

**OREGON DEPARTMENT OF TRANSPORTATION RESEARCH,  
DEVELOPMENT, AND TECHNOLOGY TRANSFER PROGRAM**

**Annual Report Fiscal Year 2025**

Oregon Department of Transportation  
Research Section  
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# **1.0 INTRODUCTION**

## **1.1 WHO WE ARE**

The goal of the Research Section is to foster innovation within the Oregon Department of Transportation (ODOT) by researching, developing, testing, and evaluating new and innovative transportation products, materials, methods, and processes.

Research and development has been an integral part of our business for more than a century. The Federal Aid Highway Act of 1921 created the Research and Technology program within what is now the Federal Highway Administration (FHWA). The same bill earmarked resources to create what would become the Highway Research Board (now the Transportation Research Board - TRB) within the National Academy of Sciences. Section 11 of the Hayden Cartwright Act of 1934 laid groundwork for the Highway Planning and Research (HP&R) program in all state departments of transportation by designating that “1/2 per centum of the amount apportioned for any year to any State...may be used for surveys, plans, and engineering investigations....” Largely because of the HP&R (later SP&R) program, research has been an integral activity at ODOT and in most other states for nearly 100 years.

Historically, research efforts in ODOT have been primarily focused in areas relating to highway materials and construction. Only to varying degrees have these activities been distinct from other engineering and testing work done within ODOT’s materials laboratory. In fact, until sometime in the 1980s, the titles of the State Materials Engineer and the State Research Engineer were held by the same person. The agency’s transition from a Highway Department to a Department of Transportation in 1969 and the Inter-modal Surface Transportation Efficiency Act of 1991 brought about a gradual diversification of ODOT’s research agenda. Research has changed from a focus on highways and construction materials to a much broader agenda that includes a greater diversity of highway topics as well as other modes of surface transportation. In 1996, the Research program was moved from the Highway Division to the Transportation Development Division the predecessor division to the current Policy Data and Analysis Division. Since that time, the Research Section has expanded, diversifying its research projects to include the following general categories:

- Active and Sustainable Transportation,
- Construction and Maintenance,
- Equity, Policy, Planning, Freight & Economic Analysis,
- Geotechnical Hydrology Environmental Science and Engineering

- Pavement and Materials,
- Structures,
- Traffic Safety and Human Factors,

The ODOT Research Section oversees transportation research projects and, through the Technology Transfer (T2) Center, provides transportation-related information to local agencies throughout Oregon. The mission of the section is to contribute to improvement in the performance of the transportation system by studying ways to enhance processes, methods, or materials in use. The section also works with technical experts and agency personnel to support research implementation.

The staff includes the Research Manager, the T2 Center Director seven research coordinators, an executive support assistant, and three part-time trainers

## **1.2 THE WAY WE DO BUSINESS**

ODOT research projects seek to address identifiable problems or issues with the goal of providing significant benefits to the department by reducing costs, increasing efficiency, addressing environmental concerns, enhancing safety, improving productivity, improving the mobility of Oregonians, or providing better service. Transportation problems or issues may be identified by anyone and are formally presented to the Research Section as problem statements. Each year these statements are reviewed by the section and other agency personnel to determine priorities for projects. Top projects receive research funding in order of priority.

The majority of direct funding for ODOT research projects is provided by the FHWA State Planning and Research (SPR) Program, Part 2. In recent years, a small portion of SPR planning funds have also been utilized. A few additional projects are financed entirely using state highway funds. Indirect costs, including facilities, office supplies and equipment, employee training, utilities, etc. are also paid for with state funds.

Project collaboration is an important element of the research program, and most research projects involve many levels of collaboration, not just funding. A small percentage of ODOT research projects are conducted in-house by Research Section staff. The section more often works with external principal investigators, most frequently those affiliated with universities. While the majority of research is performed by an outside organization, Research Section staff provide management and coordination services. Project coordination involves collaboration between the principal investigator, other researchers, and technical specialists within the agency. The project coordinator manages a technical advisory committee, composed of knowledgeable individuals from FHWA, ODOT, and other state agencies.

## **1.3 CONTENTS OF THIS REPORT**

For Fiscal Year 2024 this report documents the research projects we completed (Section 2); a review of the implementation of projects completed 5 years ago (Section 3); research publications, progress, and spending (Section 4); other research activities (Section 5). Length limitations preclude an in-depth description of every research project. Instead, the focus of this report is on projects of general interest, representative of a range of topics, and expected to be of the highest value to ODOT.

If you have questions about the contents of this report or about any aspect of research at ODOT, please feel free to contact the Research Section as follows:

ODOT Research Section

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## **2.0 COMPLETED PROJECTS**

Pursuant to 23 CFR 420.209 (a)(6), the State must have procedures for documenting RD&T activities through the preparation of final reports. Each completed research project results in a report that documents the data collected, analyses performed, conclusions, and recommendations. This section lists the projects completed in Fiscal Year 2025. Table 2.1 at the end of this section lists the published report number and publication date. All completed projects listed below resulted in a final report that is available online at:

<https://www.oregon.gov/ODOT/Programs/Pages/Research-Publications.aspx>

### **842 Constructing High-Density Longitudinal Joints to Improve Pavement Longevity**

Asphalt pavement cracking along longitudinal joints—especially near centerline rumble strips—has been a persistent issue in Oregon, leading to premature failures and increased maintenance costs. This research identified that applying a heavy tack coat in combination with the hot-pinch compaction method significantly improves joint density and cracking resistance. While a proprietary product also showed strong performance, however, its higher cost limits its use to critical locations. Based on these findings, ODOT is preparing a draft specification for pilot purposes that will permit the use of the heavy tack and hot-pinch approach on selected projects, with the potential for future specification refinements based on industry feedback. Additionally, the study highlighted the need for a roller compactor operator training or certification program, to be developed in collaboration with the Asphalt Pavement Association of Oregon (APAO).

