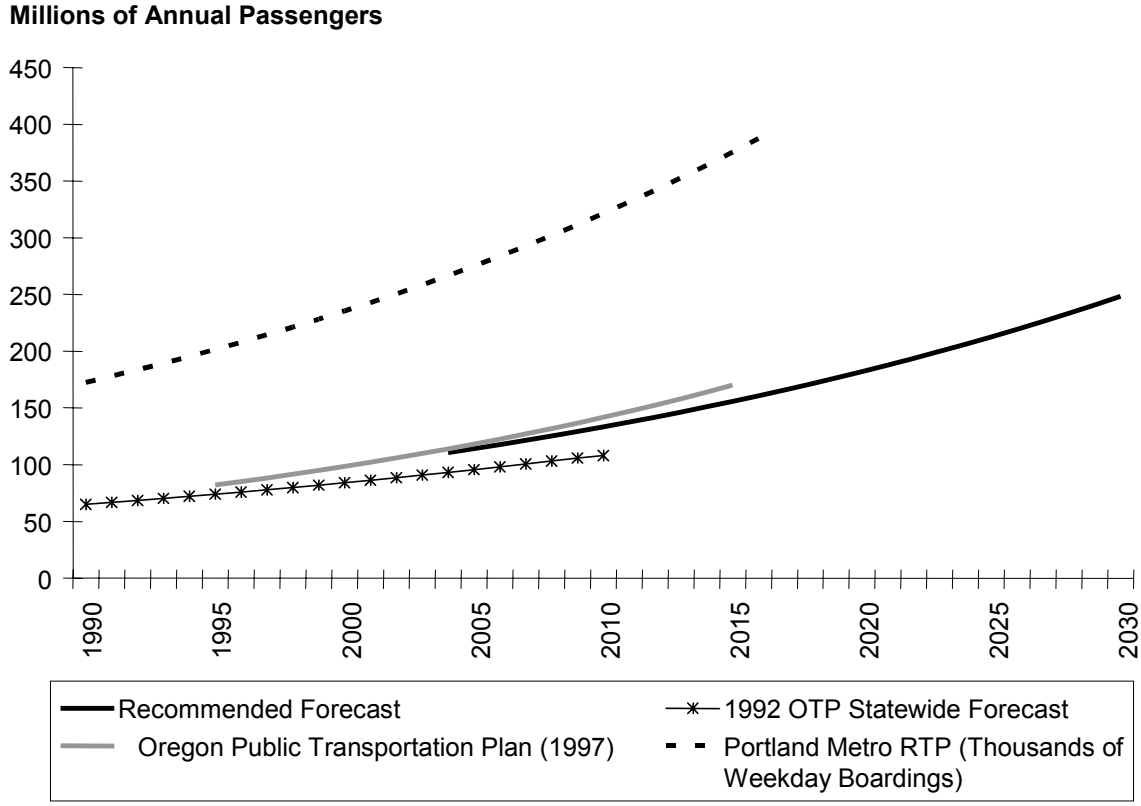
Given these considerations, the team suggests that an annual growth rate of 3.16 percent in public transportation ridership be adopted for the OTP update. The team believes that reliance on Metro's growth rate is appropriate since Portland's transit ridership accounts for about 90 percent of statewide transit usage, and this forecast extends to 2020 (the latest of the available alternative forecasts).

Table 3 – Public Transportation Forecast Summary (Passengers in Millions; Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – millions of annual passengers					
State	65 *(1990)*	108 *(2010)*	2.6% (1990-2010)	104 *(2002)*[1]	4.0% *(1990-2002)*
Metro	55 *(1990)*	97 *(2010)*	2.9% (1990-2010)	88 *(2002)*[1]	4.0% *(1990-2002)*
Oregon Public Transportation Plan (1997) – millions of annual passengers					
Statewide	82 (1995)	170 *(2015)*	3.71% (1995-2015)		
Metro Regional Transportation Plan (2000) – average weekday transit trips					
Metro	172,464 *(1994)*	387,527 *(2020)*	3.16% (1994-2020)		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[1]	4.56 *(2025)*[2]	1.36% (1990-2025)	3.42 *(2000)*[3]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended State Forecast –°millions of annual passengers	**104.0 (2002)**	**248.5 *(2030)***	**3.16% (2004-2030)**		

[1] ODOT Public Transportation presentation for OTP Update: figure shown is for comparable systems to OTP 1990 data, which for 1990 did not include special needs ridership.
[2] Oregon Office of Economic Analysis Long-Term Demographic Forecast.
[3] Bureau of Census compiled by Oregon Office of Economic Analysis.

Figure 3 – Alternative Forecasts of Public Transportation Travel



Air Passenger

Table 4 summarizes forecasts of annual passenger enplanements from the 1992 OTP base case, the 2000 *Oregon Aviation Plan*, the 2000 *Portland International Airport (PDX) Master Plan*[3], and the Federal Aviation Administration (FAA). Recent observations and trends for statewide and PDX enplanements, as well as population forecasts, are also included in Table 4.

These alternative forecasts present a wide diversity of potential future air passenger travel in Oregon. The trend lines in Figure 4 further illustrate this diversity. The original OTP forecast is the highest of all data sources, but even this source under-predicted air travel during the mid to late 1990s, as illustrated in Figure 4 by the fact that this statewide forecast was lower than observed enplanements at PDX during this timeframe. The original PDX Master Plan forecast a growth rate (3.4 percent) that was noticeably lower than the rate suggested in the *Oregon Aviation Plan* that was prepared at about the same time.

