VALUE OF TRAVEL TIME ESTIMATES

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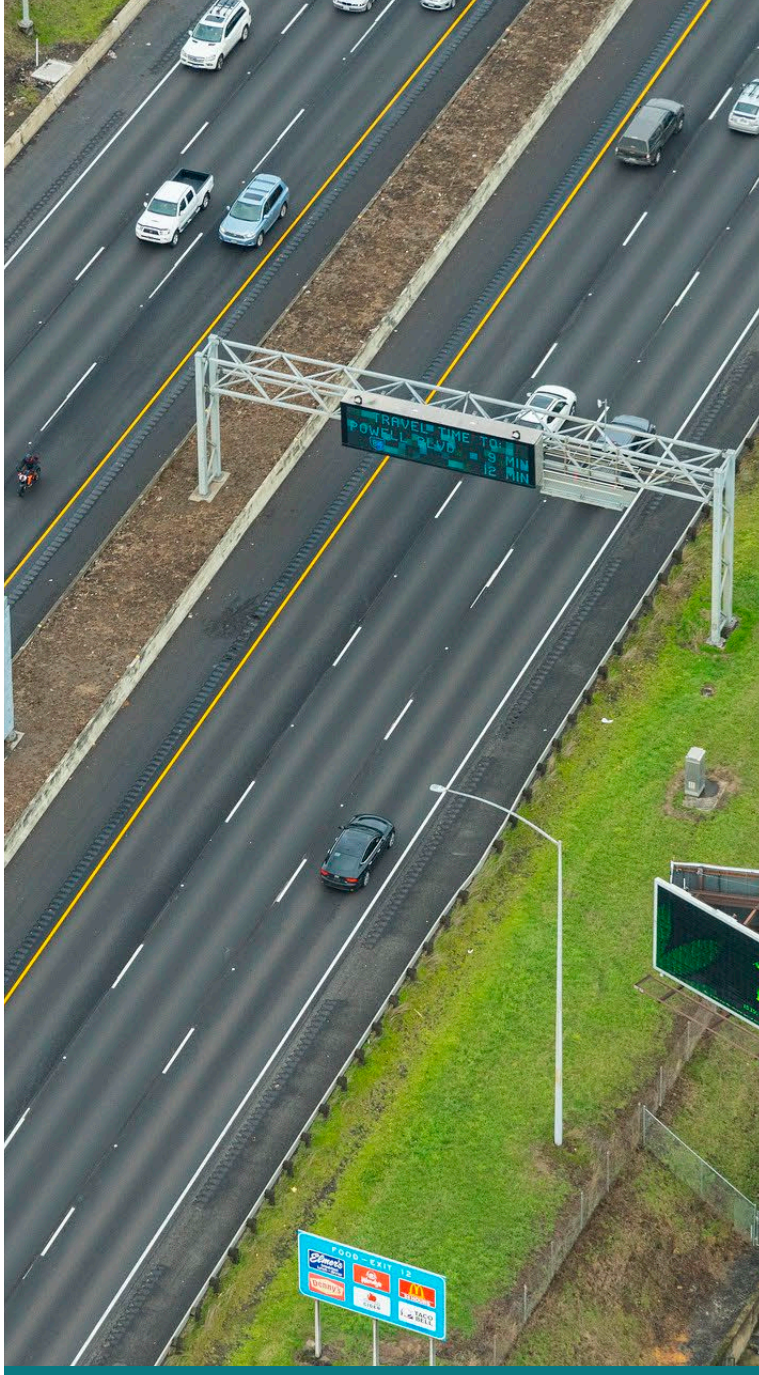

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Introduction

The Oregon Department of Transportation provides a system serving the needs of a variety of users. Safety, efficiency and reliability are important aspects of a system for users who want to minimize time spent traveling. Everyone faces the same 24-hour daily time budget. Extra delay caused by congestion and poor reliability are additional costs taking time away from other activities. Estimates of the value of travel time are used to quantify the cost of delay and support decisions related to operations, project development and construction work zone management.

The US Department of Transportation (US DOT) explains:

"The value of reducing travel time expresses three principles:

- First, time saved from travel could be dedicated to production, yielding a monetary benefit to either travelers or their employers.
- Second, it could be spent in recreation or other enjoyable or necessary leisure activities, which individuals value and are thus willing to pay for.
- Third, the conditions of travel during part or an entire trip may be unpleasant and involve tension, fatigue, or discomfort. Reducing the time spent while exposed to such conditions may be more valuable than saving time on more comfortable portions of the trip."[1]

The purpose of this document is to describe the methodology used to develop estimates of the value of travel time used to quantify delay costs occurring on Oregon highways and roads. Delay may be associated with peak hour traffic congestion (expected delay), unreliable travel times (unexpected delay), bad weather, crashes and construction work zones.

