

November 2024

At-Grade Crossing Program

Draft Systemwide Master Plan

2025-2029



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AT-GRADE CROSSING PROGRAM
DRAFT SYSTEMWIDE MASTER PLAN (2025 – 2029)
NOVEMBER 21, 2024



Contents

- 1 Executive Summary 1-1**
 - 1.1 Purpose and Background 1-1
 - 1.2 Master Plan Approach and Objectives 1-1
 - 1.3 Results Summary 1-2
- 2 Results..... 2-3**
 - 2.1 Master Plan Projects 2-3
 - 2.2 Regional and Internal Coordination 2-5
 - 2.3 Long-Term Considerations 2-7
 - 2.4 Final Master Plan Development 2-7
- 3 Master Plan Development Process 3-1**
 - 3.1 Phase 1: Draft Master Plan 3-2
 - 3.2 Phase 2: Final Master Plan..... 3-8
- 4 Continuous Process for Systemwide Safety Enhancements 4-1**
- 5 Appendix A Geographic Segments 5-1**
 - Link Light Rail 5-1
 - Sounder Lakewood Subdivision 5-3
- 6 Appendix B July 2024 Board Motion 6-1**
 - Motion M2024-45..... 6-1
- 7 Appendix C Data Analysis and Prior Studies 7-1**
 - 2021 Rainier Valley Corridor Analysis 7-1
 - 2022 Peer Analysis from the National Transit Database 7-2
 - Assessment Tool (2022) 7-4
 - Completed Projects Through June 2024..... 7-6
 - 2024 Rainier Valley Corridor Analysis 7-7
 - Summary of Key Prior Studies 7-8
- 8 Appendix D Rainier Valley At-Grade Crossing Engagement Memo 8-1**
- 9 Appendix E Project Pages 9-1**

Figures

Figure 1-1: Map of Sound Transit System..... 1-1

Figure 3-1: Master Plan Development Process 3-1

Figure 3-2: Phase 1 Draft Master Plan 3-2

Figure 3-3: Phase 1 - Enhancement and Project Packaging Steps 3-4

Figure 3-4: Phase 1 Regional Partner Coordination and Community Engagement 3-7

Figure 3-5: Phase 2 Final Master Plan..... 3-8

Figure 3-6: Phase 2 Agency Coordination and Public Engagement..... 3-9

Figure 4-1: Process of Continuous Safety Enhancements 4-1

Figure 5-1: Map of Sound Transit System..... 5-1

Figure 7-1: Total Events (2009-2021) 7-1

Figure 7-2: Total Collisions (2009-2021) 7-1

Figure 7-3: Pedestrian Near Misses and Close Calls (2009-2021) 7-1

Figure 7-4: Peer Review 7-3

Figure 7-5: Total Rail Events (2009–Jun 2024) 7-7

Tables

Table 1-1. Summary of Total Project Costs by Target Completion Time..... 1-2

Table 2-1. Near-Term and Mid-Term At-Grade Crossing Projects..... 2-5

Table 7-1: Enhancement Ideas 7-5

Table 7-2: At-Grade Crossing Program Completed Projects 7-6

Table 7-3: Summary of Key Prior Studies 7-9

1 Executive Summary

1.1 Purpose and Background

The systemwide **At-Grade Crossing Program** (Program) was launched in August 2021 to enhance safety near designated at-grade crossings, focusing on reducing unintentional acts where trains intersect on the same level with people walking, biking, and rolling, as well as vehicles.

The Master Plan applies to multiple transit lines with at-grade crossings, including all current and future planned Link lines and the Sound Transit-owned Lakewood subdivision on which Sounder operates. However, safety enhancements in the Rainier Valley are a priority and have been the initial focus of the Program, as this area has had the highest concentration of at-grade incidents since Link service began in 2009. Crossings exist in many different geographic areas, each with its own environmental, cultural, and infrastructural characteristics. Because of these differences, safety enhancements must be tailored to effectively address the specific needs of each location. However, maintaining a consistent safety framework across the entire system remains a key priority.



Figure 1-1: Map of Sound Transit System

As of June 2024, Sound Transit, in partnership with the Seattle Department of Transportation (SDOT), has **completed nine at-grade safety enhancement projects in the Rainier Valley segment**. Early data indicates positive findings in incident reduction are occurring as the agency targets zero fatalities. Towards this target, Sound Transit is continuing to accelerate progress on its current projects and has developed this **2025–2029 At-Grade Crossing Program Master Plan** (the Master Plan). In addition to identifying recently completed and current projects, the Master Plan establishes Program priorities and processes to identify, evaluate, and prioritize potential safety enhancements allowing for the development and implementation of projects throughout its duration. Processes follow industry standards and best practices with the goal of continuous safety enhancement.

1.2 Master Plan Approach and Objectives

The work to develop this Master Plan is broken up into two phases. Phase 1 encompasses the Program’s earlier groundwork, with document development beginning in July 2024. It will conclude with a presentation of the draft Master Plan to the Board in November 2024, with Rainier Valley components provided in October 2024. In Phase 2, the final Master Plan will integrate feedback from the Board and community outreach. This will shape the final plan for Board adoption in Q2 2025. Phase 2 will also include the launch of the Program’s systemwide three-year Communications and Engagement Plan, ongoing implementation of near-term Program-adopted projects, and coordination with regional partners.

The objectives of the Master Plan are:

- Establish criteria for identifying, assessing, and prioritizing safety enhancements.
- Provide a transparent process for Program and project decisions.
- Collaborate with the public and regional partners to ensure all voices, especially those from underserved and historically marginalized communities, are included in Program decision-making.
- Identify safety enhancement projects, considerations, timing, and associated costs.
- Summarize safety data and trends before and after project implementation.

1.3 Results Summary

The Master Plan identifies an initial set of 17 projects that includes safety Link light rail enhancement projects on the 1 Line, an assessment of Sounder crossings in the Lakewood Subdivision, and initial planning work to develop Tacoma Link design standards with a total cost of approximately \$65M to \$96M set for completion over the next five years beginning in 2025. The safety projects will:

- Deliver dependable regional transit service.
- Provide safe, consistent, and reliable crossings for all users, including those walking, biking, rolling, and driving.
- Build positive, lasting relationships with communities Sound Transit serves.
- Enhance access to Sound Transit service and connections to surrounding communities.
- Increase public awareness of safety behaviors around tracks and trains.

Table 1-1 below shows the anticipated total cost range for each of the one-year target project completion windows between 2025 and 2029.

As of October 2024, the At-Grade Crossing Program currently has a Program Budget of \$13.8M. The Program is actively seeking and evaluating grant opportunities, both independently and in partnership with regional collaborators. As project costs are refined, updates will be presented to the Board to request additional funding.





	Target Project Completion	Safety Focus Areas	Total Projects	Total Cost
Near	2025		9	\$12M-\$16M
	2026		5	\$12M-\$15M
Mid	2027		1	\$6M-\$10M
	2029		2	\$35M-\$55M

Table 1-1. Summary of Total Project Costs by Target Completion Time. Projects that are TBD in Table 2-1 for completion are assumed to be completed in the latest year in their timeframe category.

2 Results

This section outlines the Program’s currently identified 2025–2029 Master Plan projects. The Program will continue to identify, assess, develop, and deliver safety enhancements throughout the duration of this Master Plan. For more details explaining the project selection and ranking process refer to Section 3 below. See Appendix E, Project Pages, for more detailed project descriptions.

2.1 Master Plan Projects

Between 2021 and June 2024, Sound Transit, in partnership with SDOT, **completed nine at-grade crossing enhancement projects** in the Rainier Valley. A recent analysis of safety data within the Rainier Valley Corridor was conducted to evaluate the impact of these enhancements. Preliminary findings show a reduction in total pedestrian safety events by 33 percent and a reduction in total vehicle safety events by 3 percent. Total events include both vehicle and pedestrian near misses and collisions. Long-term monitoring is required to fully assess the effectiveness of the enhancements, and the final Master Plan will include updated data.













To continue this work and support the current positive trends, the Master Plan currently includes an initial set of **17 projects** that include safety Link light rail enhancement projects on the 1 Line, an assessment of Sounder crossings in the Lakewood Subdivision, and initial planning work to develop Tacoma Link design standards.

The projects are organized into two construction time frames:

- **Near-term projects:** Expected to be completed by 2025 or 2026.
- **Mid-term projects:** Scheduled for completion between 2027 and 2029.