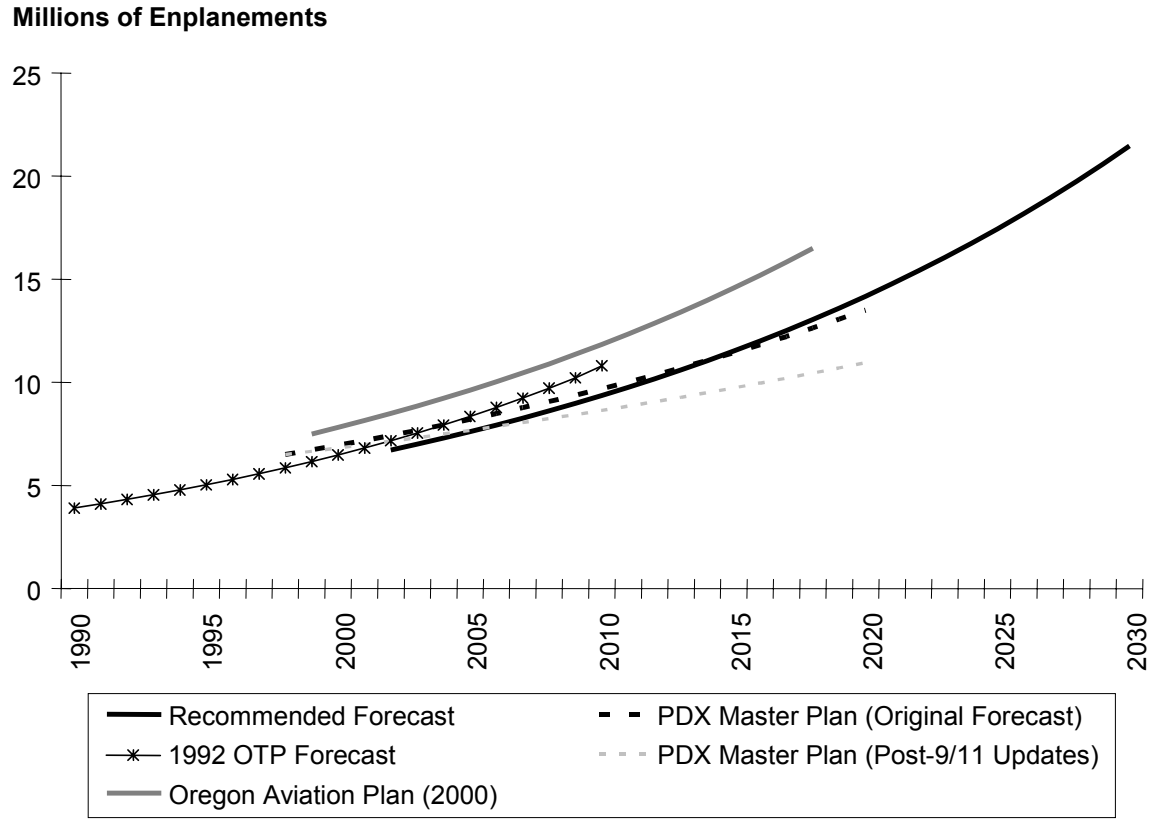
[3] The PDX Master Plan included alternative forecasts when it was originally adopted in September 2000. The original recommendation was for an annual growth rate of 3.4 percent, with a "low range" of 2.4 percent. Subsequent to the 9/11 terrorist attacks, PDX adopted the 2.4 percent "low range" forecast from the 2000 Master Plan as its official interim forecast. Both sets of forecasts are included in Table 4.

Table 4 – Air Passenger Forecast Summary (Enplanements and Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – millions of annual enplanements					
State	3.9 *(1990)*	10.8 *(2010)*	5.2% (1990 to 2010)	4.88 *(1993)* 6.71 *(2002)*	3.6% *(1993-2002)*
Portland				4.24 *(1993)* 6.20 *(2003)*	3.9% *(1993-2003)*
Oregon Aviation Plan (2000) – millions of annual enplanements					
State	7.5 (1999)	16.5 *(2018)*	4.24% (1998-2018)		
Other Forecasts – millions of annual enplanements					
Portland International Airport Master Plan 1999	6.5 *(1998)*	13.5 *(2020)*	3.4% (1998-2020)		
Portland International Airport Master Plan "Post-9/11 Update"	6.5 *(1998)*	10.9 *(2020)*	2.4% (1998-2020)		
FAA Aerospace Forecasts 2004[1]	641.4 (2003)	1,057.6 (2015)	4.3% (2003-2015)		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[2]	4.56 *(2025)*[2]	1.36% (1990-2025)	3.42 *(2000)*[3]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended Forecast – millions of annual enplanements	**6.71 (2002)**	**21.5 *(2030)***	**4.24% (2004-2030)**		

[1] This is a national forecast and includes both domestic and international air cargo carried by large regional and commuter air carriers. Source: FAA Aerospace Forecasts, FY 2004-2015, Table 9.
[2] Oregon Office of Economic Analysis Long-Term Demographic Forecast.
[3] Bureau of Census compiled by Oregon Office of Economic Analysis.

Figure 4 – Alternative Forecasts of Air Passengers



Following the economic recession that began in 2000 and the terrorist attacks of 9/11, PDX adopted an updated annual growth rate projection of 2.4 percent through 2020. However, this updated projection is much lower than the actual growth in enplanements between 1993 and 2003 (which includes the recession and 9/11 terrorist attacks), as well as FAA's annual growth projection of 4.3 percent for nationwide air travel that was adopted in March 2004. Furthermore, recent reports in the media suggest that many major airports have now surpassed pre-9/11 enplanement levels, and appear to be on a pre-9/11 growth trajectory. Indeed, for fiscal year 2004, PDX reported[4] a 3.7 percent growth in year-to-year enplanements, a growth rate higher than predicted in the original PDX Master Plan.