National estimates of the value of travel time vary from $10 to over $100 per hour. Such differences exist because estimates of the value of travel time depend on several elements:

- Mode of travel (drive, transit, bike, walk),
- Type of vehicle (passenger car, light commercial, commercial truck),
- Vehicle occupancy (drive only, driver with passenger(s)),
- Trip purpose (on-the-job, personal travel), and
- Availability of detailed data.

The estimates prepared within this report represent overall average values for passenger and commercial vehicles based on available Oregon data. These estimates are designed to be updated annually. If estimates are needed for more detailed analysis, contact ODOT directly.[2]

Important Note*: these estimates are not appropriate for preparing federal grant applications. Grant applications require detailed cost/benefit analysis that must follow complex federal methodologies*[3].

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[1] U.S. Department of Transportation, "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update), https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20Travel%20Time%20Guidance.pdf , accessed 12/19/2024

[2] ODOT Transportation Planning Analysis Unit

[3] US DOT "Benefit-Cost Analysis Guidance for Discretionary Grant Programs", December 2023: https://www.transportation.gov/sites/dot.gov/files/2023-12/Benefit%20Cost%20Analysis%20Guidance%202024%20Update.pdf

Methodology

This section of the report identifies the data used, method of calculation and examples demonstrating how the estimates can be used. The appendix includes values from the 2017 report to illustrate the change in the estimated value of travel time.

Data

The data used for this study follows an approach developed by the Texas A&M Transportation Institute (TTI)[4]. TTI cites two data sources:

- ✓ Bureau of Labor Statistics (BLS)- median hourly wage, and
- ✓ American Trucking Association Institute – average hourly wage and cost of benefits for truck drivers[5].

State employment agencies submit wage data to BLS which is used to produce national estimates. For this report, the Oregon Employment Department serves as the source of Oregon wage data representing the value of person time per hour through the Labor Market Information (LMI) data tool: Occupation and Wage Information[6].

Statewide Value of Travel Time Estimates

The Texas Transportation Institute prepares the "Urban Mobility Report" each year[7]. The purpose of the study is to monitor congestion across the nation, develop an understanding of the causes of congestion, and offer potential strategies to reduce congestion. This report has been published since 1987 and serves as a major technical reference to transportation practitioners across the nation. The value of travel time estimates developed for this study represent current state-of-the-practice for monetizing the cost of delay for congestion reporting and monitoring and best serves the analytical needs of ODOT.

The U.S. DOT provides detailed guidance on methods to estimate the value-of-time.[8] The purpose of the guidance is to advise agencies applying for federal grants to use their approved methodology to estimate value of travel time when preparing benefit-cost analysis. The procedures are complex and data intensive, but the approach can be used to validate methods used to quantify the cost of delay on Oregon highways and roads. **Table 1** provides the estimated value of travel time in Oregon for 2023. Since data must be collected before reporting wages, there will always be a one-year lag between the time this report is updated, and the year wage data is available. These estimates are consistent with methodologies used by TTI and US DOT and represent best-practices in the industry for estimating the cost of delay. Also included in the table is vehicles occupancy rates. When estimating the cost of delay to people in vehicles, we need to account for trips that include passengers to capture the full cost of delay to users.

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[4] Ellis, David R., "Value of Delay Time for Use in Mobility Monitoring Efforts", August 2018, https://static.tti.tamu.edu/tti.tamu.edu/documents/TTI-2018-6.pdf , accessed 12/20/2024.
[5] ATRI, "An Analysis of the Operational Costs of Trucking: 2023 Update" June 2024, Table 9: Average Marginal Costs per Hour, 2014-2023.
[6] https://www.qualityinfo.org/oprof/ : Occupational Profiles, All Occupations, median hourly wage.
[7] Texas Transportation Institute, "2023 Urban Mobility Report", https://mobility.tamu.edu/umr/
[8] See footnote 1 for citation.

TABLE 1. 2023 VALUE OF TRAVEL TIME AND VEHICLE OCCUPANCY RATES

Vehicle Group	Vehicle Occupancy*	Value of Travel Time per Person	Person Value of Travel Time per Vehicle
Passenger Vehicles (median wage)	1.4	$24.79	$34.71
Trucks (average wage plus benefits and operating costs[5])	1.0	$69.04	$69.04
*Vehicle occupancy estimates come from the 2010 Oregon Household Travel Survey for passenger vehicles. Data on Oregon truck occupancy rates are unavailable and assumed to be 1.0.			

