

# SPR RESEARCH PROGRAM

## SECOND-STAGE PROPOSAL SUMMARY

### PROBLEM NUMBER AND TITLE

27-59 Pedestrian Refuge Island Curb Design, Size & Traffic Control Device Placement Guidance

### PROBLEM SUMMARY

Pedestrian refuge islands are a proven safety countermeasure that provide pedestrians with a safe waiting area in the middle of a road, allowing them to cross one direction of traffic at a time. They also provide a traffic calming effect to drivers and warn them of the crossing area with curb design and traffic control devices. ODOT has installed more pedestrian refuge islands in the last two decades, many of which are struck by vehicles, increasing pedestrian crash risk and significantly increasing maintenance costs. The AASHTO Green Book and MUTCD provide considerations for pedestrian refuge island design size and traffic control device placement for various roadway scenarios (speed, traffic volumes, geometry, etc.), but not specific recommendations for reducing vehicle strike risk while maximizing pedestrian safety. The purpose of this proposal is to provide guidance to practitioners on optimal pedestrian refuge island design and delineation that balances pedestrian and vehicle safety and maintenance costs.

### ODOT OBJECTIVES

The study's primary objective is to create comprehensive, data-driven guidance for designing and placing pedestrian refuge islands in ways that reduce vehicle strikes, improve pedestrian safety, and lower long-term maintenance costs. Additionally, the research will identify roadway and design factors linked to vehicle impacts, assess existing island designs across Oregon, and determine the most effective MUTCD-compliant delineation treatments. It will also develop optimized design recommendations that balance pedestrian needs, vehicle operations, and maintenance efficiency. Finally, the study will strengthen ODOT's equity and safety commitments by ensuring that refuge islands offer safer, more accessible crossings for vulnerable road users statewide.

### BENEFITS

This study will help Oregon DOT reduce long-term costs and improve safety by identifying refuge island designs that minimize vehicle strikes and associated maintenance and repair needs. It will also streamline project delivery by giving designers clear, data-driven guidance for selecting island dimensions, curb heights, and traffic control device placements that are effective across a range of roadway contexts. By producing consistent, evidence-based guidance, the study enhances design efficiency and safer pedestrian crossings.

### SCHEDULE, BUDGET AND AGENCY SUPPORT

**Estimated Project Length:** 20 months.

**Estimated Project Budget:** \$180,000

**ODOT Support:** Amanda Salyer, P.E., Region 2 Traffic Investigations Engineer

### FOR MORE INFORMATION

For additional detail, please see the complete STAGE 2 RESEARCH PROBLEM STATEMENT online at:

<https://www.oregon.gov/odot/Programs/ResearchDocuments/27-59.pdf>

# SPR RESEARCH PROGRAM

## SECOND-STAGE PROBLEM STATEMENT

### FY 2027

#### PROBLEM NUMBER AND TITLE

27-59 Pedestrian Refuge Island Curb  
Design, Size & Traffic Control Device  
Placement Guidance

#### RESEARCH PROBLEM STATEMENT

Pedestrian refuge islands are a proven safety countermeasure that provide pedestrians with a safe waiting area in the middle of a road, allowing them to cross one direction of traffic at a time. They also provide a traffic calming effect to vehicles and warn drivers of the crossing area with both curb design and traffic control devices. Drivers can perceive these crossing locations from a longer distance than signs alone (Vignali et al., 2020). Previous studies also suggest they may lead to a 23-50% reduction in pedestrian crashes, but they can also increase “the likelihood of collisions involving pedestrian violations at large intersections” (Fitch-Polse & Agarwal, 2025). Yet, these issues have not been studied in the Oregon context.

As more pedestrian refuge islands have been installed in the last two decades, there are many locations that are struck often by vehicles, increasing pedestrian crash risk and significantly increasing maintenance costs of traffic control devices placed on the island. The Green Book (AASHTO, 2018) and MUTCD (FHWA, 2023) provide considerations for pedestrian refuge island design size and traffic control device placement for various roadway scenarios (speed, traffic volumes, geometry, etc.) but not specific recommendations for reducing vehicle strike risk while maximizing pedestrian safety. The purpose of this research proposal is to provide guidance to practitioners on optimal pedestrian refuge island design and delineation that balances pedestrian and vehicle safety and maintenance costs.