Given the preceding observations, the team recommends using the *Oregon Aviation Plan* growth rate of 4.24 percent per year for the OTP Update, and applying this growth rate to the year 2002 observations of air enplanements (6.71 million) to arrive at the year 2030 statewide forecast total of 21.5 million enplanements.

Air Freight

Table 5 summarizes base year data and forecasts of annual air freight from the Commodity Flow Forecasts (CFF), the FAA short-term and long-term forecasts, and the PDX Airport Master Plan update. Variation exists between the PDX and CFF base year

[4]Source: Portland International Airport, Monthly Traffic Report, June 2004: Fiscal Year Report.

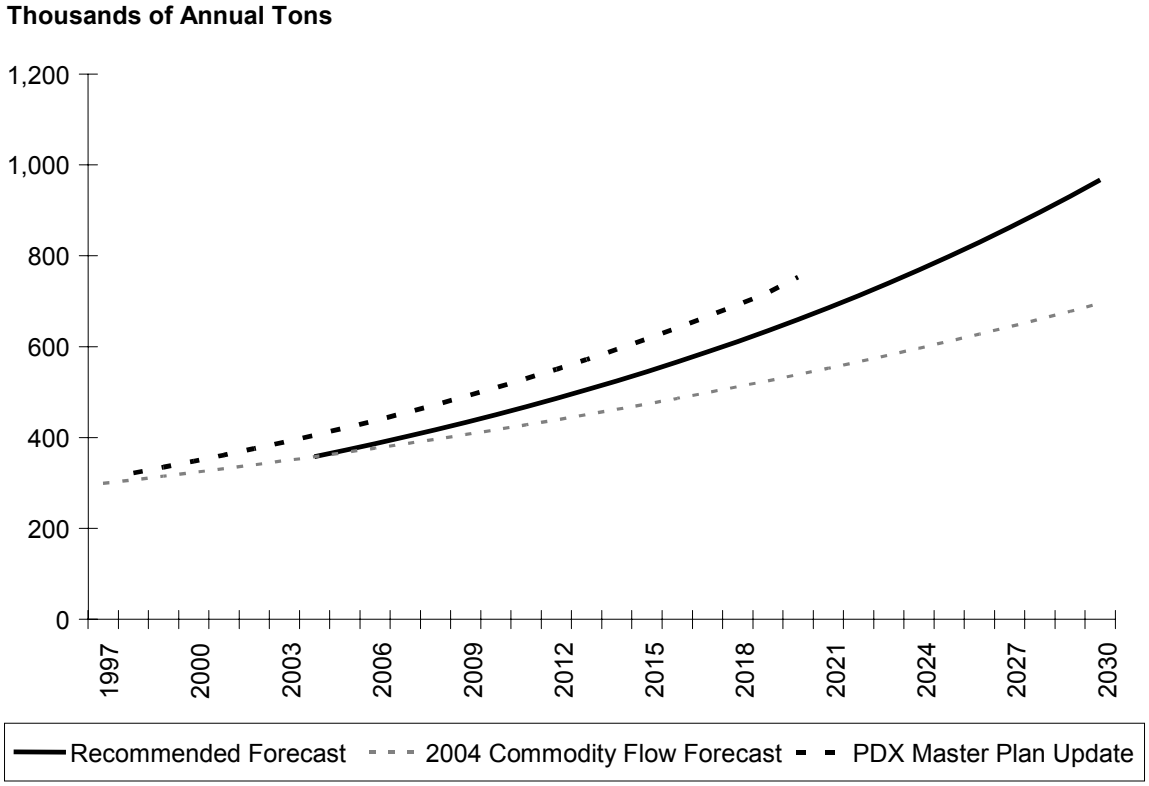
data because the PDX cargo values include mail while the CFF values do not, and the PDX values are specific to shipments out of Portland International Airport while the CFF values includes statewide air cargo.

Table 5 – Air Freight Forecast Summary

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Portland International Airport Master Plan – thousands of annual tons					
PDX Air Cargo Forecasts[1]	322 *(1998)*	753 *(2020)*	3.9% *(1998-2020)*		
Oregon Commodity Flow Forecast – thousands of annual tons					
State	299.1 (1997)	695.0 *(2020)*	2.48% (1997-2020)		
National Air Cargo Forecast – millions of revenue ton-miles					
FAA Aerospace Forecasts 2004[2]	32,887 *(2003)*	56,026 *(2015)*	4.50% (2003-2015)	28,350 (1998)	3.0% (1998-2003)
Recommended Forecast – thousands of annual tons	**358 (2004)**	**967 *(2030)***	**3.9% (2004-2030)**		

[1] http://www.portlandairportpdx.com/MASTER_post_9/11.HTM.
[2] This is a national forecast and includes both domestic and international air cargo carried by either all-cargo or passenger carrier aircraft. Source: FAA Aerospace Forecasts, FY 2004-2015.

Figure 5 – Alternative Forecasts of Air Cargo



After careful consideration, the team recommends that the air freight forecasts for the OTP update use an average annual growth rate of 3.9 percent, which is equivalent to the "post-9/11" update to the PDX Master Plan. The team suggests use of this mid-range forecast for the following reasons:

- The updated PDX forecast is a significant decrease from their original air cargo forecast of 5.1 percent annual growth, and would thus appear to already account for the effects caused by the 9/11 terrorist attacks and the economic recession that began in 2000.