Example: Unexpected Closure due to Rockfall Incident

Table 2 presents an example estimating the cost of one hour of delay for a roadway closed unexpectedly. With no notice, users are forced to wait for the road to open because there is no reasonable alternative route. In this example, one hour of traffic volume is 600 vehicles, 15% is trucks and 85% passenger vehicles. If the split of traffic volumes by vehicle size is unavailable, the statewide average assuming 91% passenger vehicles and 9% trucks can be used as a reasonable proxy shown on the bottom half of the table.[9]

TABLE 2. ESTIMATED VEHICLE DELAY COST OF ONE HOUR CLOSURE

	Proportion of Traffic Volume	One Hour Traffic Volume	Person Value of Travel Time per Vehicle	Cost of One Hour of Delay
Passenger Vehicles	85%	510	$34.71	$17,700
Trucks	15%	90	$69.04	$6,200
Total Volume	100%	600		
Total Cost of 1 Hour of Delay: With Classification Count Data				**$23,900**
Passenger Vehicles	91%	546	$34.71	$19,000
Trucks	9%	54	$69.04	$3,700
Total Volume	100%	600		
Total Cost of 1 Hour of Delay: No Classification Count Data				**$22,700**

The example above is a general approach to estimating vehicle delay for one location with little information other than average annual daily traffic volumes with and without vehicle classification data.

[9] Office of Economic Analysis, DAS, "Highway Cost Allocation Study, 2023-2025 Biennium", Exhibit 4-1, https://www.oregon.gov/das/oea/Documents/ECONW_HCAS-Cost-Allocation-Study-2023-25.pdf

There are other types of analysis requiring more complex approaches to delay cost estimation. The following examples illustrate additional uses of value of travel time estimates that require more detailed information and analysis.

Example: Traffic Performance Monitoring

ODOT monitors traffic performance over time, ranging across statewide, regional and project level analysis. For example, once a project is built, a before-and-after evaluation can be performed to understand the effectiveness of the project. For highway operations performance, typically vehicle hours of delay and the associated cost of that delay are estimated along with other performance indicators.

For example, if ODOT Region staff need to evaluate location performance before and after a project has been completed, they can use the Regional Integrated Transportation Information System (RITIS), which is a data analytic and integration platform using INRIX probe speed data as the primary data source[10]. As a subscriber to the RITIS platform, ODOT has access to numerous tools to help quantify congestion and delay on roadways in Oregon[11]. RITIS allows users to set their own input data, such as value of travel time and vehicle occupancy rates. The default entries in RITIS are national figures that may not adequately represent Oregon attributes. RITIS uses INRIX probe speed data to calculate congestion delay. Refer to the Oregon RITIS Handbook for assistance with using the RITIS tools.

Table 3 provides an example location showing how RITIS estimates the daily cost of delay. The traffic analyst would need to choose appropriate days before the project construction and after the project was completed to compare delay results. Note that reduced delay at one location may impact delay at surrounding locations, so looking beyond the project for impacts could be an important part of the delay story.

TABLE 3. RITIS EXAMPLE OF ESTIMATING DAILY DELAY COSTS

	Vehicle Classification (%)	Average Daily Vehicle Hours of Delay	Person Value of Travel Time per Vehicle	Average Daily Cost of Delay
Passenger Vehicles	85%	6,800	$34.71	$236,000
Trucks	15%	1,200	$69.04	$82,800
Total	100%	8,000		
			Daily Cost of Delay: with Classification Data	$318,800

Example: Construction Work Zone Design

ODOT construction work zones are designed to be safe for workers and travelers. There are a variety of approaches to design work zones, which are compared side-by-side before choosing the final approach. One impact considered is user delay. Completely closing a construction work zone is the safest option and may reduce the total duration of the work (which reduces construction costs), but it poses the largest delay impacts to travelers.

[10] https://inrix.com/products/speed/ INRIX speed data is a comprehensive collection of historic traffic data, including speed and delay estimates.

[11] https://www.oregon.gov/odot/Data/Pages/RITIS.aspx RITIS, is an automated data sharing, dissemination, and archiving system that includes many performance measures, dashboards, and visual analytics tools that can be used to gain situational awareness, measure system performance, and communicate information between agencies and the public.