#### RESEARCH OBJECTIVES

The primary objective of this study is to develop comprehensive, data-driven guidance for the design, sizing, and traffic control device placement of pedestrian refuge islands that reduces vehicle strike risk, enhances pedestrian safety, and minimizes maintenance costs for Oregon DOT. Five sub-objectives support this purpose:

1. Identify roadway and design factors that contribute to pedestrian refuge island vehicle strikes using crash data, Claims Against Others (CAO) records, and maintenance logs.
2. Inventory and evaluate existing pedestrian refuge island designs, including curb height, island size, bull-nose geometry, and traffic control device placement.
3. Determine the most effective delineation methods consistent with MUTCD guidance to improve visibility and reduce crash likelihood.
4. Develop optimized design recommendations that balance pedestrian safety, vehicle operational needs, and long-term maintenance considerations across a range of roadway contexts.
5. Support ODOT’s equity and safety goals by ensuring pedestrian refuge islands provide accessible, reliable, and safer crossings for vulnerable road users statewide.

## WORK TASKS, COST ESTIMATE AND DURATION

### Task 1: TAC Meeting #1 – Project Kickoff

Project kick-off meeting to review the research problem, confirm project scope, and establish expectations.

Time Frame: [1–3 Months after NTP]

### Task 2: Draft Literature Review

Conduct a comprehensive review of technical literature relevant to pedestrian refuge island design, including safety countermeasures, curb design, island geometry, sign placement, delineation, fixed-object strike reduction, vulnerable road user safety, equity considerations, and maintenance implications. Review AASHTO Green Book, MUTCD guidance, prior research, crash modification factor literature, and relevant ODOT standards.

Time Frame: [3–6 Months after NTP]

### Task 3: Draft Research Methodology

Develop the proposed methodology covering data sources (crash data, CAO claims, maintenance logs, and field inventory), data quality, variable definitions, roadway condition classifications, sampling strategy, and statistical or analytical methods appropriate for identifying factors related to island strikes and pedestrian safety. Document data collection needs, risks, and any human-subjects protections (if pedestrian observations or surveys are included).

Time Frame: [6–9 Months after NTP]

### Task 4: TAC Meeting #2 – Research Design Review

This meeting confirms the project’s analytical direction and readiness for data collection.

Time Frame: [6–9 Months after NTP]

### Task 5: Data Collection

Collect and organize all data needed for analysis, including crash histories and roadway departure patterns, CAO and available maintenance records involving struck refuge islands, field inventory of refuge island designs, curb heights, island widths, delineation, and traffic control device placement, and supplementary geometric or operational datasets as needed. Records will be kept for all data tools, methods, and calibration.

Time Frame: [6–24 Months after NTP]

### Task 6: Data Analysis

Analyze the collected data using approved methodologies to identify relationships between roadway characteristics, island design features, traffic control device placement, and likelihood of vehicle strikes or pedestrian safety benefits. Update methodology and literature review sections as needed to document deviations or additional methods.

Time Frame: [1–3 Months after Data Collection]

### Task 7: Draft Final Report

Prepare a publication-ready draft final report containing an updated abstract, introduction, and literature review, final methodology, data analysis and findings, recommended refuge island design guidance for varying roadway contexts (speed, geometry, access types), discussion of safety and equity implications,

recommendations for implementation and future research, and final data management plan as an appendix.  
Time Frame: [3–6 Months after Data Collection]

#### Task 8: TAC Meeting #3 – Review of Draft Final Report

Review the Draft Final Report and Draft Research Note. Discuss clarity, technical accuracy, and implementation considerations related to design guidance and safety applications.

Time Frame: [1 month after completion of Draft Final Report]

#### Task 9: Final Report

Revise the Draft Final Report to incorporate all required edits and prepare the final publication-ready report.

Time Frame: [1–3 Months after TAC Meeting #3]

#### **Key Deliverables:**

- Draft literature review
- Draft research methodology
- Draft final report
- Final report

**Estimated Project Length:** 20 months.

**Estimated Project Budget:** \$180,000

### EXPECTED ODOT IMPLEMENTATION ACTIONS

Statewide and regional design leadership will need to share the resulting guidance document that translates the research results into clear, Oregon-specific practices that expand upon the high-level considerations found in the AASHTO Green Book and MUTCD 11th Edition. Depending on additional funding and support, ODOT could engage regional and statewide designers through targeted strategies such as implementation workshops, webinars, design-coordination meetings, and practitioner trainings that introduce the new guidance and highlight Oregon-specific findings. Additional efforts—such as developing design decision tools, piloting installations, or producing training videos—could be pursued as well. These supplemental investments would help broaden adoption, support long-term updates, and ensure the guidance is applied consistently across varied roadway contexts