Additionally, projects fall into three different status groups:

- **Planning:** Projects that include diagnostics, studies and analysis, regional coordination and other work that helps to identify new potential safety enhancements.
- **Proposed:** Projects under consideration and not yet programmed. They will require further coordination, data analysis, and, in some cases, community engagement and communications. Proposed projects were identified through data analysis, user observations, engineering assessments, and emerging technologies and information.
- **Adopted:** Projects in the development or design phase but not yet fully funded for construction.
- **Fully Funded:** Adopted projects with secured funding and an approved budget for full implementation.

Project Type	Mode	Project Name	Safety Focus Area	Status	Cost Range*	Target Completion Date
Near-Term Projects (2025–2026)						
Planning	Sounder	Crossing Evaluation and safety analysis at Bridgeport Way S, S 74 th St, S 56 th St (Sounder Lakewood Subdivision)		Planning ¹	\$200k-\$250k	Q2 2025
Planning	Sounder	Crossing Evaluation and safety analysis on 16 at-grade crossings (Sounder Lakewood Subdivision)		Planning	\$700k-\$1M	Q4 2025
Pavement Marking	Link	Trackway Visibility Pavement Markings Pilot		Fully Funded ²	\$800k-\$1M	Q3 2025
Technology	Link	SMART Grant: Rainier Valley Safe Project Pilot, Phase 1		Fully Funded	\$2.5M	Q3 2025
Train Enhancement	Link	LRV Audible Warning Modifications Pilot		Fully Funded	\$0	Q1 2025
Signage Enhancement	Link	Another Train Coming Signage Between Stations		Adopted ³	\$2M-\$3M	Q4 2025
Infrastructure	Link	Royal Brougham Way & SODO Busway At-Grade Crossing Upgrades		Adopted	\$4M-\$5M	Q4 2025
Infrastructure	Link	Holgate St & SODO Busway At-Grade Crossing Upgrades		Adopted	\$700k-\$1M	Q4 2025
Infrastructure	Link	Lander St & SODO Busway At-Grade Crossing Upgrades		Adopted	\$1M-\$2M	Q4 2025
Planning	Link	Data collection, inventory, and input on new standards (T Line)		Planning	TBD	Q4 2026
Train Enhancement	Link	Alternating (Wig Wag) Train Headlights		Adopted	\$2.5M	Q1 2026
Infrastructure Project	Link	Automatic Pedestrian Gate Pilot, Phase 1		Adopted	\$8M-\$11M	Q2 2026






Project Type	Mode	Project Name	Safety Focus Area	Status	Cost Range*	Target Completion Date
Signage Enhancement	Link	Additional Static Signage and Delineators		Proposed ⁴	\$400k–\$800K	TBD
Signage Enhancement	Link	Another Train Coming Sign Enhancements		Proposed	\$300k–\$500K	TBD
Mid-Term Projects (2027–2029)						
Infrastructure	Link	Automatic Pedestrian Gate Pilot, Phase 2		Adopted	\$6M–\$10M	Q1 2027
Infrastructure Project	Link	SMART Grant: Rainier Valley Safe Project Pilot, Phase 2		Proposed	\$15M	TBD
Infrastructure	Link	Pedestrian Crossing Upgrades Between Stations		Proposed	\$20M–\$40M	TBD

Table 2-1. Near-Term and Mid-Term At-Grade Crossing Projects

¹Planning: [Diagnostics, studies, and analysis], ²Fully Funded: [Funded through construction], ³Adopted: [Funded through design], ⁴Proposed: [Not yet programmed] *Cost Range [See Cost estimating assumptions in Section 3.1]

For additional detailed information on the projects listed in Table 2-1, please refer to Appendix E.

Program Funding

The At-Grade Crossing Program has a Program Budget of \$13.8M as of October 2024. The projected cost to implement the 2025-2029 AGC Master Plan projects is \$65M to \$96M. The Program will further refine project costs in Phase 2 as the team continues to evaluate delivery methods and project packaging, with the goal of further expediting the work.

The Program is actively seeking and evaluating grant opportunities, both independently and in partnership with other Sound Transit project teams and regional collaborators. One of the Master Plan’s adopted projects is funded by a grant. The Program will return to the Board with a funding plan, including identifying grant opportunities, which may include yearly or longer-term funding strategies. This plan will help allocate resources equitably and efficiently across the system.

2.2 Regional and Internal Coordination

Project selection and successful implementation require close coordination both with agency partners and within Sound Transit.

Regional Coordination

Sound Transit relies heavily on its strong partnerships with regional agencies that oversee vehicular traffic flow, road safety, and physical infrastructure for vehicles and pedestrians. These collaborations are essential for successful project planning and implementation, particularly

where street and transitway solutions must integrate seamlessly due to separate infrastructure responsibilities and authorities. For instance, SDOT is generally responsible for changes to its roadways. This includes car speed limit changes, lane reductions, vehicle gates, restricted vehicle movements, and closing or consolidating intersections. While these ideas are outside Sound Transit's jurisdiction, we remain committed to collaborating with regional partners to understand the feasibility of further exploring such ideas. As updates become available, we will provide additional details as part of the final Master Plan.

The scope, timeline, and overall progress of the Master Plan projects depend on close coordination with regional agencies, and in many cases, their formal approval is required at key stages. SDOT, in particular, is a crucial partner regarding the work in the Rainier Valley and SODO. Significant progress in this area has been achieved through formal and informal collaboration with SDOT, including a 2022 Partnership Agreement reaffirming our two agency's commitment to our shared values and goal of enhancing safety, equity, community access, and mobility in the Rainier Valley. This partnership has already delivered key enhancements, including pavement markings, LED signs, traffic signal modifications, additional studies on treatments, and analysis of risks and costs.

The Program will actively collaborate with our other regional partners, including the cities of Tacoma, Lakewood, and DuPont, on planning activities and identifying proposed safety enhancements for the T Line and Sounder commuter rail in Lakewood Subdivision.

The East Link Project will bring all the East Link at-grade crossings up to the 2023 Sound Transit design requirements as part of their current project work. Once the East Link Extension project has completed this at-grade crossing work on the 2 Line, the responsibility for implementing safety enhancement projects, including coordination with regional partners, will transition to the Program.

This collaboration with our regional partners will include brainstorming sessions with staff to identify potential safety enhancements and improvements, coordinating permits, and determining long-term responsibilities for operations and maintenance, ensuring that both agencies are aligned on sustainable solutions for the future.

Beyond technical coordination, Sound Transit has opportunities to partner with these regional partners on community outreach efforts. Leveraging joint engagement opportunities with the community fosters transparency and trust and creates efficiencies for participants.

Internal Coordination

The Program collaborates with other agency departments and projects, such as East Link Extension, Graham Street Station, and West Seattle and Ballard Link Extension, to share updates, lessons learned, and strategies to ensure alignment and consistency. This cross-department collaboration yields other significant benefits, particularly in identifying project efficiencies and streamlining processes. This approach uncovers redundancies, optimizes resource allocation, improves service delivery, influences design requirements, and minimizes impacts to the public.

In addition, the Program's direct participation in developing agency standards for at-grade crossings ensures the early adoption of best practices, resulting in smoother implementation. By establishing processes that adhere to industry standards, safety is enhanced, efficiency is continuously improved, and more effective solutions are delivered across the agency.

2.3 Long-Term Considerations

Longer-term considerations for the Program extend beyond the 2025-2029 Master Plan. The Program has conducted preliminary conceptual studies for some long-term considerations. However, advancing additional work will depend on several factors, including community preferences, adherence to NEPA requirements, right-of-way availability, and a cost-benefit analysis based on project results. Extensive public engagement and coordination with other agencies is essential in building consensus and broad support for future enhancements, such as grade-separated segments or pedestrian structures. Additionally, further studies are needed to assess the scope of impacts, costs, and appropriate mitigation strategies.

In October 2023, Sound Transit conducted a high-level study to understand the potential risk, utility conflicts, potential impacts, and to develop a rough order of magnitude estimate for three grade-separated options along the Rainier Valley segment: an elevated guideway, tunnel, and open trench. The study also evaluated pedestrian grade-separated options at the three existing stations and two non-station pedestrian crossings. It reviewed assumptions for construction and service impacts and potential mitigations for each grade-separated option.

The outcomes from near- and mid-term Program projects will help guide future decisions regarding at-grade crossings systemwide, including whether grade-separated segments or pedestrian structures should be further considered for potential implementation.

The Program will also continue coordinating with regional partners on integrated long-term considerations for at-grade crossings that leverage both Sound Transit and partner-owned infrastructure while recognizing each agency's authority.

2.4 Final Master Plan Development

The development of the Master Plan occurs in two phases: Phase 1 is a draft Master Plan provided to the Board in two stages. The first stage focused on the Rainier Valley, which occurred in October 2024. The draft systemwide Master Plan incorporating the Rainier Valley will occur in November 2024. Phase 2 will be a final systemwide Master Plan, which will be shared with the Board in Q2 2025. Although work on the Master Plan had already started, the timeline was accelerated following Board Motion 2024-45 approval in July 2024. See Appendix B for the Board Motion.