For example, a bridge replacement project on an interstate highway may have several construction work zone configurations to choose from ranging from long-term lane closures or short-term complete closure. User delay can be calculated for each work zone configuration to determine which approach best serves the needs of the project and travelers. When travelers can access alternative routes to avoid a work zone, a travel demand model is recommended to simulate traveler response to the potential work zone options. Alternative routes taken by travelers vary depending on their final destination, which travel models simulate very well.

Travel models can be used to measure additional vehicle travel time and miles of travel associated with a construction work zone configuration, including use of longer or slower alternative routes.[12] Vehicle delay cost for each work zone configuration can be compared side-by-side to evaluate which approach best meets project objectives. **Table 4** presents an example of two approaches to a hypothetical construction work zone on a major highway to inform the project development phase. Early in the process the timing of construction may not be known, so developing ranges of potential costs is warranted to reveal seasonal impacts on delay.

TABLE 4. HYPOTHETICAL EXAMPLE OF TWO COMPARED APPROACHES TO CONSTRUCTION WORK ZONE DESIGN

Work Zone Configuration	Seasonal Range of Vehicle Delay Costs		Range of Additional Vehicle Operating Costs		Range of Total Work Zone Delay Costs	
One Day - 1 Lane Closure	$800	$1,000	$1,000	$1,200	$1,800	$2,200
One Day - Full Closure	$568,000	$691,000	$90,000	$110,000	$658,000	$801,000

In this example, 44% of work zone lane closure costs are due to vehicle delay and 56% due to additional miles of travel. A full closure work zone configuration results in 86% of costs due to vehicle delay and 14% due to additional miles of travel.

Conclusion

All travelers face the same 24-hour daily budget, which makes time a valuable commodity. Time spent in congestion is equivalent to lost time doing more productive and enjoyable activities. Investments in the transportation system are designed to make travel safer, reliable and efficient. Traveler delay is monitored and quantified to develop solutions that improve system performance and minimize negative impacts to users.

This document provides a consistent methodology for estimating the costs of delay for multiple purposes, such as construction work zones, incident delay, and temporary road closures. The intention is to update this report annually and make incremental improvements to the methodology when appropriate. As noted in the introduction, this methodology is not appropriate for preparing federal grant applications. Grant applications require detailed cost/benefit analysis that must follow complex federal methodologies

[12] There are travel demand models for Oregon's 8 MPOs and one ODOT statewide model. Typically the statewide model is used for this analysis because it represents all travelers – local, regional and national. More information is available here under the heading "Modeling Tools": https://www.oregon.gov/odot/Planning/Pages/Technical-Tools.aspx

Appendix

The last ODOT study "The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2017" implemented a methodology developed by FHWA for the Highway Economics Requirements System – State version (HERS-ST) benefit/cost model which is no longer supported by FHWA. The HERS approach is not consistent with current USDOT guidance on developing estimates for the value of travel time. To fill the analytical gap between 2017 and 2024, ODOT developed estimates by adjusting the 2017 values for inflation. The unexpected inflationary patterns during this period revealed this was no longer a viable approach and resulted in preparation of this report.

Table A presents a history of Value of Travel Time estimates used for a variety of projects and analyses prepared by ODOT since 2017. The most notable difference between the past method and this current method is the absence of medium truck values. Medium trucks make up a very small portion of vehicle on the road today and ODOT lacks traffic data, wage data, and routing for this class of vehicle. This is also the case at the national level.

TABLE A. HISTORY OF VALUE OF TRAVEL TIME ESTIMATES

Estimated Value of One Hour of Travel Time by Vehicle Class, Oregon 2019-2023						
Vehicle Class	**2017 Report**	**2019 Average Value**	**2020 Average Value**	**2021 Average Value**	**2022 Average Value**	**2023 Average Value**
Auto/Pickup	$ 26.44	$ 28.46	$ 30.17	$ 33.11	$ 34.32	$ 35.69
Delivery/Medium Truck	$ 31.89	$ 34.11	$ 36.50	$ 39.68	$ 38.27	$ 39.80
Freight/Heavy Truck	$ 33.24	$ 31.79	$ 32.74	$ 34.75	$ 35.57	$ 36.99
Sources:						
1) ODOT, "The Value of Travel Time: Estimate of the Hourly Value of Time for Vehicles in Oregon 2017"						
2) Employment and Wages by Industry, QCEW Annual Summary Report 2017, 2019, 2021, & 2022						
3) ATRI, "An Analysis of the Operational Costs of Trucking: 2017, 2019, 2021, 2022 Update						
4) DAS OEA Revenue Forecast - https://www.oregon.gov/DAS/OEA/Documents/other-annual.xls (used to adjust 2022 values to 2023 values)						