### **858 Development of Procedures and Technologies for Chip Seal Construction Quality Control in Oregon**

Chip seals have emerged as a cost-effective and practical approach for maintaining and preserving the existing highway network. To be cost effective chip seals need to be applied correctly and agencies need methods to validate correct applications by contractor. This study focused on establishing efficient Quality Assurance (QA) procedures for chip seals. This research provides information that may be incorporated into several ODOT documents including ODOT chip seal specifications, ODOT chip seal design guide, and updated ODOT chip seal training modules. There is a potential that this work may serve as an input for changing FHWA guidance on chip seal design methodology. The test methods and the QA processes developed and proposed for implementation in this study are expected to enhance the performance of chip-seal surfaced roadways in Oregon.

### **820 Laboratory and In-situ Characterization of Diatomaceous Soil with Implications for Geotechnical Design**

Diatomaceous deposits intersect existing and potential Oregon Department of Transportation project sites in central, eastern, and southern Oregon. This type of soil contains large amounts of fossilized diatoms and is known to have non-textbook, often contradictory, properties: high natural water content, high liquid limit, and high compressibility, but also high shear strength. Research completed in-situ and laboratory tests on diatomaceous soils from four Oregon sites: Wickiup Junction, Ady Canal, Moore Park, and Pine Cone Drive. Empirical correlations across properties were developed and in-situ tests synthesized with laboratory results. Test results were used to calibrate a critical state-type constitutive model to describe mechanical behavior. The Imperial College Pile method was modified to successfully predict pile capacity as measured with a dynamic load test. ODOT continues to explore the properties of these soils and this research forms the basis for SPR 879.

### **873 Improving Guidance for Speed Safety Camera**

This research synthesizes speed safety camera elements, issues, best practices, and evidence-based results identified from a national and international review of jurisdictions employing speed safety cameras. Using these findings, this report provides recommendations to ODOT on changes and additions to the statewide speed safety camera program, as well as potential legislative changes and future research. This research serves as an input s for revised statewide speed safety camera guidelines.

### **854 Validation of the New Speed Zoning Method for Urban Arterials and High-Speed Roadways in terms of Speed Compliance and Safety Outcomes**

This study conducted an analysis on the effects of Oregon's speed zoning method on speed compliance and safety outcomes. Speed zones were selected in an urban area based on the availability of before and after speed data. Data for roadway context was

collected, which included population, equity, land use, roadway, and exposure characteristics. The speed data was used to conduct a descriptive analysis that focused on key speed metrics to determine if the speed zone had an impact on speed compliance. A series of speed models were developed to identify significant relationships between observed speed and available explanatory variables. Oregon crash data was used to assess the safety outcomes of the selected speed zones after the new speed limit sign was installed. This study provides Oregon with recommendations related to speed and safety analysis.

**Table 2.1: Research Reports Published in FY 2025**

| <b>Report No.</b> | <b>Report Title</b>                                                                                                                    | <b>Date Published</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 842               | Constructing High-Density Longitudinal Joints to Improve Pavement Longevity                                                            | 8/2/2024              |
| 858               | Development of Procedures And Technologies for Chip Seal Construction Quality Control in Oregon                                        | 2/4/2025              |
| 820               | Laboratory and In-situ Characterization of Diatomaceous Soil with Implications for Geotechnical Design                                 | 4/2/2025              |
| 873               | Improving Guidance for Speed Safety Camera                                                                                             | 5/6/2025              |
| 854               | Validation of the New Speed Zoning Method for Urban Arterials and High-Speed Roadways in terms of Speed Compliance and Safety Outcomes | 6/11/2025             |

### **3.0 FIVE YEAR REVIEW OF PAST PROJECTS**

The Oregon DOT works to actively implement appropriate research findings and should document benefits to track the active implementation of appropriate research finding, projects completed five years ago are identified in this section. Where appropriate, findings and benefits are discussed. In particular this each project is assessed for the following implementation actions:

- Updates to ODOT documentation (e.g. policy, procedures, specifications, or other implementation documents) that have been updated as a result of this research.

- Use of the research to inform ODOT's position regarding any state statutes or administrative rules?
- Support of the work of national partners such as AASHTO, FHWA, to update national standards or guidance?
- Creation of a new program, position, or organizational unit?

This section of the report is part of Oregon's compliance with 23 CFR 420.209 (a)(5) , to determine the utilization of the State DOT's RD&T outputs, and of 23 CFR 420.209 (a)(6) documenting the department's efforts to implement appropriate research findings and benefits of our work.

All the completed projects listed below are available online at:

<https://www.oregon.gov/ODOT/Programs/Pages/Research-Publications.aspx>

#### **814 Best Practices for Installation of Rectangular Rapid Flashing Beacons with and Without Median Refuge Islands**

The research identifies the circumstances when it is best practice to provide a median island with an RRFB, with a focus on three lane roadway cross-sections. Identifying situations where an island is not needed will simplify and reduce the cost of installing RRFBs. This will allow ODOT and other agencies to install more of these pedestrian safety devices. The research also compared the effect of median-mounted RRFB displays versus far side-mounted RRFB displays with respect to these same performance measures.

Section 310.3 (page 153) of the ODOT Traffic Manual was updated to incorporate this research project. The Traffic Manual was slightly reorganized so the modifications appear in. The research has been key to helping Oregon decide when an RRFB should be installed on an island (ADT>12,000) and when it may be installed on only the left and right side of the roadway (ADT<12,000). Additionally, this research was one of several inputs to create the crosswalk treatment recommendations in Table 310.3-A of the Traffic Manual. Region traffic engineers use that table extensively now to inform engineering studies on how to treat uncontrolled marked crosswalks.

#### **815 Bridge Deck Asphalt Concrete Pavement Armoring**

Deterioration of the concrete bridge deck is one of the most significant problems affecting the service life of bridges in the United States. Moisture penetration into the asphalt overlay and standing water on the concrete bridge deck result in expansion and contraction at the interface on the bridge deck during freeze-thaw cycles. This causes debonding at the interface and results in an increased rate of deterioration for the asphalt concrete overlay. Additionally, the deicing salts permeate into the deck and cause corrosion of the steel reinforcement, weakening the structural integrity of the bridge.



Waterproofing membranes with an asphalt overlay were developed as a strategy to protect concrete bridge decks.