The Program began development on the draft Master Plan document in Phase 1, beginning in July 2024 and building on preliminary Master Plan work already started. Phase 1 will conclude with presenting the draft Master Plan to the Board in November 2024. Phase 2 will integrate feedback from Board reviews and community outreach, shaping the work needed to finalize the Master Plan for Board adoption in Q2 2025. Phase 2 will also include the Program's systemwide three-year Communications and Engagement Plan, continued implementation of near-term Program-fully funded and adopted projects, continued identification, evaluation, and prioritization of potential safety enhancements, and continued coordination with SDOT and other regional partners. See Section 3 for more details on the Master Plan development and continuous safety enhancements process.

3 Master Plan Development Process

This section outlines the process used to develop the Master Plan. The objectives of the Master Plan are to:

- Establish criteria for identifying, assessing, and prioritizing safety enhancements.
- Provide a transparent process for Program and project decisions.
- Collaborate with the public and regional partners to ensure all voices, especially those from underserved and historically marginalized communities, are included in Program decision-making.
- Identify safety enhancement projects, considerations, timing, and associated costs.
- Summarize safety data and trends before and after project implementation.

The Master Plan document is being developed in two phases. Phase 1 began in July 2024 and runs through November 2024, though groundwork to create the content of the Master Plan has been in progress since the Program’s establishment. Phase 2 spans from December 2024 through May 2025. Figure 3-1 below illustrates the process and stages for the Master Plan development.

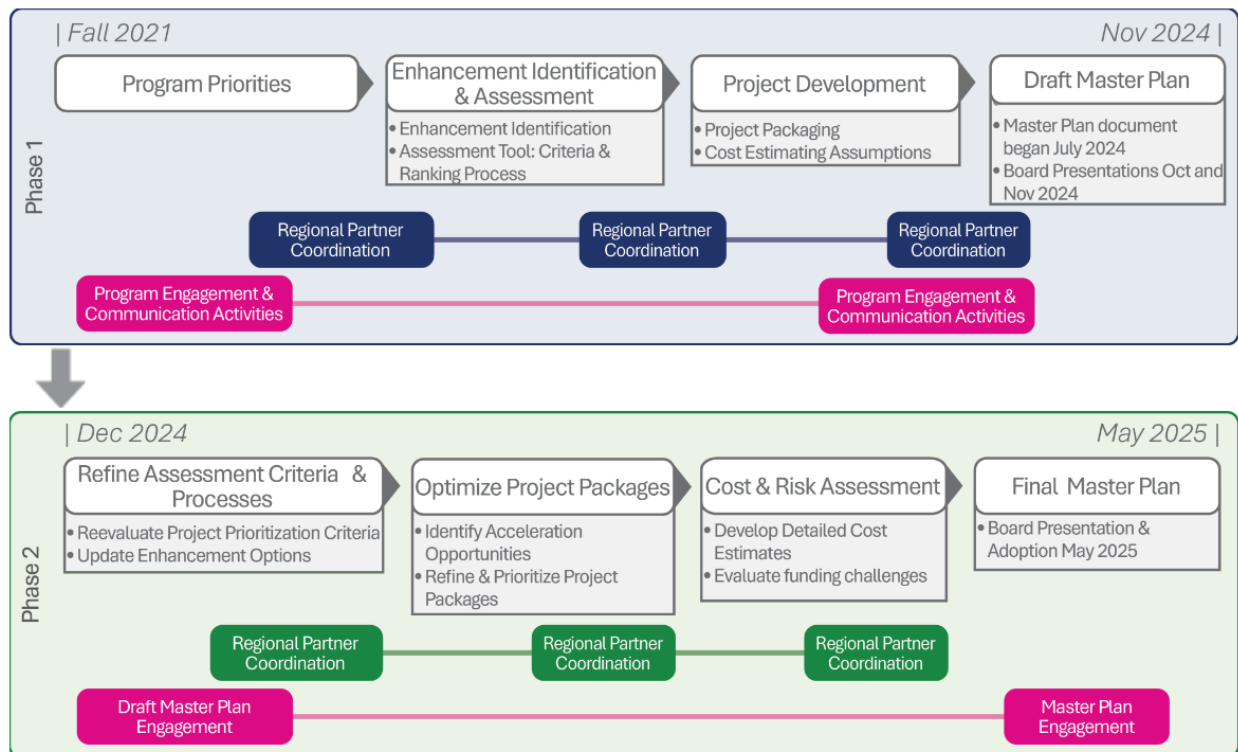


Figure 3-1: Master Plan Development Process

Phase 1: Draft Master Plan

Phase 1 involved compiling and distilling completed work, conducting research to identify additional proposed projects, including diagnostics and other planning work, and documenting

processes for developing the enhancement and risk mitigation strategies assessment criteria. This phase also included coordination with SDOT on near- and mid-term projects in the SODO and Rainier Valley segments, and community outreach to gather feedback on completed Rainier Valley segment projects and refine the overall engagement approach.

Phase 2: Final Master Plan

Phase 2 will focus on refining the assessment criteria and processes as needed, optimizing project packages to identify additional opportunities to accelerate Program work, and completing a comprehensive cost and risk assessment. This phase will integrate feedback from the Board, gather and integrate community feedback on assessment criteria and enhancements, and broaden coordination with regional partners to progress the projects and planning work outlined in this Master Plan.

3.1 Phase 1: Draft Master Plan

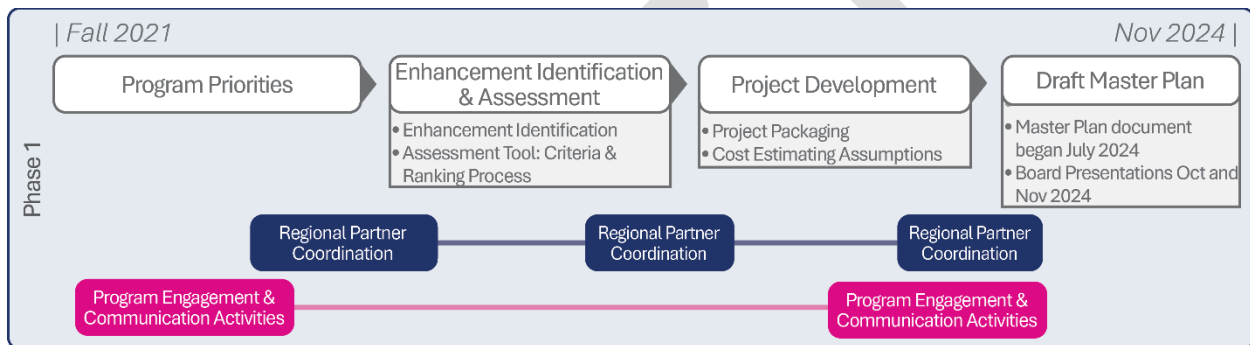


Figure 3-2: Phase 1 Draft Master Plan

Program Priorities

Identifying priorities helps align Program goals with Sound Transit’s mission and values, improves decision-making, and ensures that critical objectives are addressed first. It guides effective monitoring and evaluation and ensures the Program remains adaptable to changing data trends.

Mission: Connecting more people to more places to make life better and create equitable opportunities for all.

Values: To accomplish this mission, agency activities are driven by six values:

- **Collaboration:** We share each other’s successes and challenges and invite the involvement of all toward the achievement of common goals. We are one agency; no single department defines our business.
- **Passenger Focus:** We always start with our passengers’ needs and work back from there. They are the focus of everything we do.
- **Inclusion and Respect:** We foster a culture where everyone is treated fairly, diverse perspectives are welcomed, and every voice is heard.
- **Safety:** We ensure the safest transit trip and work environment for every rider, employee, and contractor each and every day.

- **Integrity:** We build trust by keeping commitments and taking ownership—demonstrating honesty, accountability, and transparency.
- **Quality:** As stewards of public resources, we do our best work every day and take great pride in the efficient, sustainable, and equitable delivery of our services and projects.

To ensure alignment with the agency’s values, the following five priorities have been identified to guide the focus and development of the Program:

- Reduce collisions and near misses with vehicles and pedestrians.
- Provide a consistent and safe passenger experience systemwide.
- Provide reliable service without degradation to operational performance.
- Increase accessibility of the Sound Transit network for all.
- Build positive, proactive relationships with surrounding communities that foster trust and increase perception of safety of Sound Transit’s service.