- The CFF is believed to be too low given national air cargo data from the FAA for the years 1998 to 2003. These FAA data, which span the economic upheaval of the late 1990s and early 2000s, show a higher growth rate than projected by the CFF.

- The higher growth rates in FAA's forecasts are heavily influenced by international air cargo shipments, which tend to be less of an influence at Oregon's airports due to the very small number of nonstop and direct international flights.

Use of this growth rate results in a 2030 forecasts of 967,000 annual tons.

Rail Freight and Passenger

Tables 6 and 7 summarize forecasts of annual freight rail tonnage and passenger rail ridership from the 2001 *Oregon Rail Plan*, the 1992 OTP base case, the Freight Analysis

Framework (FAF), and Oregon's 2004 Commodity Flow Forecast updates[5,6]. Actual growth is shown as estimated in the 2001 *Oregon Rail Plan*; forecasts were not developed in this modal plan. Population forecasts and recent observations are also included in Table 5.

After careful consideration of the alternative forecasts, the team recommends an average annual growth rate of 1.73 percent for rail freight traffic. The team believes that this rate, which is equivalent to the value developed for the 2004 Commodity Flow Forecast update, best reflects observed freight rail tonnage growth rates during the 1990s and future population and economic growth rates, and it is also a statewide forecast. This growth rate was applied to the year 1998 observation of rail tonnage (from the 2001 *Oregon Rail Plan)* to arrive at the year 2030 forecast total of 102.3 million annual tons.

Passenger rail forecasts in the *Oregon Rail Plan* were based upon ODOT's goal to increase the number of daily round trips and to reduce the travel time between Portland and Eugene to two hours, 15 minutes. The ODOT service expansion rate of 28.8 percent is based upon service coordination with Washington and British Columbia to provide more through travel opportunities in the corridor. The increased round trips, supplemented by Thruway bus service between Portland and Eugene to connect with new trains between Portland and Seattle, are expected to provide more travel opportunities at times that people wish to travel. According to the *Oregon Rail Plan*, both ridership and revenue would continue to increase in the years beyond 2003, with further enhancements to the rail service. Given these planned enhancements to travel speed and service frequency, the team believes that the 3.6 percent annual ridership growth forecast in the *Oregon Rail Plan* is attainable, and we recommend this value for use in the OTP. This ridership growth rate, which is three times the population growth rate, will result in annual ridership of just over 1.0 million trips by 2030.

[5] There needs to be reconciliation via definition for the OTP and FAF rail tonnage figures. The FAF forecasts are higher than the OTP base case in percentage growth per year.

[6] The 1997 base year estimate of 83.2 million tons from the 2004 Oregon Commodity Flow Study includes through movements, while the 1997 estimate of 26.4 million tons from the Portland Commodity Flow Study only includes rail origins and destinations in the Portland/Vancouver area.

Table 6 – Rail Freight Forecast Summary (Tons in Millions; Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – millions of annual tons					
State	136 *(1990)*	223 *(2010)*	2.5% (1990-2010)		
Oregon Rail Plan (2001) – millions of annual tons					
State	53.8 *(1992)*	n/a[1]		59.1 *(1998)*	1.58% *(1992-1998)*
Other Forecasts – millions of annual tons					
Freight Analysis Framework	53.0 *(1998)*	109.0 *(2020)*	3.33% (1998-2020)		
Oregon Commodity Flow Forecast (2004)[2]	83.2 *(1997)*	146.6 (2030)	1.73% (1997-2030)		
Commodity Flow Forecast Update & Lower Columbia River Cargo Forecast for Portland/Vancouver[3]	26.4 *(1997)*	59.2 *(2030)*	2.47% (1997-2030)		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[4]	4.56 *(2025)*[4]	1.36% (1990-2025)	3.42 *(2000)*[5]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended Forecast – millions of annual tons	**59.1 (1998)**	**102.3 *(2030)***	**1.73% (2004-2030)**		

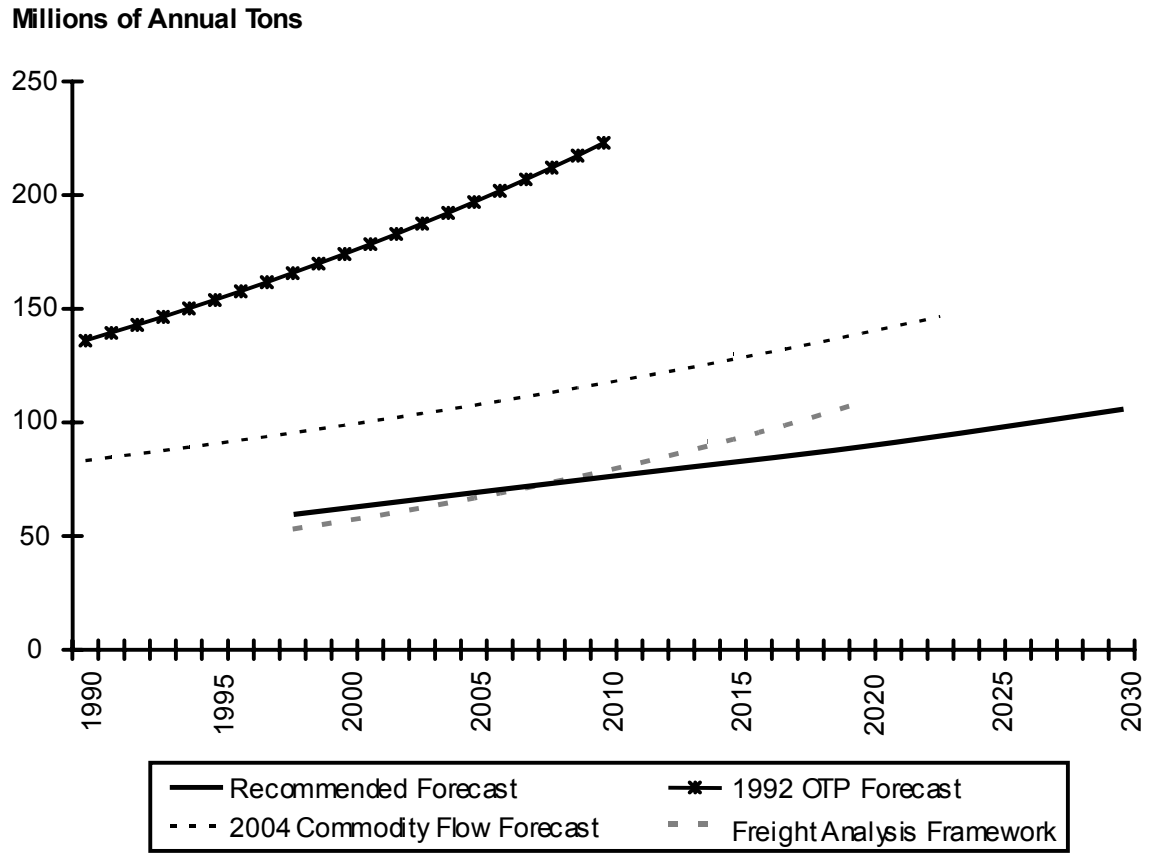
[1] No freight rail forecast provided in the Oregon Rail Plan.
[2] Includes all rail origins, destinations, and through movements in Oregon.
[3] Includes rail origins and destinations in the Portland/Vancouver metropolitan area.
[4] Oregon Office of Economic Analysis Long-Term Demographic Forecast.
[5] Bureau of Census compiled by Oregon Office of Economic Analysis.