The main goals of this study were to provide the industry and Oregon Department of Transportation (ODOT) with better insight on the failure mechanisms of asphalt overlays on concrete bridge decks and establish field and laboratory experiments to evaluate the performance of these overlays. The most effective deck waterproofing systems and overlay strategies (in terms of both cost and performance) were determined for concrete bridge decks in Oregon. By determining the most effective waterproofing methods and strategies, this research will serve to decrease repair and replacement costs and increase the service life of asphalt overlays on concrete bridge decks in Oregon. This research supports the ongoing preservation of the State's bridges.

### **817 Concrete Bridge Deck Performance Data and Metrics for the State of Oregon**

The objective of the research was to define a dataset that can be used by ODOT to monitor concrete bridge deck performance and factors affecting deterioration of concrete bridge-decks. The development of a means to use this dataset in a predictive manner to guide maintenance and monitoring efforts was a further objective. Both objectives were achieved to some degree.

The dataset and predictive approach that the research produced is information in the National Bridge Inventory (NBI), or can be readily derived from the NBI and other ODOT data (i.e. climate zone, ADTT, design period, and distance from salt water). The predictive method is a very simple set of equations based on the current bridge condition rating.

The research identified that concrete cover is an important parameter that should begin to be tracked for most, or all, concrete bridge decks. Slightly less important, but also informative are the parameters of rebar type, deck slenderness, and rebar spacing. Based on a survey of other state DOTs, it was also found that expert opinion holds that deicer quantity, chloride concentration, crack area, and delamination area should be tracked. Additionally, some agencies reported collecting information on the in situ concrete cover and deck thickness of newly constructed bridge decks. Since these were identified as important parameters from design values, recording as built observations of them is recommended.

### **818 Implementation of ODOT Tack Coat Technologies and Procedures to Improve Long-term Pavement Performance**

Tack coats are the bituminous materials applied between asphalt concrete pavement layers to facilitate interlayer bonding, allowing successive pavement layers to adhere together and behave as a monolithic structure. This minimizes tensile strains at the top and bottom of the asphalt layer, which can cause premature fatigue cracking and early pavement failure. Several new types of tack coat emulsions are purported to create better bonding and greater ease of constructability. Using direct shear testing, this study

quantified the impact of new emulsions from three companies on bond strength as compared to emulsions traditionally used in Oregon under different surface conditions (milled and overlay) and contaminants such as dust and moisture, and different application rates.

Additionally, this study focuses on developing and implementing a more robust set of specifications and QC provisions for tack coats. By improving upon and implementing a rigorous in-situ test for tack coat quality is validated for large-scale implementation as part of the highway construction inspection process. In this study, a wireless scale system that can be controlled from a tablet computer, was also developed to measure application rate accuracy and uniformity during construction. A field test procedure using this system was also developed to determine tack coat curing time to avoid tracking during construction. Using the system. Use of these tests will help ensure strength between asphalt pavement layers in new construction and rehabilitation projects alike, extending the structural design life of Oregon's roads.

#### **784 Seismic Retrofits for Square Reinforced Concrete Columns Using Titanium Alloy Bars**

This research project demonstrated the feasibility of using small, titanium alloy bars to address the seismic vulnerability of old, square columned reinforced concrete bridges. It documented the performance characteristics of such a retrofit and proposed design specifications and parameters.

ODOT is currently rewriting the Seismic Retrofit Section of our Bridge Design Manual (BDM), and it is expected to be published October 2026. The new Seismic Retrofit Section of BDM will list a few preferred retrofit alternatives for Oregon bridges, and the use of titanium bars and spirals will be one of those options. Information from the research for retrofitting the bridge columns using titanium spirals has been shared with the bridge design community through several training sessions and conferences the benefit of using titanium bars and spirals for seismic retrofit.

#### **828 Addressing Oregon's Rise in Deaths and Serious Injuries for Senior Drivers and Pedestrians**

A two-year increase in Oregon's fatality and serious injury crash rate for drivers and pedestrians 65 years and older triggered a federal rule requiring Oregon to develop strategies to address the increases. This research first identified the locations and circumstances with an over-representation of serious crashes involving drivers and pedestrians age 65 and older. Researchers then selected proven best practices and countermeasures appropriate for those conditions that will provide targeted safety improvements in both the short and long term.

Findings from this work were incorporated into the 2021 Transportation Safety Action Plan. In 2021 this work was presented at International Road Federation Conference: Vision Zero for Latin America.

## 4.0 FY 2025 PUBLICATIONS, ACTIVITY, AND SPENDING

The following section summarizes activities of the Research Section, including the status of active projects, cost information.

### 4.1 RESEARCH PROJECT STATUS

The status of 107 research projects initiated from FY 2016 through FY 2025 is summarized in Table 4.1. The reports published in FY 2025 are discussed in detail in Section 2 above. Table 4.2 summarizes the major projects that completed in FY 2025, and Table 4.3 documents the major projects continuing past FY 2025. Major projects are defined as those that were selected by the Research Advisory Committee or had a budget of at least \$70,000 and lasted at least one year. Table 4.4 summarizes all other research projects and related activities and includes the Research Discretionary Fund and miscellaneous continuing activities.

**Table 4.1: Project Status Summary, FY 2016 – FY 2025**

| <b>Project Start<br/>Fiscal Year</b> | <b>Complete</b> | <b>Cancelled</b> | <b>On<br/>Schedule</b> | <b>Behind<br/>Schedule</b> | <b>Total New<br/>Projects</b> |
|--------------------------------------|-----------------|------------------|------------------------|----------------------------|-------------------------------|
| 2016                                 | 14              | 1                | 0                      | 0                          | 15                            |
| 2017                                 | 9               | 0                | 1                      | 0                          | 10                            |
| 2018                                 | 11              | 0                | 0                      | 0                          | 11                            |
| 2019                                 | 9               | 1                | 0                      | 0                          | 11                            |
| 2020                                 | 7               | 0                | 2                      | 0                          | 9                             |
| 2021                                 | 7               | 0                | 2                      | 3                          | 11                            |
| 2022                                 | 4               | 0                | 5                      | 2                          | 11                            |
| 2023                                 | 1               | 0                | 8                      | 2                          | 11                            |
| 2024                                 | 1               | 0                | 8                      | 0                          | 9                             |
| 2025                                 | 0               | 0                | 9                      | 0                          | 9                             |
| <b>Total</b>                         | <b>63</b>       | <b>2</b>         | <b>35</b>              | <b>7</b>                   | <b>107</b>                    |

