Oregon Department of Transportation

Research Stage 1 Problem Statement

Number 26-57 – "Evaluate Safety Outcomes Considering Performance-Based Design Approaches"

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

Both nationwide and in Oregon, fatal and serious crashes have increased markedly. As Oregon undertakes a major update to its Strategic Highway Safety Plan (SHSP) or TSAP, it is anticipated that the update will incorporate principles of the Safe System Approach (SSA), which emphasizes safe roadways as a key element. Oregon relies on a comprehensive Highway Design Manual to guide project development. Recent efforts, such as NCHRP 830: *A Performance-Based Highway Geometric Design Process*, have proposed a shift from fixed tabular standards to a performance-based design approach that evaluates how design choices influence measurable outcomes. However, these efforts remain largely conceptual, lacking a specific, actionable performance template. They also address a broad range of considerations, including context, cost, schedule, operations, and safety. The effort is, as should be expected, also focused on the full complement of design – including context, cost, schedule, operations, and safety. The focus of this research is to rigidly examine safety outcome opportunities that could be achieved through considering performance-based design approaches. Establishing a research-informed design process specifically aimed at safety and integrated with Safe Systems approaches and aligned with the upcoming Strategic Highway Safety Plan update and the yearly update of the Oregon Highway Design Manual offer a timely opportunity to affect process and procedures to improve safety outcomes in Oregon.

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

This research will focus on a staged approach to integrating and establishing performance-based design in Oregon's practice, effecting same through periodic updates of the Highway Design Manual and providing overall consistent with the safety approach articulated in the Transportation Safety Action Plan. In addition, most of performance based design work to date has focused on concepts or had incorporated Highway Safety Manual approaches. While concepts are valuable and the HSM is linked to safety performance functions, this effort seeks to explore driver performance based on design consistency, limit states, and outcomes. As the updates of the Design manual are periodic this affords the ability to layout a vision while integrating as efforts piecemeal – as research is developed and performance results achieved these can be integrated into the Highway Design Manual. Moreover, the effort should be directed by both investment opportunities systemwide and safety priorities. Thus, this research is envisioned to focus on the top three safety focus areas related to highway design (roadway departures crashes, intersection crashes, and those involving pedestrians and bicycles). On the investment side, focus we be on 1R and 3R investment programs as those are sizeable program areas. Even more specifically there may be opportunities to directly address, per the NCHRP study, horizontal curve design and superelevation rates, corridor pedestrian and bicycle safety risk and safety investments, and intersection safety through designs seeking to reduce entry speeds and collision angles.

The primary deliverable for this research will be a roadmap or guidance document that outlines a phased approach to implementing performance-based design. It will provide a framework for integrating research findings and performance results into Oregon's highway design standards incrementally, ensuring continuous improvement and alignment with safety priorities. It will also detail specific steps and timelines for incorporating these findings into Oregon's highway design practices, ensuring alignment with safety and investment priorities. By targeting these areas, this research will establish a solid foundation for performance-based design that enhances safety and supports broader transportation goals.

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
Christi McDaniel-Wilson	State Traffic Safety Engineer		
Will Woods	Senior Standards Engineer		
Heidi Shoblom			
Christopher Henson			

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:

There is no explicit link to climate in this research but, through exploration of performance-based design outcomes should lead to more effective investment (thus cost savings which can be redirected) and to outcomes which reduce speeds and improve conditions for pedestrians and bicyclist thus supporting climate goals.

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:

While the effort is focused on overall reductions in fatalities and serious injuries, we know there are overrepresentations in the crash data and particularly are aware of the equity issues associated with vulnerable road users. This work would explicitly address opportunities to improve design and reduce vulnerable road user fatalities and serious injuries and thus implicitly address equity issues.

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:

Roadway design has implicit safety outcomes. The embrace of performance-based design offers both substantially cost savings through more efficient agency practices but also safer outcomes. One of those safety outcomes is to reduce fatalities and serious injuries for vulnerable road users. Such efforts should also create designed systems that encourage more walking and biking as the focus here is explicitly on system design.

5. Other comments:

6. Corresponding Submitter's Contact Information:

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This form is not a grant application or contract document.