Table 7 – Passenger Rail Forecast Summary
(Passengers in Thousands; Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[1]	4.56 *(2025)*[1]	1.36% (1990-2025)	3.42 *(2000)*[2]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Oregon Rail Plan (2001) – thousands of annual riders					
State	108 *(1998)*	650 *(2018)*	28.8% *(1998-2003)* 3.6% *(2003-2018)*		
Recommended Forecast – passenger rail ridership		**1,006**	**3.6%**		

[1] Oregon Office of Economic Analysis Long-Term Demographic Forecast.
[2] Bureau of Census compiled by Oregon Office of Economic Analysis.

Figure 6 – Alternative Forecasts of Rail Freight Tonnage



Deep Draft (Ocean) Marine Freight

Table 8 summarizes forecasts of annual deep draft (ocean) marine freight tonnage from the 1992 OTP base case, the FAF, and alternative commodity flow sources. Recent observations and growth trends from the U.S. Army Corps of Engineers (COE) are also provided. The alternative forecasts in Table 8 need to be viewed with caution since:

- The Portland/Vancouver study data only covers ports along the lower Columbia River, but in both Washington and Oregon; and

- The 2004 Commodity Flow data is a total for both deep draft and shallow draft marine freight; these components were not disaggregated in the 2004 data.

These forecasts also need to be viewed against recent COE observations suggesting a rather steep decline in both imports and exports between 1998 and 2002. While it may be assumed that this decline is tied solely to the economic recession, other COE data indicate that freight tonnage at the Columbia River mouth declined at an average 1 percent rate between 1993 and 2002. It should be noted that these average rates mask wide year-to-year fluctuations between ± 10 percent. Nonetheless, the recent COE observations, COE forecasts, and Commodity Flow forecasts all suggest that the 1992 OTP growth rates for deep draft marine freight were significantly overstated.

Table 8 – Deep Draft (Ocean) Marine Freight Forecast Summary (Tons in Millions; Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – millions of annual tons					
State Imports	3 *(1990)*	8 *(2010)*	5.0% (1990-2010)	5.3 (2002)[1]	-2.7% (1998-2002)[1]
State Exports	21 *(1990)*	34 *(2010)*	2.5% (1990-2010)	13.5 (2002)[1]	-4.9% (1998-2002)[1]
Other Forecasts – millions of annual tons					
Freight Analysis Framework (water tonnage)	16 *(1998)*	24 *(2020)*	1.86% (1998-2020)		
Commodity Flow Forecast Update & Lower Columbia River Cargo Forecast for Portland/Vancouver	25.3 *(1997)*[2]	34.8 *(2030)*[2]	0.97% (1997-2030)		
State Commodity Flow Forecast (2004)	38.3 (1997)[3]	43.9 (2030)[3]	0.74% (1997-2030)		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[4]	4.56 *(2025)*[4]	1.36% (1990-2025)	3.42 *(2000)*[5]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended Forecast – millions of annual tons	**23.8 (2004)**	**30.6 *(2030)***	**0.97% (2004-2030)**		