**Table 4.2: Expenditures and Status for Major Projects Ended During FY 2025**

| <b>Project No.</b> | <b>Project Title</b>                                                                                                                   | <b>Spent in FY'2025</b> | <b>Publication Status</b> | <b>Status</b>       |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|---------------------|
| SPR 807            | Coastal Landslide and Sea Cliff Retreat Monitoring for Climate Change Adaptation and Targeted Risk Assessment                          | \$17,709                | Published                 | Completed           |
| SPR 820            | Laboratory and In-situ Characterization of Diatomaceous Soil with Implications for Geotechnical Design                                 | \$-                     | Published                 | Completed           |
| SPR 834            | Vulnerability and Risk Prioritization for Coastal Highway Erosion Areas of Concern                                                     | \$-                     |                           | Publication-Pending |
| SPR 841            | Pedestrian Equity Analysis                                                                                                             | \$81,746                |                           | Publication-Pending |
| SPR 842            | Constructing High-Density Longitudinal Joints to Improve Pavement Longevity                                                            | \$ 1,558                | Published                 | Completed           |
| SPR 846            | Trends and Challenges Posed by Medium-Duty Trucks to the Operations and Safety of Oregon Highways                                      | \$ 612                  | Published                 | Completed           |
| SPR 847            | Alternative Bridge Deck Overlays                                                                                                       | \$23,522                |                           | Publication-Pending |
| SPR 850            | Automating LIDAR Data to Develop and Manage Active Transportation Asset Inventories                                                    | \$-                     |                           | Publication-Pending |
| SPR 851            | Evaluation of Electronic Enforcement of Motor Carrier Compliance and Safety                                                            | \$ 9,238                |                           | Publication-Pending |
| SPR 854            | Validation of the New Speed Zoning Method for Urban Arterials and High-Speed Roadways in terms of Speed Compliance and Safety Outcomes | \$-                     | Published                 | Completed           |

| <b>Project No.</b> | <b>Project Title</b>                                                                                    | <b>Spent in FY'2025</b> | <b>Publication Status</b> | <b>Status</b>       |
|--------------------|---------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|---------------------|
| SPR 856            | Automated Methods for Correcting ODOT's Real-Time GNSS Network for Surveying and Post Disaster Recovery | \$11,680                |                           | Publication-Pending |
| SPR 858            | Development of Procedures And Technologies for Chip Seal Construction Quality Control in Oregon         | \$ 9,397                | Published                 | Completed           |
| SPR 860            | Piloting Smart Work Zone Technologies to Improve Oregon Highway Safety and Mobility                     | \$-                     |                           | Publication-Pending |
| SPR 863            | Effects of Trucking Regulator Relaxations on Freight Safety in Oregon                                   | \$13,196                | Published                 | Completed           |
| SPR 866            | Prototyping Automated Framework for Asset Extraction and Characterization from Mobile Lidar Data        | \$55,041                |                           | Publication-Pending |
| SPR 868            | Develop a new VisionEval Land Use Model for Strategic Evaluation of Land Use Scenarios                  | \$66,443                |                           | Publication-Pending |
| SPR 871            | Validation of HSM Crash Prediction Methods for Specific Intersection Types in Oregon                    | \$67,960                |                           | Publication-Pending |
| SPR 873            | Improving Guidance for Automated Speed Enforcement                                                      | \$96,299                | Published                 | Completed           |

**Table 4.3: Expenditures and Status for Ongoing Major Projects FY 2025**

| <b>Project No.</b> | <b>Project Title</b>                                                                                                             | <b>Spent in FY'2025</b> | <b>Expected End Date</b> | <b>Status</b>   |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|-----------------|
| 836                | Prioritizing Wildlife Collision Mitigation Zones for Long Range Planning Efforts                                                 | \$78,685                | 12/31/2025               | Continuing      |
| 852                | Implementation of Balanced Mix Design Methods in Oregon to Meet Long-Term Performance Goals                                      | \$47,832                | 06/30/2025               | Continuing      |
| 853                | Predicting Near Real-Time Post-Fire Landslide Debris Flows Along ODOT Corridors                                                  | \$47,362                | 06/30/2025               | Continuing      |
| 859                | Real-Time Continuous Bridge Scour Monitoring for Improved Safety and Cost Savings                                                | \$55,744                | 12/31/2024               | Pre-Publication |
| 861                | Signal-Controller-in-the-Loop Simulation for Testing and Deploying Advanced Signal Operations on Arterial Roadways               | \$55,251                | 6/30/2025                | Continuing      |
| 862                | Increasing Asphalt Recycling to Reduce Paving Costs, Improve Pavement Longevity, and Reduce Environmental Impact                 | \$150,044               | 11/30/2025               | Continuing      |
| 864                | Phase 2: Quantitative Evaluation Process for Improved Rockslope Safety and Reduced Maintenance                                   | \$85,941                | 6/30/2026                | Continuing      |
| 865                | Low-Carbon Ultra-High Performance Concrete for Use in Highway Infrastructure                                                     | \$136,053               | 9/29/2025                | Continuing      |
| 867                | Automated Wildlife Detection for Wildlife Vehicle Collision Reduction                                                            | \$147,592               | 06/30/2027               | Continuing      |
| 870                | Placement Options for In-street Pedestrian Crossing Signs (R1-6a)                                                                | \$109,571               | 6/30/2026                | Continuing      |
| 872                | Development of a Diversity, Equity and Inclusion (DEI) Workforce Sustainability Evaluation Tool                                  | \$97,615                | 6/30/2026                | Continuing      |
| 874                | New Methods for Improving Load Rating of Existing Steel Bridges                                                                  | \$96,299                | 6/30/2026                | Continuing      |
| 875                | E-commerce Impacts on Oregon Household Level Deliveries, Trips, and VMT                                                          | \$161,917               | 6/30/2026                | Continuing      |
| 876                | Implementation Requirements for Work Zone Intrusion Technologies to Reduce Fatalities                                            | \$89,993                | 6/30/2026                | Continuing      |
| 877                | Developing Guidance on Leading Pedestrian Intervals and Curb Extensions to Improve Pedestrian Safety at Signalized Intersections | \$99,663                | 6/30/2026                | Continuing      |
| 878                | Real-Time Landslide Surface Monitoring for Improved Safety, Response, and Repair                                                 | \$86,228                | 12/31/2027               | Continuing      |
| 879                | Phase II: Method Development for Construction Design in Diatomaceous Soils                                                       | \$163,716               | 12/31/2027               | Continuing      |
| 880                | An Innovative Technology to Prevent Wind-Induced Fatigue Cracks in the Astoria-Megler Bridge.                                    | \$41,795                | 12/31/2026               | Continuing      |

