Oregon Department of Transportation

Research Stage 1 Problem Statement

Number 26-02 - "Develop New Recommended Passing Sight Distance Values for Two-Lane Bidirectional Highways"

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

A major principle in highway design and safety engineering is that roadways should be designed to be inclusive, i.e., to accommodate the vast majority of roadway users. This basic principle is violated by the current Passing Sight Distance (PSD) values used in practice, which are included in the 7th edition of the Policy on Geometric Design of Highways and Streets (a.k.a. Green Book 2018) and the 11th edition of the Manual on Uniform Traffic Control Devices (MUTCD) published in 2023. Specifically, the PSD values in these important reference documents were developed using a set of assumptions that are overly optimistic, as they do not address the safety of passing maneuvers when the passed or the passing vehicle (or both) is not a passenger car (e.g., truck, bus, or RV). Larger vehicles particularly trucks have considerably different dimensions and performance from passenger vars which affect the distance and time required for completing a safe passing maneuver. In this regard, the Green Book (2018) assumes both the passed and the passing vehicles to be passenger cars with a length of 19 feet each, while the average length of a semitruck is 72 feet. Further, the Green Book also assumes that the speed difference between the passing and passed vehicles when they are abreast (front ends at the same position) is 12 mph, which may prove challenging (and unrealistic) when the passing vehicle is a truck, a bus, or an RV. These assumptions largely explain the fact that the current required PSD values are notably less than those reported in most relevant studies in the literature (and the Green Book editions prior to the 6th edition introduced in 2011). It is important to note that, on two-lane highways, many passing maneuvers involve larger vehicles including trucks, especially that the mean speed of the larger vehicles tends to be lower than that of the passenger cars (including SUVs, pickups, and minivans).

2. What **final product or information** needs to be produced to enable this research to be implemented?

The proposed research aims at developing a set of recommended PSD values for safe passing maneuvers on two-lane two-way highways. Besides the design speed, the prospective PSD values will be sensitive to vehicle mix (i.e., percent heavy vehicles) and terrain conditions (primarily grade). Such guidance in PSD determination, while essential for safe passing maneuvers, is lacking in the current practice. The proposed investigation is expected to employ quantitative analyses that include, but are not limited to, traffic simulation in developing the recommended PSD values. The analysis will consider typical vehicle mix scenarios and different speeds and roadway grades in developing PSD values required for safe passing maneuvers. The project outcome is a practical set of PSD values in the form of charts (or look-up tables) where practitioners can determine the appropriate PSD for design and lane striping purposes using speed, percent heavy vehicles and grade.

It is important to note that the proposer was part of a research team working on the NCHRP 17-65 project where a special software, SwashSim, was developed and used in modeling traffic operations on two-lane highways including passing maneuvers (project developed the new 2-lane highway methodology in the

Highway Capacity Manual 2022). Major benefits of this simulation software (in relation to the proposed research) are the ability to model heavy vehicle performance on grades and the extensive calibration efforts of the simulation model using field data from different states and regions.

3. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

Name	Title	Email	Phone
Colleen O'Hogan	Roadway Safety Program Manager	colleen.p.ohogan@odot.oregon.gov	

4. Decision making lenses

Please complete the following three sections. Your answers to these questions will be applied on a programmatic basis to support agency decisions. Answering yes to the questions below is not required. Resolving a narrowly focused technical research problem may meet agency needs without answering yes to any of the following questions. The ODOT Research Section will seek a balanced portfolio some projects will answer yes to one of the three categories below (e.g. climate, equity, and/ or safety) and other projects in a different category.

We are looking for an overall program balance and no one project is expected to balance all categories. Generally, a research problem statement is expected to be able to answer yes with clear and verifiable information in only one of the three categories below, some projects may be able to answer yes in two or even three categories. Some projects (i.e. needs focused on specific elements of infrastructure design), may have no yes answers but may still be high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. Every mile driven in Oregon is powered by a clean source of fuel. We seek research that supports construction and maintenance operations are carbon neutral and investments in mobility that support travel by low and no emission modes. While every research project may not result in a reduction in emissions, transportation investments overall support emission reductions to achieve state goals. Oregon envisions a transportation system that is resilient in the face of seismic and climate events and impacts to the degradation of the natural environment are reduced. Our vision includes a transportation infrastructure is built in a way that avoids impacts on key habitat and results in better environmental conditions for wildlife and native vegetation. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4f. Will addressing the **transportation issue** identified as a need in Question 1 develop, or validate methods for the estimation, measurement, or monitoring of transportation generated greenhouse gasses (GHG)?

☐Yes ☒No ☐Unsure

4g. If climate or GHG is not the focus of this **transportation issue** identified in this problem statement, will the research apply a GHG analysis to transportation infrastructure, planning, operations, maintenance, or materials?