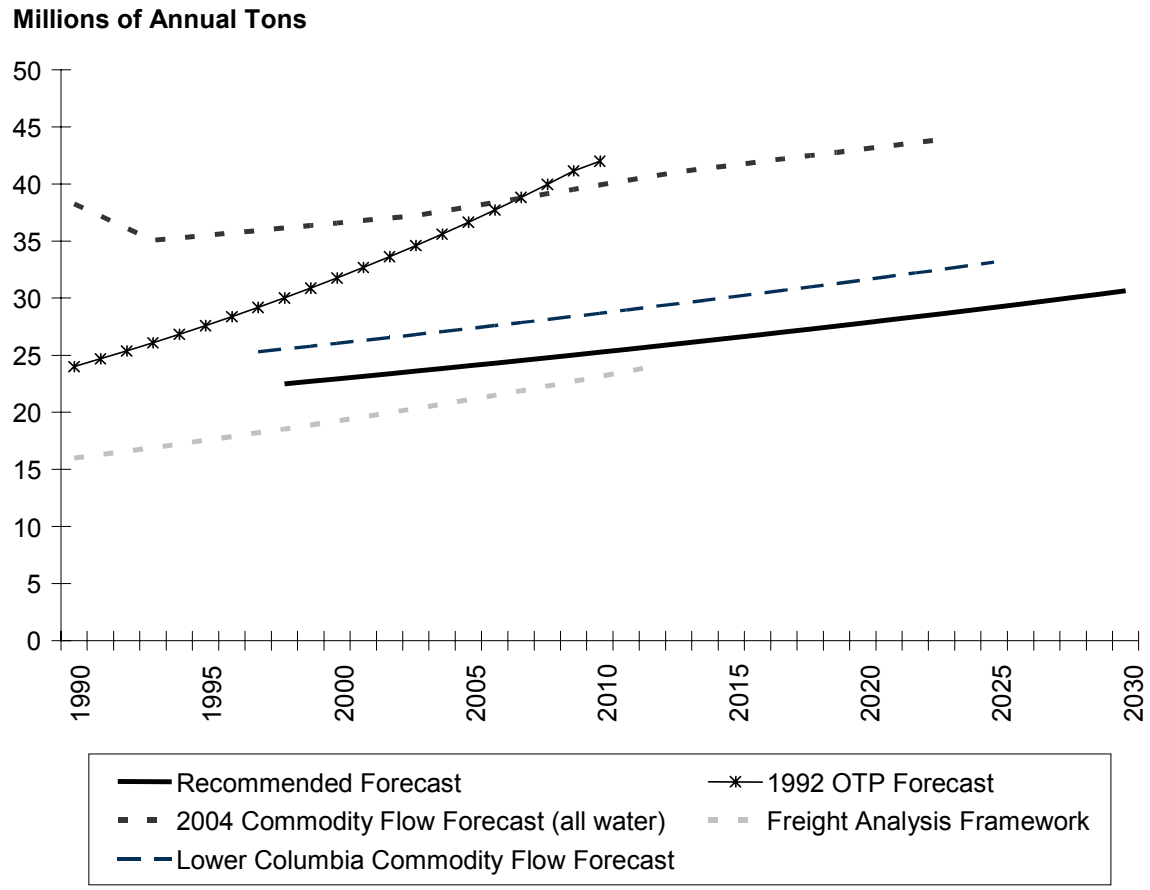
[1] U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, *State-to-State Public Domain Database*.
[2] Tonnage estimates and forecasts include freight movements for both Oregon and Washington ports along the lower Columbia River.
[3] Tonnage estimates and forecasts include both deep draft (ocean) and shallow draft (barge) freight movements for Oregon. Separate values are not currently available from this source.
[4] Oregon Office of Economic Analysis Long-Term Demographic Forecast.
[5] Bureau of Census compiled by Oregon Office of Economic Analysis.

Figure 7 depicts the trend lines suggested by the forecasts from the OTP, FAF, and the 2004 Commodity Flow Forecasts. The bold line in this figure illustrates the trend line for the recommended forecast of 0.97 percent annual growth on an estimated 2004 value of 23.8 million tons of combined imports and exports. The recommended annual growth rate was set equal to the rate from the Portland/Vancouver commodity flow forecast since:

- This source had projections out to year 2030;
- The 1992 OTP forecasts are clearly not supported by observations between 1993 and 2002;
- This source applied only to deep draft marine freight, while the other remaining sources included shallow draft; and
- The 1997 base year value (after adjustments for inclusion of Washington ports and exclusion of other Oregon ports) appears consistent with the 1998 COE statewide observation of 22.8 million tons.

The 2004 base year value of 23.8 million tons was derived from the 1998 COE data, and adjusted at the recommended 0.97 percent annual growth. It is felt that the 1998 COE estimate provides a more stable starting point for forecasts than the 2002 estimate since it avoids the wide economic swings of the latter "dot-com boom" and subsequent "bust", the economic recession that began in 2000, and the terrorist attacks of 2001.

Figure 7 – Alternative Forecasts of Deep Draft (Ocean) Marine Freight Tonnage



Shallow Draft (Barge) Marine Freight

Table 9 summarizes forecasts of annual shallow draft (barge) marine freight tonnage from the 1992 OTP base case, the FAF, and alternative commodity flow sources. Recent observations and growth trends from the COE are also provided. As with the deep draft marine data, the alternative forecasts in Table 9 need to be viewed with caution since:

- The Portland/Vancouver study data only covers ports along the lower Columbia River, but in both Washington and Oregon; and

- The 2004 Commodity Flow data is a total for both deep draft and shallow draft marine freight; these components were not disaggregated in the 2004 forecasts.

These forecasts also need to be viewed against recent COE observations suggesting a modest decline in barge tonnage between 1998 and 2002. While it may be assumed that this decline is tied solely to the economic recession, other COE data indicate that freight tonnage along the length of the Columbia River declined at an average 1.3 percent rate between 1993 and 2002. It should be noted that these average rates mask wide year-to-year fluctuations between ± 12 percent. Nonetheless, the recent COE observations, COE

forecasts, and Commodity Flow forecasts all suggest that the 1992 OTP growth rates for shallow draft marine freight were significantly overstated.