| <b>Project No.</b> | <b>Project Title</b>                                                                                         | <b>Spent in FY'2025</b> | <b>Expected End Date</b> | <b>Status</b> |
|--------------------|--------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|---------------|
| 881                | Landslide hotspot prioritization, planning, and management tool                                              | \$163,818               | 12/31/2028               | Continuing    |
| 882                | Benefit-Cost Analysis of Roundabouts to Support Long Range Investment Policy                                 | \$82,666                | 12/31/2026               | Continuing    |
| 883                | Advancing pedestrian safety at intersections: Temporal modeling of pedestrian crash frequency and severity   | \$13,607                | 6/30/2029                | Continuing    |
| 884                | Developing Next-Generation of Bridge Fragility Models for Oregon's Transportation Network                    | \$121,521               | 6/30/2027                | Continuing    |
| 885                | Resiliency through Proactive Design: Integration of NCHRP 15-61                                              | \$3,153                 | 6/30/2027                | Continuing    |
| 886                | Mobile Lidar Evaluation of Road Marking Condition for Federal Reporting                                      | \$129,661               | 9/30/2027                | Continuing    |
| 887                | Increasing Asphalt Recycling in Oregon through Improvements in Cold and Hot Mix Asphalt Production Processes | \$117,392               | 3/31/2028                | Continuing    |
| 888                | Evaluation of the relationship between near misses and crash outcomes at intersections in Oregon             | \$60,577                | 12/31/2026               | Continuing    |
| TNIS               | Transportation needs and issues Survey                                                                       | \$94,828                |                          | Ongoing       |

**Table 4.4: Other FY 2025 Research Activities**

| <b>Project #</b> | <b>Project Title</b>                         | <b>Spent FY 2025</b> | <b>Status</b> |
|------------------|----------------------------------------------|----------------------|---------------|
| 301-000          | SPR Project Selection and Development        | \$221,559            | Ongoing       |
| 302-000          | SPR Implementation                           | \$15,764             | Ongoing       |
| 302-200          | Library Literature Reviews                   | \$41,865             | Ongoing       |
| 304-121          | National Research Liaison and NCHRP Activity | \$14,904             | Ongoing       |
| 304-401          | Northwest Transportation Conference          | \$2,092              | Ongoing       |
| 304 - 481        | AASHTO TIG                                   | \$6,000              | Ongoing       |
| 304 - 811        | CSS Pilot Support                            | \$402                | Completed     |
| 304-851          | Mower Image System                           | \$10,200             | Continuing    |
| 304-971          | Stormwater Management with BMP               | \$8,681              | Continuing    |
| 500-040          | State Information Requests (State funded)    | \$714,406            | Ongoing       |

## 4.2 BUDGET AND FUNDING

Research funding originates from several sources:

### **Federal State Planning and Research (SPR)**

SPR program funding is set at two percent of each state's FHWA highway funding under 23 U.S.C. 307(c). Of that two percent, at least 25 percent (i.e., 0.5%) is specifically identified for Research, Development, and Technology Transfer (RD&T). For Oregon, in recent years this amounts to roughly \$2.8 million per year. SPR RD&T funds support a large share of direct expenditures on research projects. In addition to those funds specifically earmarked for research, in recent years the Research Section also has drawn research project and T2 program funds from the planning portion of SPR.

### **Local Technical Assistance Program (LTAP)**

FHWA LTAP funding is targeted for technical assistance and training for local agency public works programs. These funds provide half the funding for the programs and activities of the T2 program.

### **Other Federal Funds**

A number of discretionary federal funding sources may be used to support research development and technology transfer. These include discretionary programs authorized under recent surface transportation bills, Statewide Transportation Innovation Council Incentive Grants, and National Traffic Safety Administration grants.



## Oregon Highway Fund

These funds are used in several ways. The Research Section uses state highway funds to cover indirect costs. In addition, with some specific exceptions, SPR funds require 20% local participation. In most cases, the source of these “matching” funds is the Oregon Highway Fund. Finally, a few research projects are carried out entirely with state highway funds.

## Local Government

LTAP funding requires 50 percent local participation. Most of these required matching funds are provided by the Association of Oregon Counties and the League of Oregon Cities. Members of these organizations are the primary recipients of T2 services. Table 4.5 summarizes expenditures by program area and by source of funds.

**Table 4.5: Expenditures Summary by Program and by Source of Funds**

| <b>Program</b>              | <b>Federal<br/>SPR<br/>Research</b> | <b>Federal<br/>LTAP</b> | <b>Federal<br/>Other</b> | <b>State<br/>Funds</b> | <b>Local<br/>Governm<br/>ent</b> | <b>Total</b>       |
|-----------------------------|-------------------------------------|-------------------------|--------------------------|------------------------|----------------------------------|--------------------|
| SPR Research Program        | \$2,750,613                         |                         | \$89,456                 | \$710,017              |                                  | \$3,550,086        |
| State Research Program      |                                     |                         |                          | \$49,936               |                                  | \$49,936           |
| LTAP Program                |                                     | \$210,000               |                          | \$102,985              | \$125,000                        | \$437,985          |
| TRB Subscription            | *                                   |                         |                          |                        |                                  | \$0                |
| NCHRP                       | *                                   |                         |                          |                        |                                  | \$0                |
| Pooled Fund Led by Oregon   | \$123,886                           |                         |                          |                        |                                  | \$123,886          |
| External Pooled Fund        | \$95,000                            |                         |                          |                        |                                  | \$95,000           |
| Research & Library Indirect |                                     |                         |                          | \$714,406              |                                  | \$714,406          |
| LTAP Indirect               |                                     |                         |                          | \$27,357               |                                  | \$27,357           |
| <b>TOTAL</b>                | <b>\$2,864,567</b>                  | <b>\$210,000</b>        | <b>\$89,456</b>          | <b>\$1,604,702</b>     | <b>\$125,000</b>                 | <b>\$4,893,725</b> |

\* TRB Subscription and NCHRP transfers were made in state FY 2026 and will be reported in the 2026 Annual Report.