Enhancement Identification and Assessment

This section illustrates the process to identify, evaluate, and prioritize potential safety enhancements, which include risk mitigation strategies. Input was gathered from various sources, including community and regional partner feedback, segment analyses, and industry research. Each proposed enhancement was assessed using a set of criteria, ensuring a consistent and transparent evaluation. This approach allowed the team to prioritize enhancements based on their potential safety impact, feasibility, and alignment with Program priorities.

Enhancement Identification

The Program uses a combination of strategies to enhance safety, including infrastructure changes (or “enhancements”), operational procedures, training, and promoting safer behaviors to reduce the risk of future incidents. Identification is informed by extensive research, segment monitoring, community engagement, and collaboration with regional partners. Throughout the duration of the Master Plan, enhancement identification will use several channels, such as:

- **Industry Best Practices:** Proven methods with established data supporting their effectiveness.
- **Peer Agency Research:** Insights from similar transportation agencies that faced comparable challenges.
- **Data Analysis:** Safety event reports (including collisions, near misses, and violations), traffic volumes, and field data collected from at-grade intersections.
- **Field Visits and Team Input:** Observations made during site visits, complemented by feedback from engineers, operations staff, safety experts, and other industry experts.

Example: Dynamic LED “Another Train Coming” signs was an enhancement that was identified via research on industry best practices and peer agency mitigations. These signs have been implemented at other transit agencies and seem to yield positive results in reducing train vs. pedestrian conflicts based on data analysis.

- **Community and Partner Agency Feedback:** Ideas and concerns shared by the public, partner agencies who operate Sound Transit service, and regional partners during outreach efforts.

See Appendix C for more details on Program data and prior work, including the 2022 Peer Analysis using data from the National Transit Database.

Assessment Tool: Criteria and Ranking Process

The assessment criteria is based on the Program priorities and uses a systematic, data-driven approach to rank safety enhancements, which includes risk mitigation strategies, for at-grade crossings. This process allows the team to evaluate potential improvements quickly and consistently while maintaining transparency. The goal is to focus on improvements that would provide the most meaningful and lasting safety impacts. The team followed a three-step process: an initial safety review to ensure compliance with standards, a high-level risk assessment, and a final ranking process to prioritize enhancements.



Figure 3-3: Phase 1 - Enhancement and Project

Step 1 Pre-Screen

Pre-screening quickly filtered out ideas or proposals that failed to meet basic safety requirements or regulatory standards.

- **Safety Impact:** Assessment of whether the enhancement improves or maintains agency and industry safety requirements and if it presents any critical risks.
- **Compliance with Regulatory Standards:** Confirmation that the enhancement adheres to federal, state, and local guidelines.

Step 2 Risk Assessment Screening

The risk assessment screening aimed to identify challenges, evaluate the likelihood and impact of those risks, and determine whether proposed enhancements negatively impact operations, cost, or timelines.

- **Proven History:** Evidence of successful implementation in other regions or applications.
- **Implementation Timeline:** How quickly the enhancements can be deployed.
- **Cost:** Initial and ongoing costs associated with the enhancement.
- **Third-Party Approvals:** Necessary approvals from regional partners and other agencies.

Step 3 Ranking

The ranking process prioritized the most effective solutions using a weighted evaluation criterion, prioritizing pedestrian safety to ensure the most critical improvements were addressed first.

- **Overall Safety Impact:** The idea evaluated significantly improves safety for pedestrians, motorists, and trains.
- **Operational Reliability:** Assurance that enhancements will function effectively with minimal disruptions.
- **Community Impacts:** Consideration of how enhancements affect local communities, focusing on those with disabilities, businesses, and commuters both during construction and after implementation.
- **Ongoing Maintenance Costs:** Evaluation of the long-term maintenance requirements.
- **Training Impacts:** Assessment of personnel training needs for proper use and maintenance of new systems or equipment.

These criteria were applied uniformly to all options evaluated. Appendix E offers more details on the options evaluated and their descriptions.

Project Development

Enhancement options were bundled into project packages with preliminary cost estimates developed to facilitate future prioritization, funding, and implementation as described below.

Projects include a single ranked enhancement or a group that provides efficiencies if implemented together for timing and cost purposes. Project Packages are presented in Appendix E.

The goal was to bundle projects for faster delivery while minimizing operational impacts and service disruptions. Factors considered include:

- **Safety Event Data:** Areas with the highest incidents of collisions, near misses, or violations were prioritized.
- **Traffic and Pedestrian Volume:** Intersections with high vehicle and pedestrian traffic volumes were preferred, particularly those adjacent to transit stations, which consistently ranked high in safety incidents.
- **Implementation Feasibility:** Enhancements that could be implemented quickly and with minimal disruption to existing operations were prioritized, especially at locations near stations where work could be bundled for efficiency.

Example: Updated "Another Train Coming" signs, which have a proven track record of reducing pedestrian risky behavior, scored highly due to their anticipated positive impact on pedestrian safety, low ongoing maintenance costs, training impacts and ease of implementation. This data-driven evaluation allowed the team to prioritize high-impact enhancements effectively.

Example: Station locations were prioritized for "Another Train Coming" sign installation due to high crossing volumes and a history of pedestrian violations. Data analysis indicates that intersections near stations frequently appeared in the top ten for safety events, making them a high priority for immediate action.

- **Operational Efficiency:** Grouping projects to avoid repeated disruptions at the same locations or segments.
- **Cost Efficiency:** Consolidating projects to reduce cost and maximize the use of available resources, considering grant opportunities.
- **Speed of Implementation:** Favoring enhancements and locations where enhancements could be deployed swiftly, aligning with the agency’s goal of accelerating safety improvements.

Using the assessment tool and the project prioritization framework, the Program ensures that enhancements are implemented where they are most needed while balancing cost, efficiency, and community impact. Phase 2 will involve updating the criteria. The process will evolve based on community feedback and corridor monitoring to ensure alignment with public expectations and safety requirements.

In response to the Board’s July motion to accelerate work, the team is restructuring project packages to fast-track all currently adopted projects. This includes reevaluating cost considerations and streamlining approval processes to meet the agency’s expedited timeline.

Cost-Estimating Assumptions

The cost-estimating framework used for the draft Master Plan breaks down costs into specific categories. Cost estimates for Phase 1 were calculated based on:

- **Total Project Cost:** All costs associated with the project are included in the cost estimate, including Sound Transit and Consultant labor, permitting, construction, third-party costs, and project integration.
- **Historical Unit Costs:** Data from recent similar infrastructure projects were analyzed to establish a baseline for typical expenditures.
- **Production-Based Unit Costs:** Each enhancement option, such as signal upgrades, signage, and pedestrian safety measures, was assigned a unit cost based on expert estimates or recent project bids (if available), material market prices, and labor rates.
- **Contingency:** Construction contingency was added to account for design growth due to the early design phase. As design advances, this contingency will be modified.
- **Construction Delivery Method:** Design-Bid-Build delivery assumed in cost estimates.
- **Escalation Factors:** Given the anticipated multi-year timeline, inflation and cost escalation were factored into the estimates at an average annual rate of 5%, consistent with trends observed in recent infrastructure projects.
- **Construction Constraints:** Constraints on construction timing due to avoidance of service interruptions and to protect public safety may have a significant effect on project construction costs. Working at night with a condensed work-zone, limiting working hours, the need to pay overtime or off-hour wages, and the need to mobilize and demobilize certain aspects of the operation on a daily basis can all contribute to costs during the construction of a project.
- **Contractor Selection:** The contractor’s size, availability, and capability influence bid markups (administrative and operating expenses, contingencies, and profits). Larger, in-demand general contractors that can perform several scopes of work will bid with higher markups than smaller, specialized contractors. Due to the variable size of the AGC projects, the estimating was done assuming that the work would be performed by a medium sized general contractor.

Regional Partner Coordination and Community Engagement

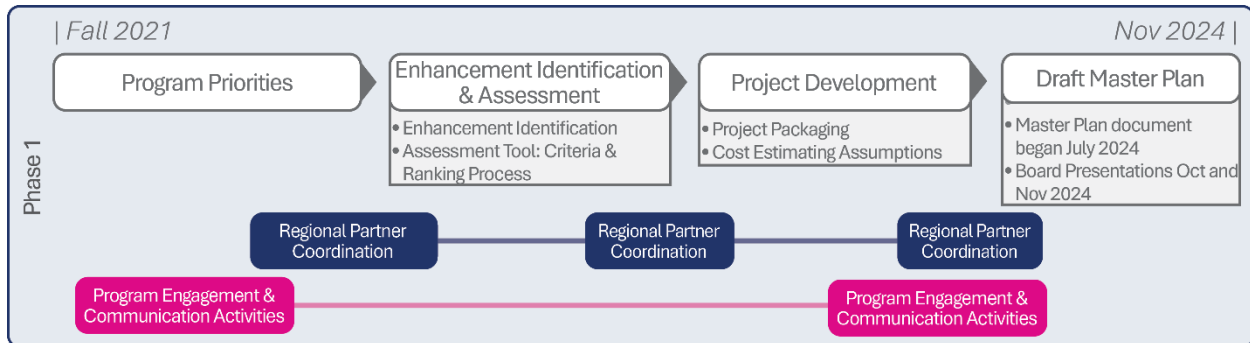


Figure 3-4: Phase 1 Regional Partner Coordination and Community Engagement

Regional Partner Coordination

As outlined in Section 2.2, regional partner coordination is a key component of Phase 1 of the Master Plan. Coordination and approval from these partners are critical to advancing projects under this Program. Much of the work, particularly in the Rainier Valley, has been conducted in close collaboration with SDOT.