Table 9 – Shallow Draft (Barge) Marine Freight Forecast Summary (Tons in Millions; Population in Millions)

Data Source	Base Year Estimate *(Year)*	Forecast		Recent Observation	
		Forecast Value *(Year)*	Annual Growth Rate	Recent Value *(Year)*	Annual Growth Rate
Oregon Transportation Plan (1992) – millions of annual tons					
State	11 *(1990)*	18 *(2010)*	2.5% (1990-2010)	12.9 (2002)[1]	-1.7% (1998-2002)[1]
Other Forecasts – millions of annual tons					
Freight Analysis Framework (water tonnage)	16 *(1998)*	24 *(2020)*	1.86% (1998-2020)		
Commodity Flow Forecast Update & Lower Columbia River Cargo Forecast for Portland/Vancouver	14.1 *(1997)*[2]	15.5 *(2030)*[2]	0.29% (1997-2030)		
State Commodity Flow Forecast (2004)	38.3 (1997)[3]	43.9 (2030)[3]	0.74% (1997-2030)		
Population Forecast – millions of people					
OTP Update Population Growth Forecast	2.84 *(1990)*[4]	4.56 *(2025)*[4]	1.36% (1990-2025)	3.42 *(2000)*[5]	1.87% *(1990-2000)* 1.20% *(2000-2025)*
Recommended Forecast – millions of annual tons	**14.0 (2004)**	**15.1 *(2030)***	**0.29% (2004-2030)**		

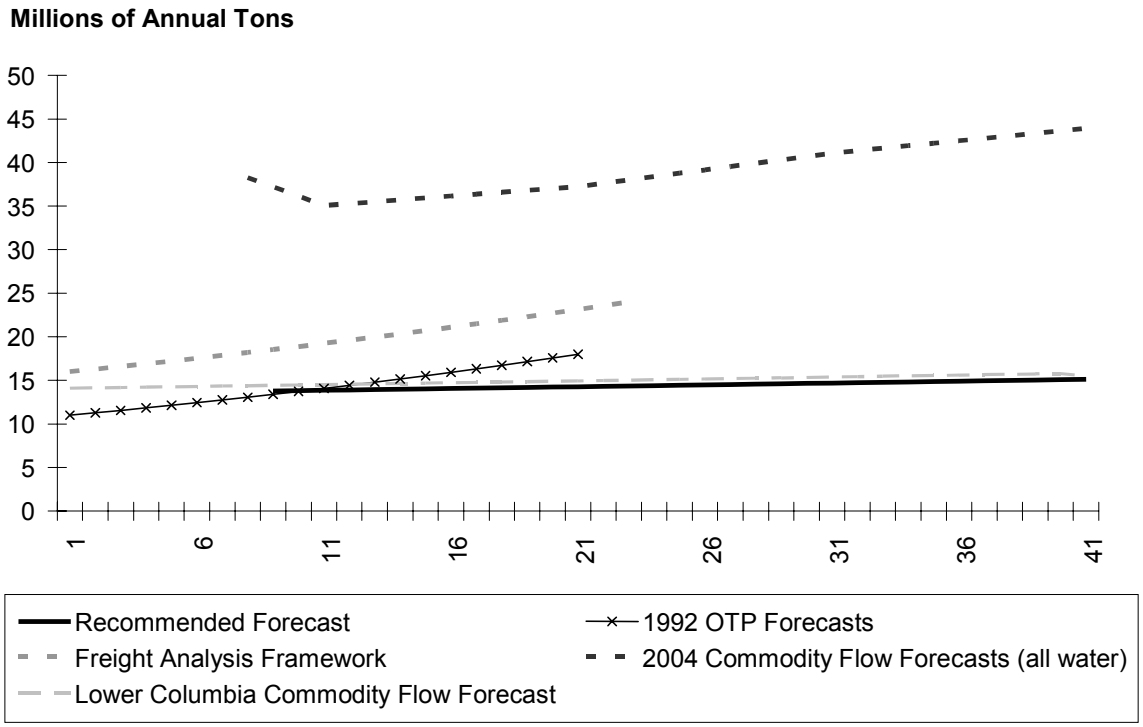
[1] U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, *State-to-State Public Domain Database*
[2] Tonnage estimates and forecasts include freight movements for both Oregon and Washington ports along the lower Columbia River.
[3] Tonnage estimates and forecasts include both deep draft (ocean) and shallow draft (barge) freight movements for Oregon. Separate values are not currently available from this source.
[4] Oregon Office of Economic Analysis Long-Term Demographic Forecast
[5] Bureau of Census compiled by Oregon Office of Economic Analysis.

Figure 8 depicts the trend lines suggested by the forecasts from the OTP, FAF, and the 2004 Commodity Flow Forecasts. The bold line in this figure illustrates the trend line for the recommended forecast of 0.29 percent annual growth on an estimated 2004 value of 14.0 million tons of barge freight. The recommended annual growth rate was set equal to the rate from the Portland/Vancouver commodity flow forecast since:

- This source had projections out to year 2030;
- The 1992 OTP forecasts are clearly not supported by observations between 1993 and 2002;
- This source applied only to shallow draft marine freight, while the other remaining sources included deep draft;
- The 1997 base year value (after adjustments for inclusion of Washington ports and exclusion of other Oregon ports) appears consistent with the 1998 COE statewide observation of 12.9 million tons;
- This rate reflects a growing shift in the importing of bulk natural resources (e.g. sand, stone, cement, wood, etc) from sources in Canada and other western states to sources in the Far East. (This latter trend is also reflected in the higher recommended growth rate for deep draft marine freight.)

The 2004 base year value of 14.0 million tons was derived from the 1998 COE data, and adjusted at the recommended 0.29 percent annual growth. It is felt that the 1998 COE estimate provides a more stable starting point for forecasts than the 2002 estimate since it avoids the wide economic swings of the latter "dot-com boom" and subsequent "bust", the economic recession that began in 2000, and the terrorist attacks of 2001.