## **5.0 OTHER FY 2025 RESEARCH ACTIVITIES**

In addition to major research projects, the ODOT Research Section is responsible for a number of ongoing programs and activities, smaller projects, and the annual selection of new research projects. These include:

- the Oregon Technology Transfer (T2) Center, Oregon's Local Technical Assistance Program (LTAP);
- research project selection;
- small, discretionary projects;
- specific activities to support research implementation;
- selection of and participation in pooled fund projects with other states; and
- serving as ODOT's point of contact for regional and national transportation research activities.

The next few pages present activities and accomplishments in some of these areas.

### **5.1 OREGON TECHNOLOGY TRANSFER CENTER (T2)**

The T2 Center provides transportation-related information to local agencies throughout Oregon. The Center is jointly funded by FHWA, local agencies, and ODOT. Oregon's T2 Center is one of 53 centers in the nation that make up FHWA's Local Technical Assistance Program (LTAP) and Tribal Technical Assistance Program (TTAP).

The T2 Center provides the following services:

- a lending library of audio/visual materials;
- a program of free and low cost seminars, training classes, and workshops;
- a "Circuit Rider" service that includes annual technical assistance and informational visits to local road agency customers; and
- responses to customer inquiries relating to transportation technology.

The T2 Center strives to make local road agencies aware of the latest and most effective transportation technologies. T2 does this by acting as an information and training resource to encourage and strengthen communication between government agencies at all levels and through the delivery of "low cost seminars, training classes and workshops" to local road agency employees.

The center’s training program is its most visible service. It consists of three elements: 1) short courses, which are delivered by Circuit Riders and focus on roadway and workplace safety; 2) a training program, which delivers six or more events per year in partnership with organizations such as the Oregon Chapter of the American Public Works Association (APWA); and 3) a two-level Roads Scholar certification program with 18 core classes taught by in-house and contract trainers. The Roads Scholar program is the most formalized aspect of the center’s training services and continues to be very successful.

## 5.2 RESEARCH PROJECT SELECTION

Project selection begins in the fall with modifications and updates to published research priorities. The process ends in the spring with the annual project selection meeting.

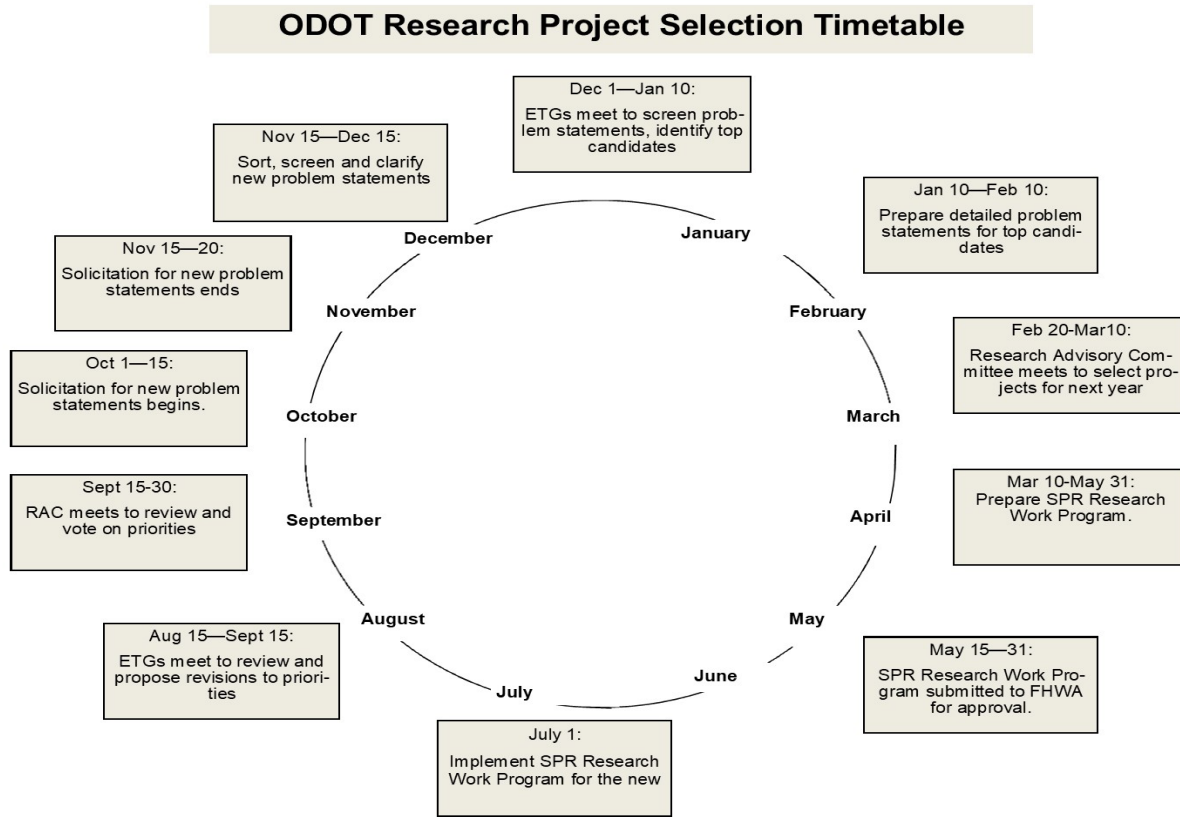
Research project selection is carried out in two stages. Expert Task Groups (ETGs), with support and coordination from the Research Section staff, make initial recommendations. The ODOT Research Advisory Committee (RAC) makes the final decision, selecting projects to go forward from the pool of ideas nominated by the ETGs.

A list of the new research projects selected for FY 2024 is shown in Table 5.1: New Projects Selected for Fiscal Year . Figure 5.1: ODOT research project selection timetable, provides a schematic of the project selection timetable.