Equity-Centered Public Engagement

A key Program goal is to meaningfully engage with the community while prioritizing safety as a top Sound Transit concern and core value. The Program aims to build long-term relationships, enhance two-way communication, and establish the agency as a dedicated and trusted part of the community. The Program strives to achieve equitable safety outcomes by using accessible and convenient ways to connect with people where they are.

Rainier Valley Community Survey

A Rainier Valley Safety Survey was conducted between July and October 2024 to gather community feedback on the level of awareness and perspectives around different at-grade crossing safety enhancements made in the Rainier Valley, as well as on general perceptions about at-grade safety. Feedback received will inform potential refinement to criteria or projects in Phase 2.

Three-Year Systemwide Program Communications and Engagement Plan

An engagement consultant has been retained to develop and implement a three-year Communications and Engagement Plan, continuing to advance engagement conducted in Phase 1, building on and expanding the Program's existing engagement efforts (see Appendix D) to include other system communities. Developed during Phase 1, it will be implemented in Phase 2 and beyond, incorporating feedback from the Board, community discussions, and partnerships with community-based organizations. The plan will focus on being present at community gatherings, offering interpretation services, providing translated materials, and creating opportunities for public participation online and in person.

The Program prioritizes engaging communities of color, low-income groups, individuals with limited English proficiency, and vulnerable populations. Centering equity is critical for the success of these engagement efforts. The Program has and will dedicate appropriate resources and provide meaningful and diverse ways for the community to learn about the Program and help shape the Master Plan and planned and future projects.

During the development of the Master Plan, representatives from Sound Transit’s Office of Civil Rights, Equity, and Inclusion and Accessibility Services provided essential input to ensure an equity focus throughout the Program and will continue to be involved. This includes applying Sound Transit’s Equitable Engagement Tool, which provides a framework to help achieve desired outcomes.

3.2 Phase 2: Final Master Plan

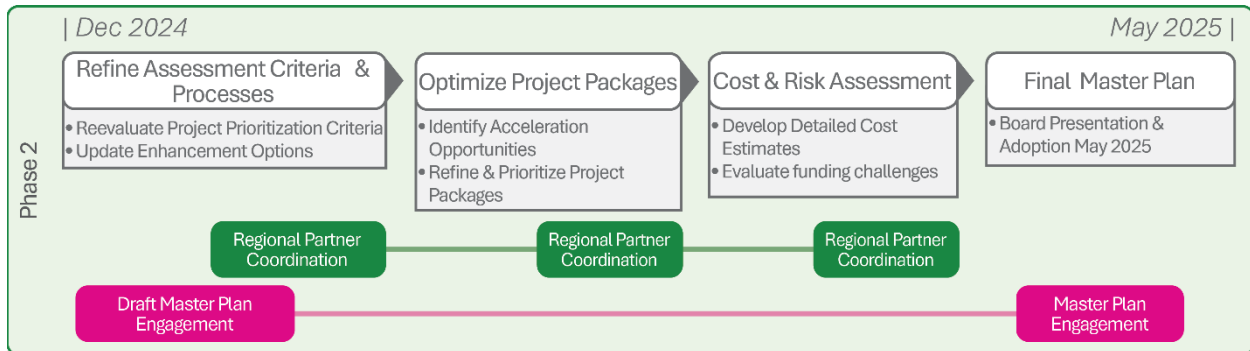


Figure 3-5: Phase 2 Final Master Plan

The sections below provide a brief description of future activities. This section will be revised during Phase 2 development of the final Master Plan.

Refine Assessment Criteria and Processes

When Phase 2 begins, the team will determine if the assessment criteria require refinement and reassessment based on feedback about the enhancements, which include risk mitigation strategies and criteria. This feedback will come from three key sources:

- Community and agency partners, including a recent survey and conversations with community interests and agency partners.
- Sound Transit Board guidance.
- Engineering subject matter experts’ ongoing assessment.

If needed, the team will apply refined criteria to enhancement and risk mitigation strategies, which may result in an updated list of enhancements, including new enhancements not previously considered in Phase 1.

Optimize Project Packages

The team will consider the refined enhancements list to optimize project packages, equitably and efficiently advance safety enhancement across the system, possibly include new packages, and identify additional opportunities to accelerate Program work.

Optimization will also include strategically selecting contract delivery methods to accelerate the schedule.

As previously noted, the team is restructuring and refining project packages to fast-track all currently adopted projects in response to the Board’s July motion to accelerate work.

Cost and Risk Assessment

For any project, it is essential to understand the current cost and the risk of cost changes. From Phase 1 to Phase 2, the Program will move from higher-level cost ranges to detailed cost estimates to provide more certainty using initial design information. These estimates will help optimize refined project packaging as the Program moves forward. The Program will also conduct a comprehensive cost and risk assessment to evaluate potential financial challenges, contingencies, and mitigations. This work will influence an overall funding plan, as discussed in Section 2.1. Agency Coordination and Public Engagement

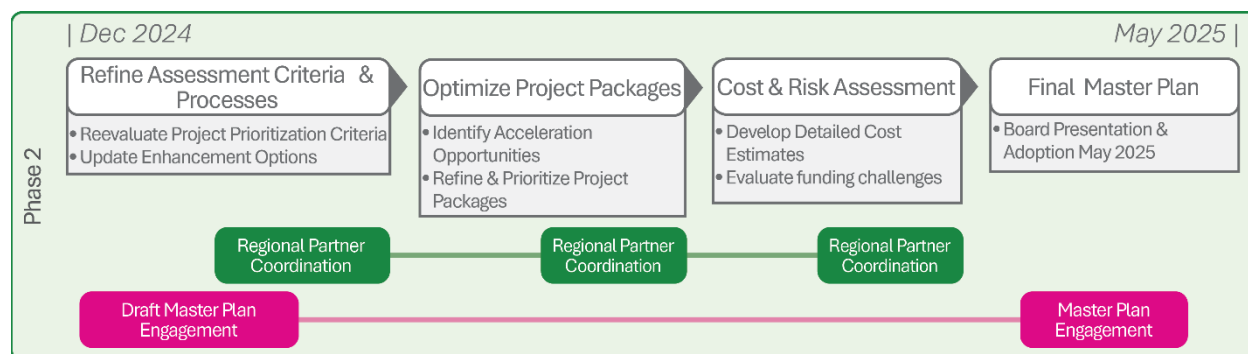


Figure 3-6: Phase 2 Agency Coordination and Public Engagement

Regional Partner and Internal Agency Coordination

Collaboration will continue with internal and external partners such as the City of Seattle, the City of Tacoma, and other local agencies, as discussed previously in Section 2.2. The Sound Transit Board will review and be involved in finalizing and adopting the Program’s Master Plan and budget.

Equity-Centered Public Engagement

As described in Section 3.1, the Program will continue to implement elements of the three-year AGC Program Systemwide Communications and Engagement Plan during Phase 2, expanding Phase 1 engagement (see Appendix D) to other system communities and focusing on three main topics:

- Draft Master Plan Engagement (Fall 2024–May 2025): Phase 2
- Project Development and Construction Outreach and Communications (Beginning as early as Winter 2024/2025): Phase 2 and beyond
- Safety Awareness and Education (throughout the three-year plan): Phase 2 and beyond

The Program will provide several accessible, comfortable, and convenient options to inform and engage the community. This will include connecting with people “where they are,” whether at stations, community events, community-based meetings, or just going about their daily lives.

The Program will report on engagement efforts at the end of Phase 2, including feedback received, ensuring transparency.

4 Continuous Process for Systemwide Safety Enhancements

The Master Plan establishes Program priorities and processes to identify, evaluate, and prioritize potential safety enhancements. This process will guide the Program in maintaining a safe, secure, and continuously improving system for all users.