☐Yes ☒No ☐Unsure

4h. Will the addressing the **transportation issue** include development or testing of construction practices, methods, or materials to establish potential reductions in greenhouse gas emissions?

☐Yes ☒No ☐Unsure

4i. Will the solving the **transportation issue** in question 1 study or support the reduction of vehicle miles traveled and single occupancy vehicle travel or support transition to electric vehicles (or other types of zero emission vehicles) or low-carbon alternative fuels?

☐Yes ☒No ☐Unsure

4j. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☐Yes ☒No ☐Unsure

4k. Will the solving the **transportation issue** in question 1 lead to work that may result in better environmental conditions for wildlife and native vegetation ?

☐Yes ☒No ☐Unsure

4l. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

Equity

Equity can have many dimensions and impacts relating to communities, and transportation. It is important that problem statement proposals clearly explain in what capacities are equity dimensions or impacts being examined within problem statements. It is a goal of the OTP to "Improve access to safe and affordable transportation for all, recognizing the unmet mobility needs of people who have been systemically excluded and underserved. Create an equitable and transparent engagement and communications decision-making structure that builds public trust". Proposed research may have the intent of studying elements of this goal or apply analysis to specific transportation topics to ensure the resulting research recommendations is consistent with our equity goals. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4a Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐Yes ☒No ☐Unsure

4b If the **transportation issue** is not focused on transportation equity, will the primary topic be assessed for equity benefits or impacts within the research project?

☐Yes ☐No ☒Unsure

4c Is the implementation of potential findings from this research likely to directly involve participation from an identified group that would benefit from an equitable process or outcome?

☐Yes ☐No ☒Unsure

4d Is the intended final product or information expected to support ODOT's equity efforts (Including but not limited to supporting one of the equity related objectives of the ODOT's Strategic Action Plan or Oregon Transportation Plan) ?

☐Yes ☒No ☐Unsure

4e If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

Rural highways claim disproportionate rates of fatalities and injuries compared to their urban counterparts. According to the fatality facts 2021, around 40% of traffic fatalities took place in rural areas, although only 20% of people in the U.S. live there, and 32% of all vehicle miles traveled (VMT) occurred in rural areas (Fatality Facts 2022, accessible at: https://www.iihs.org/topics/fatality-statistics/detail/urban-rural-comparison). Remote rural and tribal communities in large primarily use rural highways in their travel. Improving the safety of passing maneuvers on two-lane highways will help close the gap between urban and rural areas when it comes to the risks associated with travel on public roadways.

Safety

Research outcomes may include interventions and countermeasures to prevent or reduce the frequency of crashes or other causes of transportation-related injury or death; or may include measures to reduce severity of injury (including prevention of death) after a crash or other injurious event. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan, Oregon Transportation Safety Action Plan and Oregon Transportation Plan.

4m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☐Yes ☒No ☐Unsure

4n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☐Yes ☒No ☐Unsure

4o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☒Yes ☐No ☐Unsure

4p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☐Yes ☒No ☐Unsure

4q. Will the solving the **transportation issue** support improving safety through **investing strategically**?

☐Yes ☐No ☒Unsure

4r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

Safe passing maneuvers are critical for safe traffic operations on rural two-lane highways. According to the 2022 Oregon Traffic Crash Summary, a total of 700 multiple-vehicle crashes occurred in rural areas where the vehicles involved were moving in opposite directions. Out of those 700 crashes, 68 were classified as fatal crashes and 434 as injury crashes. While no further details are provided in the summary crash statistics, it is known that driver distraction and unsuccessful passing maneuvers are two possible reasons that may lead two vehicles moving in opposite directions to share the same lane.

The proposed research will result in a set of recommended PSD values that are used in determining the length and location of passing zones on two-lane highways. The prospective PSD values would be adequate for the vast majority of passing maneuvers by considering vehicle mix and grade along with the design speed, thus improving safety on rural two-lane highways.

The proposed recommended PSD guidance should also help address the disproportionate safety risks on rural highways that are used extensively by rural and tribal communities.

5. Other comments:

The proposer recently served as an expert witness in a case of a fatal crash which involved a failed passing maneuver on a rural two-lane highway in Southeastern Montana (HWY 212 in Crow Reservation). The two vehicles involved in the passing maneuver were both semi-trailers.

6. Corresponding Submitter's Contact Information: [1 individual]

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PLEASE SUBMIT THE COMPLETED FORM BY EMAIL TO: odotnewresearch@odot.oregon.gov

This form is not a grant application or contract document. Please do not include proprietary information on this form. Once this form is received ODOT may revise and publish the problem statement. If selected, ODOT will assign investigator(s) of the department's choosing to conduct research.