**Table 5.1: New Projects Selected for Fiscal Year 2025**

| <b>Project No.</b> | <b>Project Title</b>                                                                                                                                                              | <b>Scheduled End Date</b> | <b>Total Project Budget</b> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|
| <b>889</b>         | Evaluating Mowing Practices for Pollinator Habitat Enhancement: Highway Vegetation Management and Its Impact on Endangered Pollinators                                            | 6/30/2030                 | \$324,000                   |
| <b>890</b>         | Updating Streamflow Statistics for Central and Eastern Oregon to Reduce Flooding Risk                                                                                             | 6/30/2028                 | \$294,500                   |
| <b>891</b>         | Impact Study on Increasing Truck Permit Weight Limits: Infrastructure & Economic Considerations weight, more problems and faster infrastructure degradation ODOT will need to fix | 6/30/2028                 | \$368,600                   |
| <b>892</b>         | Phase III Wickiup Junction: Diatomaceous Soil Numerical Modeling to Support Design, Performance, and Feasibility                                                                  | 6/30/2029                 | \$344,500                   |
| <b>893</b>         | Development of Methods to Produce High-Quality ‘Household-Based’ VMT Dataset                                                                                                      | 6/30/2028                 | \$160,000                   |
| <b>894</b>         | Design Guidelines for Bridge Pile Foundations Subjected to Combined Inertial and Liquefaction Induced Lateral Spreading Loads                                                     | 6/30/2029                 | \$413,000                   |
| <b>895</b>         | Develop Guidance on the Safety Performance of Edge Line Pavement Markers and Guardrail Delineations on Rural Oregon Roads                                                         | 6/30/2028                 | \$195,600                   |
| <b>896</b>         | The Potential Of Using Crack-Attenuating Asphalt Mixtures In Oregon To Combat Long-Term Durability Issues                                                                         | 6/30/2029                 | \$319,000                   |

**Figure 5-1 ODOT research project selection timetable**



### 5.3 SMALL QUICK RESPONSE AND DISCRETIONARY PROJECTS

#### Small Projects

Each year the Research Section conducts small projects, typically totaling \$50,000 or less each. Funds are set aside for these types of projects so that money may be quickly allocated once a proposal is approved. These quick response or discretionary projects may be funded using SPR funds or using state funds entirely.

#### Information Requests

Divisions, sections, and units of ODOT will periodically request information from the Research Section. Information requests typically consist of requests for literature searches, statistical analyses, or small compilation reports. The section also responds to requests from other states about ODOT practices. On occasion, local transportation agencies have requested information, as well.

Though information requests are not tracked individually, it is estimated that the research staff spent 1820 hours responding to requests in Fiscal Year 2024, addressing a wide range of topics.

## **5.4 POOLED FUND PROJECTS**

The Research Section has committed to working with other states to fund research through the Transportation Pooled Fund (TPF) program. This program offers significant advantages.

One advantage is cost sharing. For every ODOT dollar invested in these pooled fund projects, about \$15 is leveraged from other organizations. A second advantage is that TPF projects are approved for 100% federal funding, which means participating states do not need to use state matching funds. The ODOT Office of Innovative Finance leads two pooled funds independent of the Research Program.. Oregon commits a mix of SPR and state funds to these projects. ODOT Research continues to monitor thirty ongoing-pooled fund projects from previous years and one proposed pooled fund. (Table 5.2)

**Table 5.2: Transportation Pooled Fund Project Summary**

| Number          | Title                                                                                                                                                        | Status                                      | Your Commitments |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|
| 1651--><br>1651 | Collaboration on Strategic Planning Models                                                                                                                   | Solicitation posted                         | \$25,000         |
| TPF-5(178)      | Implementation of the Asphalt Mixture Performance Tester (AMPT) for Superpave Validation                                                                     | Cleared by FHWA                             | \$105,000        |
| TPF-5(255)      | Highway Safety Manual Implementation                                                                                                                         | Cleared by FHWA                             | \$80,000         |
| TPF-5(264)      | Passive Force-Displacement Relationships for Skewed Abutments                                                                                                | Contract signed                             | \$30,000         |
| TPF-5(288)      | Western Road Usage Charging Consortium                                                                                                                       | Cleared by FHWA                             | \$175,000        |
| TPF-5(299)      | IMPROVING THE QUALITY OF PAVEMENT SURFACE DISTRESS AND TRANSVERSE PROFILE DATA COLLECTION AND ANALYSIS                                                       | Cleared by FHWA                             | \$90,000         |
| TPF-5(316)      | Traffic Control Device (TCD) Consortium                                                                                                                      | Cleared by FHWA                             | \$60,000         |
| TPF-5(350)      | Development of Next Generation Liquefaction (NGL) Database for Liquefaction-Induced Lateral Spread                                                           | Contract signed                             | \$20,000         |
| TPF-5(357)      | Connecting the DOTs: Implementing ShakeCast Across Multiple State Departments of Transportation for Rapid Post-Earthquake Response                           | Objectives fulfilled                        | \$105,000        |
| TPF-5(358)      | Wildlife Vehicle Collision Reduction and Habitat Connectivity                                                                                                | Objectives fulfilled                        | \$100,000        |
| TPF-5(367)      | Evaluation and Full Scale Testing of Concrete Prefabricated Bridge Rails                                                                                     | Objectives fulfilled                        | \$60,000         |
| TPF-5(384)      | Exploring Non-Traditional Methods to Obtain Vehicle Volume and Class Data                                                                                    | Cleared by FHWA                             | \$10,000         |
| TPF-5(386)      | Gravel-Bed River Assessment Tool for Improved Resiliency of Engineering Design                                                                               | Commitment Year Extended<br>Cleared by FHWA | \$15,000         |
| TPF-5(398)      | Moving Forward with the Next Generation Travel Behavior Data Collection and Processing(The WAIVER IS APPROVED FOR SPR-A FUNDS ONLY...NOT APPROVED FOR SPR-B) | Cleared by FHWA                             | \$85,000         |
| TPF-5(399)      | Improve pavement surface distress and transverse profile data collection and analysis, Phase II                                                              | Cleared by FHWA                             | \$75,000         |
| TPF-5(433)      | Behavior of Reinforced and Unreinforced Lightweight Cellular Concrete for Retaining Walls                                                                    | Contract signed                             | \$40,000         |
| TPF-5(437)      | Technology Transfer Concrete Consortium (FY20-FY24)                                                                                                          | Contract signed                             | \$40,000         |