Following Phase 2 and continuing throughout the Master Plan timeframe, pilots and other projects will inform new enhancements, as will continuous monitoring of the safety of the system as part of the agency’s safety and security risk management program, community and regional partner feedback, emerging information, best practices, and technology advancements.

The team will follow the process described in Phase 1, Section 3.1, incorporating any refinement of criteria and processes for enhancement identification and assessment and project development as identified in Phase 2. At any point in the Master Plan’s duration, activity in each part of the continuous safety enhancement shown in Figure 4-1 can occur simultaneously.

In addition to the process to identify and assess proposed enhancements, the Program will also:

- Develop detailed cost and risk analysis
- Continue to develop and implement current and future enhancement projects systemwide
- Continuous data monitoring and evaluation in partnership with agency Safety and Security Management Program
- Use information gathered to inform future enhancements

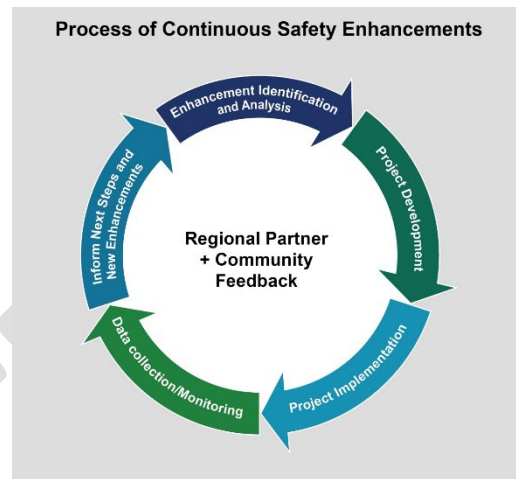


Figure 4-1: Process of Continuous Safety Enhancements

5 Appendix A Geographic Segments

The Sound Transit system has multiple transit lines with designated at-grade crossings across various locations.

Light rail transit technology allows Sound Transit’s Link light rail network to be designed to operate partially on streets. Commuter rail, including Sound Transit Sounder service, gives individuals a dependable, congestion-free commute using dedicated heavy rail tracks. The T Line in Pierce County, with its low-floor boarding, means it can operate in curbside or a median right-of-way, as well as in mixed traffic or a dedicated right-of-way.

Each at-grade crossing within each system segment is a unique geographic area with distinct environmental, cultural, and infrastructural features that may influence the design and implementation of safety enhancements. Tailored approaches may be appropriate to address local needs, but enhancing consistency across the system remains a cornerstone of the Program. The geographical context of the different system segments is provided below. The AGC three-year Communications and Engagement Plan includes details regarding community context and regional partners, and approaches to engage and coordinate throughout the Master Plan.



Figure 5-1: Map of Sound Transit System

Link Light Rail

The 1 Line currently serves Lynnwood to south of Sea-Tac Airport. The 2 Line currently serves S Bellevue to the Redmond Technology Center, and in 2025 will connect to downtown Seattle and downtown Redmond.

With voter approval of system expansion in 2008 and 2016, the Link light rail system will eventually grow to 116 miles and five lines.

1 Line

The Link Light Rail 1 Line (initially called Central Link) opened in July 2009, connecting 13 stations from Westlake Station in downtown Seattle to Tukwila International Boulevard Station. The line was extended to Sea-Tac/Airport Station in December 2009.

Rainier Valley

Link light rail service operates for 4.5 miles in semi-exclusive right-of-way at-grade along MLK Jr Way S in the Rainier Valley, spanning from S Walden Street in the north to S Norfolk Street in the south. There are 28 signalized intersections; some are pedestrian-only. There are also three at-grade stations: Columbia City, Othello, and Rainier Beach.

A mix of residential and commercial zones, diverse communities, and a rich cultural landscape characterize this geographic area. The segment faces unique challenges, such as high pedestrian activity, traffic congestion, and environmental considerations related to the urban setting. Tailored safety and infrastructure enhancements may be necessary to address these local needs while maintaining consistency with the broader system. This section of the Link service plays a critical role in connecting the Rainier Valley to the wider transit network, supporting regional mobility and access.

This section of track is also the largest source of variability in the Link light rail system due to delays and service disruptions caused by traffic signals and other safety events. The variability in the Rainier Valley can result in “train bunching,” which can cause crowding and other operational challenges up and down the alignment, including the future operational movement to interline trips for both the 1 and 2 lines between International District Station and Lynnwood City Center. In addition, variability can result in needing additional light rail trainsets to accommodate slower travel times. Improving reliability in the Rainier Valley would support Sound Transit’s ability to meet federal grant commitments related to service levels as the system expands.

SODO

The SODO segment of the 1 Line has four at-grade crossings, one of which is pedestrian-only, and two at-grade stations: Stadium and SODO. The Link light rail service operates for approximately one mile in the semi-exclusive right-of-way along the SODO busway, a transit-only corridor from S Royal Brougham Way in the north to S Lander Street in the south. A multi-use trail for pedestrian and bicycle use runs parallel to the light rail tracks on the east side of the trains.

This geographic area is part of Seattle’s industrial district with a small residential population. This area is also home to Lumen Field and T-Mobile Park, two major sports/event stadiums. The Stadium station is adjacent to the Seattle Greyhound station directly east of the platform and serves as a connection point from long-distance bus lines to the local transit network. The light rail is a major service provider for eventgoers to access these stadiums, and both Stadium and SODO stations see drastic increases in ridership on event days. High ridership and increased pedestrian activity during peak times pose safety challenges that should be tailored to this unique location and the riders it serves.

This section of track contains four at-grade crossings and is bookended by grade-separated segments to the north and the south. These at-grade crossings can increase delays, conflict points with vehicles/pedestrians, and decrease reliability throughout the corridor.

2 Line

The 2 Line, also known as the East Link Extension, is a light rail line serving the Eastside region of the Seattle metropolitan area. It runs for 6.6 miles in the cities of Bellevue and Redmond. The initial segment, known as the East Link Starter Line, serves eight stations between S Bellevue and Redmond Technology stations and opened on April 27, 2024. The full line is scheduled to open in 2025 and is planned to include 18 miles and serve 12 stations in downtown Seattle, Mercer Island, Bellevue, and Redmond. The 2 Line will continue through the downtown Seattle Transit Tunnel and share stations with the 1 Line through to Lynnwood City Center station.

There are 17 at-grade crossings and four at-grade stations currently open for the 2 Line: East Main, BelRed, Overlake Village, and Redmond Technology Station. East Main and BelRed are located in the City of Bellevue, and Overlake Village and Redmond Technology Station are located in the City of Redmond. BelRed and Overlake Village stations are located in close proximity to large park-and-

ride lots. Redmond Technology Station is located on the headquarters campus of Microsoft. The transit center is served by Sound Transit Express, King County Metro, and Microsoft's private shuttle buses. The light rail station is the eastern terminus of the 2 Line.

When the full line opens, there will be one additional at-grade station, Judkins Park station, and one additional at-grade station in downtown Redmond. Judkins Park station is located between the westbound and eastbound lanes of I-90. There is a single at-grade pedestrian-only crossing at the west end of the station platform, which provides access for users coming from Rainier Ave S. This station is likely to serve users who are blind, deafblind, or blind with other disabilities as they access The Lighthouse for the Blind, which is located approximately 0.6 miles away.

T Line

Sound Transit's first light rail line, the T Line, opened in 2003 with five stations. There are currently 47 at-grade crossings and 12 stations. The T Line generally runs at grade in mixed traffic with an exclusive lane for its single-track section. As with any at-grade running line in a downtown core, there are numerous crossings and conflict points for trains, vehicles, pedestrians, and cyclists. This system has 12 stations on a 4-mile track, running from the Tacoma Dome to the Hilltop neighborhood. The 2.4-mile extension, which occurred in 2023, to the Stadium District and the Hilltop area west of downtown included seven additional stations and added a geographic area that has a high concentration of schools, hospitals, and community gathering spaces. An extension to Tacoma Community College, which will add six new stations and increase the total track length to 8.4 miles, is expected to open in 2039-2041. The light rail is a major service provider for eventgoers to access special events scheduled at the Tacoma Dome or hosted in downtown Tacoma and connects to the University of Washington campus in Tacoma. Each train can carry 85-100 passengers, depending on the car model.

Sounder Lakewood Subdivision

Sound Transit owns the 20-mile segment of tracks from the Tacoma Junction to the Nisqually Valley, of which Sounder operates from Tacoma to Lakewood. A 14.5-mile-long segment runs between DuPont and Tacoma and has 16 at-grade crossings and three stations: Lakewood, South Tacoma, and Tacoma Dome. The Sound Transit Sounder S Line, Amtrak Cascades, and Coast Starlight lines operate through this corridor. This section of track was formerly owned by BNSF and was purchased by Sound Transit for commuter rail use in 2003, with BNSF retaining a freight easement.