Figure 8 – Alternative Forecasts of Shallow Draft (Barge) Freight Tonnage



Sensitivity of Forecasts to Structural Changes

In general, the OTP forecasts summarized in the memorandum are derived from modal plans and modal forecasts, and have been adjusted when it has been possible to adjust them directly for new information since the forecast was made. More fundamental underlying questions do not allow easy point by point adjustment to these previous forecasts, since it is unlikely that these underlying questions were addressed in the forecast procedures that were used in previous studies. The underlying questions are addressed here qualitatively to the extent that they can be addressed. Many of these changes are profound and challenge the state of the art of understanding of travel. In reality, there are no good quantitative answers now available anywhere on these topics; therefore, these issues are addressed qualitatively below.

After reviewing these factors, it is recommended that VMT forecasts of a growth of 1.35 percent per year should be affirmed as the basis for the OTP update. The forecasts of VMT recommended in this memorandum are that VMT will grow at the same rate as population. This represents a major change over the trends through most of history, although VMT per capita has stabilized in Oregon, as reported in the *Congestion Overview*. Specific concerns about factors influencing VMT are discussed below.

Impacts of Retirement of the Baby Boom Generation

The baby boom generation has not yet retired in any great numbers, although there are retired persons of various age groups, including those born in those years. In general, data show that the elderly do drive less and make fewer miles of personal travel by all

modes than those who are younger, but this has historically also been accompanied by increases over time in mileage driven by or miles of personal travel by everyone. If the cohorts of the elderly do travel less than they used to, but the other cohorts continue to travel more than they used to, the impact is muted. *The Mobility Needs of Older Americans*[7] is a useful reference on this topic.

"Saturation Point" of VMT Per Capita

Perhaps the most useful information related to this topic is the VMT per capita compiled by ODOT and reported in the *Congestion Overview*. The recent relative stability of the Oregon data on miles per capita provides some credence to the notion that there might be some saturation point in VMT per capita. A Cambridge Systematics team member postulated this type of saturation point in the Transportation Research Board (TRB) Special Report 220, *A Look Ahead Year 2020*[8]. This research postulated saturation in terms of vehicles per person of driving age and in terms of vehicle miles per personal use vehicle. The saturation factor of miles per vehicle was based on observed miles per vehicle for vehicles based outside the central city (suburban vehicles). The postulated saturation of personal use travel in terms of miles per capita per person of driving age population does not take account of the most fundamental unit, which is time. If speeds decrease, this should provide some further dampening impact upon miles per capita. The data for Portland in terms of miles per capita differs from comparably sized urban areas, both for reasons of land use and transit policies, but also for geographic reasons, since the West Hills acts to divide the region into two travel sheds.

The strongest body of evidence is that of the general stability of total travel time across cultures, although not across segments of particular societies in terms of urban area sizes. Those in very large urban areas do spend more time in travel. Although there seems to be a general reluctance to travel much in excess of about an hour per day, the experience in the largest cities or urban areas is that average travel times are greater than the travel times in smaller areas.

Income Versus VMT

The cross-sectional data on VMT in relation to income quintiles may show a general limit on the desire for more miles of travel in comparison to income. They are not immune to time constraints, so it could be postulated that the travel of the high-income quintiles does represent a limit on personal travel per capita, based on the tradeoff between time and the benefits of added miles of personal travel. Those in the lower-income quintiles would be expected to see more VMT per capita, but at reduced rates of VMT growth once their incomes reach that of the current high-income groups.

Past VMT growth in relation to income growth was driven not just by low fuel prices, but also by increases in the longevity of the vehicle fleet, which have made more vehicles available per dollar of expenditure on vehicle purchases. This increased durability of

[7] Rosenbloom, S., *The Mobility Needs of Older American,* The Brookings Institution Series on Transportation Reform, July 2003.
[8] Reno, A., TRB Special Report 220, *A Look Ahead Year 2020*, Personal Mobility in the United States, pp. 369 to 393, Cambridge Systematics, Inc.

vehicles has enabled lower-income groups to own proportionately more vehicles than they would have been able to afford with a less durable fleet (as in previous decades.).

VMT and Fuel Prices

The divergences between the VMT growth trends and income growth trends could be due in large part to fuel price trends. In the 1970s, when fuel prices were growing rapidly, real income rose faster than VMT. The trend lines crossed over in the early 1980s. This was due to increases in fleet fuel economy and declining real fuel prices. Then through the remainder of the 1980s and most of the 1990s, VMT grew faster than real income. The trends crossed over in 1999 when there was the spike in fuel prices. The fuel supply situation today and in the future is different than what was faced in the 1970s. Then the source of the problem was largely political. Now the world is running into accelerating demand due to the industrialization of China and other former third world countries and to absolute limitations in supply. It is possible that these long-run trends lead to suppression of VMT growth. There exists enormous flexibility in the technological ability to increase fuel efficiency over the long term (although not over the short term), since the turnover of the vehicle fleet is very slow, due also to the increased durability of vehicles.

Since the growth forecasts for the Highway Plan are at the same rate for highway VMT as for population, and no meaningful declines in VMT per capita has been observed in the past, it is concluded that the recommended forecast represents a responsible forecast. The State Congestion Overview presents VMT per capita since 1980, and indicates some smaller changes since 1990, with a very modest increase for most years but a decrease in just two selected years (1991 and 2000). Given the relative stability of this number, and the fact that it has not declined in the past, a forecast of stability in this ratio of VMT per capita rather than a decline is made.