### POTENTIAL BENEFITS

This study will help Oregon DOT reduce costs, improve safety, and streamline design decisions by identifying the most effective and low-maintenance pedestrian refuge island designs for different roadway contexts. By analyzing crash data, Claims Against Others, and maintenance records, the research will pinpoint design elements that reduce vehicle strikes, lowering both repair expenses and staff time spent replacing damaged signs, markers, and hardware. The resulting guidance will also help designers quickly select island dimensions, curb heights, and traffic control device placements that maximize pedestrian safety and minimize future maintenance burdens, increasing both efficiency and consistency across the state. Because the work produces clear, data-driven design recommendations that go beyond the general considerations in AASHTO and MUTCD, it will improve the effectiveness of ODOT's investments while supporting more equitable, reliable pedestrian crossings for vulnerable users.

### PEOPLE

**ODOT champion(s):**

Amanda Salyer, P.E., Region 2 Traffic Investigations Engineer

**Problem Statement Contributors:**

Greg Griffin, Ph.D., Principal Research Analyst

Amanda Salyer, P.E., Region 2 Traffic Investigations Engineer

**REFERENCES**

AASHTO. (2018). *A policy on geometric design of highways and streets, 2018* (7th edition). American Association of State Highway and Transportation Officials.

FHWA. (2023). *Manual on Uniform Traffic Control Devices for Streets and Highways, 11th Ed.*  
[https://mutcd.fhwa.dot.gov/kno\\_11th\\_Edition.htm](https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm)

Fitch-Polse, D., & Agarwal, S. (2025). The benefits of active transportation interventions: A review of the evidence. *Journal of Transport and Land Use, 18*(1), 77–122. <https://doi.org/10.5198/jtlu.2025.2468>

Vignali, V., Pazzini, M., Ghasemi, N., Lantieri, C., Simone, A., & Dondi, G. (2020). The safety and conspicuity of pedestrian crossing at roundabouts: The effect of median refuge island and zebra markings. *Transportation Research Part F: Traffic Psychology and Behaviour, 68*, 94–104.  
<https://doi.org/10.1016/j.trf.2019.12.007>

# STAFF REVIEW PAGE

## LITERATURE CHECK

### TRID&RIP

A review of TRID & RIP databases found no existing research that answers the research question

RIP shows no current research in progress on this topic.

## ODOT DECISION LENSES

**Climate:** This research is not focused on climate and will not include analysis of climate.

**Equity:** This study does address ODOT's transportation equity efforts through analysis of pedestrian crash disparities, and implementing the study could involve participation from an identified group that may benefit from the research. This study would add more data-driven elements for consideration of pedestrian refuge design. A data-driven method supports equity by using evidence to objectively identify, understand, and address systemic disparities that may be overlooked in anecdotal observations. Additionally, it is equitable to continue to provide safe and reliable pedestrian facilities as accessible mobility options.

**Safety:** Safety is the primary focus of this research proposal. Safety for vulnerable road users crossing a roadway and safety for vehicles encountering a fixed object in and around the roadway. ODOT's primary safety performance measures is to reduce risk and actual fatal and serious crashes on all roadways. Safety emphasis areas under this umbrella include reducing the risk of vulnerable road user crashes and reducing roadway departure crashes. A pedestrian refuge island is a FHWA proven safety countermeasure for vulnerable road users under certain design criteria and conditions, but it is also a fixed object that a vehicle can strike in a roadway departure crash. Addressing and reducing these two crash risks is critical to the success of this proposed research study. Identifying the most cost-effective pedestrian refuge design for various roadway conditions will also allow ODOT to invest both STIP and maintenance funding strategically.

## TECHNOLOGY & DATA ASSESSMENT

No Identified T&D output

At the end of this project, the implementing unit(s) within ODOT will need to coordinate the adoption of new technology or data in order to realize the full potential of this research.

## CROSS-AGENCY IMPACTS

- List ODOT partners or impacted units.
  - ODOT Technical services Roadway Engineering Unit
  - ODOT Region Offices
  - ODOT Transportation Safety Office
  - ODOT Pedestrian and Bicycle Program
  - ODOT All Roads Transportation Safety (ARTS) Program
- Identify any issues of concern raised by an ODOT partners. Note expected mitigation that addresses these concerns.
  - None raised