Sounder commuter service to Lakewood began in 2012. Sound Transit plans to extend Sounder commuter service to DuPont in 2045, adding additional stations at Tillicum and DuPont. The Tillicum station location is planned adjacent to Joint Base Lewis-McChord. The terminus at the planned DuPont station is near an existing park-and-ride lot.

6 Appendix B July 2024 Board Motion

Motion M2024-45

A motion of the Board of the Central Puget Sound Regional Transit Authority directing the chief executive officer to: (1) expand the geographic scope of Sound Transit's At-Grade Crossing Program to not only include all Link light rail at-grade crossings, but also Tacoma Link and Sound Transit-owned Sounder at-grade crossings while still prioritizing improvements in the Rainier Valley; (2) accelerate current at-grade projects, and expand projects as needed (3) conduct a comprehensive study of at-grade crossings in the Rainier Valley identifying short-, mid-, and long-term at-grade crossing safety improvements; and (4) deliver a Rainier Valley Safety Master Plan of potential at-grade crossing safety improvements to the Board in October 2024 that prioritizes at-grade crossing safety improvements where the most collisions occur (e.g. along MLK Jr. Way S. in the Rainier Valley), followed by a systemwide at-grade crossing safety plan in November 2024, and provide regular progress reporting to the Rider Experience and Operations and System Expansion Committees until the safety master plans are transmitted.

Background

Public transportation is critical in increasing mobility, especially for individuals and families who lack private transportation, have no- or low-income, live in communities without essential goods and services, and must travel for school, work, and other opportunities. As Sound Transit expands its Link light rail, the agency must continue to improve rider and pedestrian safety at at-grade crossings along the existing lines, especially where service has disproportionately impacted BIPOC communities.

In 2022, Sound Transit and SDOT signed a partnership agreement reaffirming a shared commitment to enhance safety, equity, community access, and mobility in the Rainier Valley. This motion seeks to build upon that partnership to study and expeditiously implement enhancements for at-grade stations in the area.

When the 1 Line was constructed, it was built at grade through the Rainier Valley with three stations along Martin Luther King Jr. Way South: Columbia City, Othello, and Rainier Beach. MLK Jr. Way S is one of the two main roadways in the Rainier Valley, making it a vital and highly used corridor for various modes of transportation. The Rainier Valley is also historically one of the most diverse zip codes in the Puget Sound region.

The at-grade design along MLK Jr. Way S means that pedestrian and vehicle collisions with the light rail can and have occurred. The Seattle Times has reported that since service began in 2009, light rail vehicles have collided with a vehicle, person, or object at least 136 times in the Rainier Valley. In 2023, Sound Transit reported 26 collisions with light rail vehicles for the year. Of these collisions, 20 occurred at-grade crossings, and 18 occurred along the MLK Jr. Way S corridor. Of the 11 collision-related fatalities throughout the Link's operating history, eight individuals have tragically lost their lives in the Rainier Valley.

Collisions in the MLK corridor also significantly affect overall Link system operations. When collisions occur, trains may be one-tracked, but the disruption and delay often interrupt scheduled service for the entire 1 Line. This poses future service and rider experience concerns as the Link system expands and new lines are integrated with this corridor. This section of track is the largest

source of variability in the Link light rail system performance due to delays and service disruptions caused by traffic signals and collisions. The variability in the Rainier Valley can result in “train bunching,” which can cause crowding and other operational challenges up and down the alignment, including the interlining of trips for both the 1 and 2 Lines between International District Station and Lynnwood City Center. In addition, variability can result in additional light rail fleets needing to maintain service levels across the system while accommodating slower travel times. Having improved reliability in the Rainier Valley will assist in Sound Transit’s ability to meet federal grant commitments related to service levels as the system expands.

A disproportionate amount of train collisions occur along the MLK Jr. Way S corridor, negatively impacting communities that live, work, and commute through this region. Sound Transit and SDOT have affirmed that reducing collisions and near misses is a top priority for both agencies. The direction provided by this motion will expand upon the current work to better understand the feasibility of safety enhancements to at-grade crossings that can help achieve these goals.

Sound Transit’s Link light rail includes 27 at-grade Link light rail crossings in the MLK Jr. Way S corridor. Outside the corridor there are an additional 22 at-grade Link light rail crossings. Sounder commuter rail service has 16 at-grade crossings on the Sound Transit-owned Lakewood subdivision, and Tacoma Link includes 47 at-grade crossings.

Train safety is an important issue in the U.S., where every three hours in the U.S., a person or vehicle is hit by a train, and more than 60% of collisions occur at crossings equipped with lights and/or gates.

In light of safety issues related to at-grade crossings in August of 2021, Sound Transit unified work across the agency into one multidisciplinary work group that focuses specifically on at-grade crossing safety.

Sound Transit’s At-Grade Crossing Program focuses on Link light rail at-grade crossings. It reduces the safety risk to the lowest practical level as defined by the Federal Transit Administration on the existing operational system and voter-approved projects currently under construction. While Tacoma Link and Sound Transit-owned Sounder at-grade crossings are not currently within the Program’s scope, they are planned to be incorporated.

Sound Transit, in partnership with SDOT, has completed work in the Rainier Valley Corridor, including pavement markings, LED signs, traffic signals, additional studies on treatments, and analysis of risks and costs. Sound Transit has many active studies, pilot projects, and projects underway in the Rainer Valley Corridor, including but not limited to an eye-tracking study/analysis, a signal reprioritization pilot, an audible warning modification pilot, paint to enhance trackway visibility pilot, a pilot for automated pedestrian gates at station locations, and light rail vehicle wig wag headlights, as well as traffic modeling.

In recognition of the series of efforts underway, as well as continuing community concerns related to at-grade crossing safety in communities in King, Pierce, and Snohomish Counties where Sound Transit rail service operates, the agency must accelerate the pace and expand the geographic scope of these at-grade crossing safety projects, intensify focus on the short-term at-grade crossing safety concerns on existing corridors, and identify medium and long-term issues and opportunities that impact at-grade crossing safety, and system operations and reliability of Sound Transit service. Identifying these medium and long-term issues could present significant opportunities for system expansion and future needs for rolling-stock acquisition.

Because Sound Transit-owned at-grade crossings intersect with the rights-of-way of jurisdictions,

including Seattle, Bellevue, Redmond, Tacoma, Lakewood, and DuPont, it is necessary to ensure strong agency relationships with partner jurisdictions.

Motion

It is hereby moved by the Board of the Central Puget Sound Regional Transit Authority that the chief executive officer is directed to expand the geographic scope of Sound Transit's At-Grade Crossing Program to include not only all Link light rail at-grade crossings but also Tacoma Link and Sound Transit-owned Sounder at-grade crossings while prioritizing improvements in the Rainier Valley and accelerate the execution of current at-grade crossing projects underway to improve near-term at-grade crossing safety and expand current projects as needed.

The chief executive officer is further directed to conduct a comprehensive study in which Sound Transit staff will (a) analyze past at-grade crossing safety incidents on MLK Jr. Way S; (b) identify and evaluate short-, mid-, and long-term at-grade crossing safety improvements that could be implemented at at-grade stations along MLK Jr. Way S.; (c) explore the feasibility of different options in their evaluation such as gates, pedestrian spaces, reduced speed limits for cars, lane reductions, grade separation, and other possible upgrades, as well as develop a potential funding plan identifying any possible grant sources; (d) build upon work already underway to work collaboratively with SDOT and other regional partners where appropriate to assess at-grade crossing safety enhancements; (e) identify any opportunities to accelerate actions under their current at-grade crossing safety studies/planning work.

The chief executive officer is further directed to develop and compile a Rainier Valley Safety Master Plan with a focus on the Rainier Valley and a systemwide at-grade crossing safety plan in which staff will (a) evaluate the feasibility, costs, benefits, and potential impacts of each proposed potential improvement including recommendations for project prioritization based on the highest risk areas; (b) ensure the language used in the document is easily understandable or use layman's terms if highly technical language must be utilized; (c) detail what actions would be needed to implement improvements including any required collaboration with other agencies; and (d) work to improve at-grade crossing safety on projects under construction, projects in planning, and any long-range plans.

Staff will transmit a report on the Rainier Valley Safety Master Plan to the Board in October 2024, followed by a systemwide at-grade crossing safety plan in November 2024, and must provide monthly updates to the Rider Experience and Operations Committee and System Expansion Committee on the progress of all current work on at-grade crossing projects until the safety master plans are transmitted.

