

Research Stage 1 Problem Statement

PROPOSED TITLE: Evaluating Oregon Roadside Design and Maintenance for Safety and Savings

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

Expert informants to ODOT's Traffic Safety Research Roadmap (1) identify two problems related to whether clear zone design changes impact crash rates, and whether clear zone design guidance reflects the current safety impacts of trees. ODOT's current Highway Design Manual, Roadside Development Manual, and Highway Directive on Ornamental Landscaping address related issues for safety and maintenance, but recent research suggests opportunities for improvement in safety (2-3) and maintenance costs (4). However, these previous studies may not directly apply to Oregon contexts, and questions exist on how best to implement them through design and maintenance guidance. Additionally, ODOT staff have reported significant costs due to run-off-road collisions with ODOT infrastructure, such as rapid rectangular flashing beacons (RRFBs), that may be attenuated through roadside design or maintenance practices. This study will need to address which locations in Oregon may benefit most from changes in roadside design and maintenance, likely impacts to safety and maintenance costs, and how to implement them through design guidance and maintenance policies.

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

Oregon's crash rates vary across contexts, and diverse landscapes require solutions tailored to these conditions. A scan of previous research, crash hot and cold spots in Oregon, and landscape elements that could be related to those relatively high and low crash rates need to be evaluated to reveal opportunities for safety improvements. Next, design and maintenance staff should inform practices that lead to the roadside conditions associated with higher and lower crash rates, likely involving meetings and review of maintenance records. A gap analysis between these findings and current ODOT standards will suggest improvements, and a fiscal analysis will clarify potential cost savings in design, construction, and maintenance categories.

Implementation of the study will be through any changes to ODOT's Highway Design Manual, Roadside Development Manual, and Highway Directives relating to roadside design and maintenance, subject to concurrence of ODOT Divisions.

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 |
|------|-------|-------|-------|
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|------------------|---|------------------------------------|--------------|
| Lily Nguyen | Professional Engineer, Highway Design Manual Contact | Lily.N.NGUYEN@odot.oregon.gov | 503.551.1396 |
| Patricia Caswell | Maintenance Environmental Program Manager | Patti.CASWELL@odot.oregon.gov | 503.913.9221 |
| Magnus Bernhardt | Landscape Architect, Environmental Section Program Leader | Magnus.U.BERNHARDT@odot.oregon.gov | 503.731.8283 |
| Amanda Salyer | Traffic Investigations Engineer, Region 2 | Amanda.SALYER@odot.oregon.gov | 971.208.4302 |

4. Other comments:

Related research is anticipated to begin soon at the national level, focused on urban and suburban roadways with posted speeds of 35-50 mph (NCHRP 17-136 Safe System Approach for Including Trees in Urban and Suburban Roadway Contexts), but this study does not address roadside management issues beyond trees.

References

- 1 Roll, J. and G. Griffin. n.d. *Oregon Department of Transportation Traffic Safety Research Roadmap*. Pending publication. https://rpubs.com/ODOT_Research/TSRRM
- 2 Xiao, D., Wen, Z., Xu, X., & Šarić, Ž. (2016). Simulation and Analysis of the Buffer Function of Freeway Greening on Out-of-Control Vehicles. *Promet - Traffic&Transportation*, 28(3), 257–265. <https://doi.org/10.7307/ptt.v28i3.1858>
- 3 White, E. O., & Meixler, M. S. (2024). Assessing large-scale roadside tree removal using aerial imagery and crash analysis: A difference-in-differences approach. *Landscape and Urban Planning*, 244, 104980. <https://doi.org/10.1016/j.landurbplan.2023.104980>
- 4 White, E. O. (2023). Unclear territory: Clear zones, roadside trees, and collaboration in state highway agencies. *Transportation Research Part D: Transport and Environment*, 118, 103650. <https://doi.org/10.1016/j.trd.2023.103650>

5. State of Oregon Decision Making Lenses

State decision making lenses are a part of the state of Oregon’s policy structure. State policy and federal policy are not always aligned. The state will prioritize research according to state policy, however ODOT may be required to skip prioritized proposals based on constraints placed on the use of federal funds. If state funds are available ODOT will attempt to fund prioritized research that is deemed ineligible for federal funding.

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 a high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. To that end, we seek research that reduces carbon emissions from construction activities and materials, and from maintenance equipment and operations. Oregon envisions a transportation system that is resilient, this means a system that is durable in the face of seismic events and extreme weather to avoid negative impacts, withstand them or bounce back quickly to resume system function. We seek research that improves the ability of the transportation system to adapt or cope with more frequent and extreme weather events. This may include innovations in data and data sharing, construction materials and project design, communication, emergency planning and response, and more. Similarly, we seek research that avoids negative impacts on key habitats and ecosystems that can buffer or reduce damage to infrastructure and improve 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](#).

5a. 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 gases (GHG)?

☐ Yes

☒ No

☐ Unsure

5b. 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

5c. Will 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

5d. Will 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

5e. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, or monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☐ Yes

☒ No

☐ Unsure

5f. Will 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

5g. 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 the equity dimensions or impacts being examined. Oregon commits to social equity in the OTP, specifically 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.* We seek research that studies elements of this goal or applies analysis to specific transportation topics to ensure the resulting research recommendation is consistent with agency equity goals. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#) and [Oregon Transportation Plan](#).

5h. Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐ Yes

☒ No

☐ Unsure

5i. 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

5j. 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

5k. 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

5l. If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

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](#).

5m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☐ Yes

☐ No

☒ Unsure

5n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☒ Yes

☐ No

☐ Unsure

5o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☒ Yes

☐ No

☐ Unsure

5p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☒ Yes

☐ No

☐ Unsure

5q. Will solving the **transportation issue** support improving safety through **investing strategically**? 5r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

This study will directly address ODOT's Transportation Safety Action Plan (2021)'s Roadway Departure Emphasis Area (pp. 89-90), which remains a consistent challenge for the state, contributing to 1,330 fatalities and 3,336 serious injuries between 2014 and 2018. This research has the potential to address both the hotspot and systemic factors of roadway departure crashes in Oregon, in addition to addressing the costs of hard and soft infrastructure in the state right-of-way.

Specifically, this study addresses healthy and livable communities with emphasis on the landscape environment, both through knowledge on safety impacts of different designs and management techniques, and through other livability factors of landscaped rights-of-way, including visual screening, ecological design, and visual interest. Best available technologies in safety are addressed in this study by protecting new safety assets like RRFs, and testing new approaches for safety analyses in the research design.

Communication and collaboration are built into this study's statement, by incorporating input from ODOT staff beyond the technical advisory committee, including design and maintenance staff to inform practices before final study recommendations are made, to ensure the practicality of implementing results. Finally, incorporating their input into any changes to existing ODOT design and maintenance guidance and policies will best support lasting and scalable improvements to safety from this study.

6. Corresponding Submitter's Contact Information:

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7. ODOT Sponsor Contact Information (Required if Submitter is not an ODOT employee)

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|-----------------|------------------------------|
| Name: | Greg Griffin |
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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.