| Number     | Title                                                                                                                                                                   | Status                                      | Your Commitments |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|
| TPF-5(440) | Support for Urban Mobility Analyses -<br>WAIVER APPROVED FOR SPR-A FUNDS ONLY                                                                                           | Objectives fulfilled                        | \$50,000         |
| TPF-5(442) | Transportation Research and Connectivity(librarian toolkit / knowledge networking / information condition / analysis of resources / digitization efforts / ADA support) | Commitment Year Extended<br>Cleared by FHWA | \$10,000         |
| TPF-5(447) | Traffic Control Device (TCD) Consortium (3)                                                                                                                             | Cleared by FHWA                             | \$30,000         |
| TPF-5(451) | Road Usage Charge (RUC) America                                                                                                                                         | Cleared by FHWA                             | \$100,000        |
| TPF-5(456) | EconWorks - Improved Economic Insight -<br>THE WAIVER IS FOR SPR-A FUNDS ONLY.<br>ONLY SPR-A FUNDS MAY BE SENT TO THIS PROJECT                                          | Cleared by FHWA                             | \$20,000         |
| TPF-5(470) | Traffic Signal Change and Clearance Interval Pooled Fund Study                                                                                                          | Cleared by FHWA                             | \$100,000        |
| TPF-5(478) | Demonstration to Advance New Pavement Technologies Pooled Fund                                                                                                          | Cleared by FHWA                             | \$50,000         |
| TPF-5(479) | Clear Roads Winter Highway Operations Phase III Pooled Fund                                                                                                             | Cleared by FHWA                             | \$125,000        |
| TPF-5(485) | Consequences-Based Analysis of Undrained Shear Behavior of Soils and Liquefaction Hazards, Phase 1: Filling the Data Gaps                                               | Cleared by FHWA                             | \$60,000         |
| TPF-5(501) | Roadside Safety Pooled Fund - Phase 3                                                                                                                                   | Cleared by FHWA                             | \$260,000        |
| TPF-5(511) | TRB Core Program Services for a Highway RD&T Program “ Federal Fiscal Year 2023/TRB (State DOTs) Fiscal Year 2024                                                       | Cleared by FHWA                             | \$140,902        |
| TPF-5(524) | Stormwater Management to Address Highway Runoff Toxicity Due to 6PPD-Quinone from Tire Rubber                                                                           | Cleared by FHWA                             | \$160,000        |
| TPF-5(534) | Mobility Analysis and System Transportation Efficiency Research (MASTER)-SPR-A FUNDS ONLY                                                                               | Cleared by FHWA                             | \$70,000         |
| TPF-5(554) | Traffic Control Device (TCD) Consortium (4)                                                                                                                             | Cleared by FHWA                             | \$30,000         |
| TPF-5(556) | Uncrewed Aircraft Systems (UAS) Standardization                                                                                                                         | Cleared by FHWA                             | \$125,000        |

## 5.5 REGIONAL AND NATIONAL RESEARCH COORDINATION

ODOT participates directly or indirectly in a number of national research programs and initiatives. In general, the role of ODOT Research is that of liaison, or point of contact. Among the responsibilities carried out by ODOT Research in Fiscal Year 2021 are the following:

### **Transportation Research Board**

The Research Section Manager is the Oregon DOT representative to the Transportation Research Board (TRB). This responsibility involves a range of duties that relate to coordination of communication and services between ODOT and TRB.

### **AASHTO Research Advisory Committee (RAC)**

The Research Section Manager is also a member of the AASHTO Research Advisory Committee (RAC). The RAC has several important functions within AASHTO and in setting the national transportation research agenda, as well as serving as the principal point of contact for transportation research between states.

The RAC meets annually. In addition, RAC members meet regionally via bi-monthly conference calls. Specific functions and duties of the Research Advisory Committee include the following.

- **Review and rating of projects submitted to the National Cooperative Highway Research Program (NCHRP)** Every year, problem statements are submitted to NCHRP for funding. The TRB, on behalf of AASHTO and the state Departments of Transportation, allocates approximately \$37 million each year for research benefiting highways. The AASHTO RAC member in each state is responsible for submitting an advisory ballot, used to select projects for funding.
- **Nomination of NCHRP project panel members** Each NCHRP project is managed by a panel of experts. Many of those panelists are drawn primarily from the 50 state Departments of Transportation. AASHTO RAC members are responsible for nominating panel members from their respective states.
- **Coordination of synthesis data collection** One component of NCHRP is a sub-program called NCHRP Synthesis, which consists of small studies of the state of knowledge and current practice in a particular area of highway technology. Each synthesis project includes a questionnaire survey of current practice by state Departments of Transportation. The AASHTO RAC members are responsible for coordinating that data collection within their own departments.



- **Other support for NCHRP** RAC members pay their state's annual NCHRP contribution, provide assistance to DOT employees who wish to submit problem statements, and disseminate NCHRP research results within their departments.
- **National RAC listserv** Members of the Committee are members of an electronic mail listserv, which is used to communicate on a variety of topics. A key use that has evolved is the gathering of information about practices in other states, particularly with regard to the applications of new technology. ODOT Research coordinates hundreds of such requests for information from other states every year.

### **University Transportation Centers**

In addition to providing full project funding, ODOT Research Section funds are also used to leverage funds contributed by other organizations and centers to jointly sponsor research projects. University Transportation Centers (UTCs), including Pacific Northwest Transportation Consortium (PacTrans) in which Portland State University is a full member, the Portland State University led Transportation Research and Education Consortium (TREC), Center for Freight Transportation for Efficient and Resilient Supply Chain (FERSC), and Western Transportation Institute have been important partners in funding research.

### **Title VI of the Civil Rights Act**

The Oregon Department of Transportation ensures compliance with Title VI of the Civil Rights Act of 1964; 49 CFR, part 21; related statutes and regulations to the end that no person shall be excluded from participation in or be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance from the U.S. Department of Transportation on the grounds of race, color, sex, or national origin.