

Research Stage 1 Problem Statement

PROPOSED TITLE: Maximizing Existing Software and Tools for Asset Identification and Extraction

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

Geometronics uses Mobile LiDAR with several different software packages for extracting point and linear features, mostly for project design. The applications in use are Leica Cyclone 3DR, ESRI ArcGIS Pro, TopoDOT, and Bentley iTwin Capture. Tools in these applications can extract features and attributes that historically were collected manually in the field for asset inventory. This research will investigate how ODOT can maximize current software with existing Mobile LiDAR to supplement, and potentially reduce, future manual field data collection efforts for asset inventory features such as concrete barrier, guardrail, signs, luminaires, traffic signals, inlets, manholes, and ADA corners (this is not an exhaustive list).

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

A report, manuals, and workshops detailing the relevant tools available in each software package, what features and attributes can be extracted from the mobile LiDAR, potential workflows between the different tools and software packages, and a comparison of time for collecting the features either with LiDAR, manually in the field, or a combination of both. Updates to asset data collection manuals and workshops using LiDAR with new workflows may be necessary.

Example workflow that may be implemented or improved upon: Cyclone 3DR has an Auto Classification tool that can separate point clouds into ground, vegetation, road surface, curb, guardrail, road signs, poles, and wires. Cyclone 3DR also has a scripting tool that can potentially automate running the classification tool on a large LiDAR dataset such as an entire highway. Can we take the separated LiDAR classes (now smaller point clouds) and use them in ArcGIS Pro, TopoDOT, and iTwin Capture to extract asset features more efficiently? TopoDOT can extract point features such as luminaires, poles, signs, and signal heads semi-automatically, and you can manually attach attributes to the features utilizing the lidar and images from the mobile scanner. ArcGIS Pro and iTwin Capture have deep learning tools to extract features from LiDAR and Raster images. Can these tools be used to extract manholes, inlets, or ADA corners?

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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Jonathan Rawlings	Remote Sensing Project Surveyor	Jonathan.rawlings@odot.oregon.gov	503.930.8941
Rhonda Dodge	Remote Sensing Lead	Rhonda.K.DODGE@odot.oregon.gov	503.507.1809
Asset Owners	Various - ETSB	Various	Various

4. Other comments:

Would like this research to be conducted internally.

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:

Safety is not the focus of the proposal, but by implementing alternative methods for asset data collection with LiDAR we are potentially reducing time spent in/near the roadway collecting features and attributes that can be collected in an office.

Having documentation that shows what asset features we can effectively extract with existing mobile LiDAR and software will allow Geometronics to better communicate our capabilities with the asset owners.

6. Corresponding Submitter's Contact Information:

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

Name:	
Title:	
Crew Number:	
Telephone:	
Email:	

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.