APPROVED by the Board of the Central Puget Sound Regional Transit Authority at a regular meeting thereof held on July 25, 2024.



Kathryn Flores

Board Administrator



Dow Constantine

Board Chair

7 Appendix C Data Analysis and Prior Studies

Evaluating and understanding data provides meaningful insights to compare Sound Transit to other peer agencies, identify trends and areas for improvement, assess enhancement effectiveness, and encourage data-driven decision-making. Data is integral to the safety risk management process, guiding efforts to identify improvement opportunities, informing research such as industry best practices and peer analyses, prioritizing locations for implementation, and enabling continuous monitoring. This appendix includes and is organized in a way to articulate initial Program work like the 2021 Rainier Valley Corridor Analysis and the 2022 Peer Analysis, which led to the development of the Assessment Tool in 2022 and, ultimately, the list of completed projects through June 2024 and a summary of key prior studies. The last section is the ongoing data monitoring piece and includes an initial look at a draft data analysis of the Rainier Valley with updated data through June. Long-term monitoring is required to fully assess the effectiveness of the enhancements, and the final Master Plan will include updated data.

2021 Rainier Valley Corridor Analysis

This analysis, conducted in Phase 1 during the enhancement identification step identified in Section 3.1, established a baseline of existing conditions and data trends for at-grade crossings in the Rainier Valley. It reviewed safety events on the Sound Transit Link light rail, using both Sound Transit and SDOT data to identify trends, prioritize locations, and develop mitigation strategies. The review suggested potential strategies such as warning signs, dynamic pavement markings, adaptive signal recovery, illuminated markers, turn gates, photo enforcement, and education. These recommendations were further evaluated using the assessment tool outlined in Section 3.1.



Figure 7-1: Total Events (2009-2021)



Figure 7-2: Total Collisions (2009-2021)



Figure 7-3: Pedestrian Near Misses and Close Calls (2009-2021)

Key Take-Aways

The map in Figure 7-1 visualizes the number of reported safety events at each crossing along MLK Jr Way S from 2009 to 2021. Figure 7-2 shows that the S Graham Street and S Dawson Street intersections experienced the greatest collisions, mostly due to illegal motor vehicle left-turn movements. Illegal left turns account for 63% of all collisions, while 15% involve pedestrians.

A near miss refers to an event or situation where a transit vehicle operator must take evasive maneuvers or other actions to avoid striking a pedestrian, vehicle, or object. Among the five most frequent intersections for pedestrian near misses between 2009-2021, four are station locations, and one is Graham Street, a future station location.

This data underscores the importance of prioritizing safety enhancements for left-turning vehicles corridor-wide and pedestrian access at station locations.

2022 Peer Analysis from the National Transit Database

Conducting peer reviews of other agencies offers insight into safety incidents across similar systems. Compared to other light rail transit agencies nationwide, Sound Transit has fewer grade crossings than many peer agencies but ranks near the middle when comparing numbers of injury and fatality incidents. This information highlights peer agencies that may have applicable lessons learned that Sound Transit can incorporate into potential solutions to improve safety.

Assessment Tool (2022)

The Program enhances safety using strategies like infrastructure changes, operational updates, training, and promoting safer behaviors to reduce the likelihood of safety incidents. Enhancements were identified through research, monitoring, community engagement, and regional collaboration. Sources included:

- **Industry Best Practices:** Proven effective methods.
- **Peer Agency Research:** Insights from similar agencies.
- **Data Analysis:** Safety reports, traffic volumes, and field data.
- **Field Visits:** Observations and feedback from staff and consultants.
- **Community and Partner Agency Feedback:** Input from public outreach and partner agencies.

See Section 3.1 Enhancement Identification and Assessment for additional details on the process.

The Program's initial round of enhancement identification began in late 2021/early 2022. Ideas were collected as part of reviewing the 2021 Rainier Valley Corridor Analysis, the regional partner and community outreach process, and ideas collected as part of peer agency research. The group surveyed operators, contacted nearly three dozen community-based organizations, held nine virtual community conversations, surveyed the ADA community for feedback, and collaborated with SDOT to collect enhancement ideas.

Below are some example ideas received. Some of the ideas received are outside of Sound Transit authority. Some scored highly in the initial assessment and were ready for immediate implementation, while others are more complex, requiring further research, feasibility, and traffic studies, consultation with federal regulations, and a review of industry best practices. Ideas that did not meet the criteria or scored poorly were deprioritized. As new enhancement ideas are received, they will undergo the same evaluation process and be compared against all previously submitted ideas—including those that were initially deprioritized—with updates reflecting any new information or regulatory guidance.

Administrative Controls		Engineering Controls		Roadway Redesign
<p>Safety Education</p> <ul style="list-style-type: none"> • 5 Core Safety Messages • Safety campaigns with partners • Safety education campaigns • Engagement activities • Outreach and training on specific mitigations <p>Encouragement</p> <ul style="list-style-type: none"> • Rainier Area Security Emphasis Team • Crossing guards • Using red light cameras to mail education materials 	<p>Operations Procedures</p> <ul style="list-style-type: none"> • Audible warning signage for operators • Training emphasis 	<p>Audible</p> <ul style="list-style-type: none"> • Enhance wayside bells • Localized audible announcements <p>Visual</p> <ul style="list-style-type: none"> • Updated static signage • Dynamic no left-turn warning signs • Dynamic “Another Train Coming” warning signs • Retroreflective tape around signal heads • Refreshed pavement markings • Paint to visually emphasize trackway • In-pavement lights <p>Physical Infrastructure</p> <ul style="list-style-type: none"> • Pedestrian gates at station locations • Channelization / fencing 	<p>Technology</p> <ul style="list-style-type: none"> • Leading pedestrian intervals • Traffic signal reprioritization pilot • Video Analytics • V2X • Touchless pedestrian push buttons • Smarter traffic signal controller • Signal system battery backup • ROW detection <p>Vehicle</p> <ul style="list-style-type: none"> • Adjust LRV bell volume • Wig wag headlights 	<ul style="list-style-type: none"> • Consolidate crossings • Eliminate crossings • Grade separate • Full corridor quad gates & flashers • Two-phase crossing • Larger pedestrian refuge areas • Other traffic calming measures

Table 7-1: Enhancement Ideas

Completed Projects Through June 2024

Between 2021 and June 2024, as part of Phase 1 outlined in Section 3.1, Sound Transit, in partnership with SDOT, **completed nine at-grade crossing enhancement projects** in the Rainier Valley, summarized in Table 7-2 below. The collaboration with SDOT was crucial, as some projects fall under SDOT’s jurisdiction while others are within Sound Transit’s authority. Data from these projects is continuously monitored to assess project effectiveness and identify overall trends in the corridor, which will guide future enhancements. Early data shows positive trends in incident reduction.










Project Type	Project Name	Safety Focus Area	Completion Date
Signage Enhancement	LED flashing no left-turn signs		Mar 2022
Signage Enhancement	LED flashing another train coming signs at station intersections		Sep 2023
Signage Enhancement	Other signage updates		Jan 2024
Pavement Markings	R X R pavement markings in left-turn pockets		Jun 2021
Pavement Markings	“LOOK” pavement markings		Sep 2023
Pavement Markings	Corridor pavement marking refresh		Sep 2023
Traffic Signal Enhancements	Leading pedestrian intervals		Aug 2023
Traffic Signal Enhancements	Retroreflective tape added to signal heads		May 2024
Traffic Signal Enhancements	Signal Reprioritization Pilot		Jun 2024

Table 7-2: At-Grade Crossing Program Completed Projects

2024 Rainier Valley Corridor Analysis

As the table above indicates, Sound Transit and SDOT have introduced several safety enhancement treatments to the Rainier Valley Corridor over the past few years. This report was intended to update safety data within the corridor and provide a preliminary assessment of the effectiveness of mitigation projects implemented since 2021.

Key Take-Aways

As shown in Figure 7-5, S Graham and S Dawson have the highest recorded number of total collisions, unchanged since the 2021 analysis. Also unchanged since the 2021 analysis, of the top five intersections with the highest total pedestrian events, three are located at station intersections, and one is a future station location.

Most train versus vehicle collisions occur when the train and vehicle travel in the same direction. This is likely due to obstructed driver visibility when making prohibited left turns. Collisions and near misses are most frequent during the evening peak hour.

Between 2021 and June 2024, Sound Transit, in partnership with SDOT, **completed ten at-grade crossing enhancement projects** in the Rainier Valley. Early data findings show a reduction in total pedestrian safety events by 33 percent and a reduction in total vehicle safety events by 3 percent. Total events include both vehicle and pedestrian near misses and collisions.

Long-term monitoring is required to fully assess the effectiveness of the enhancements, and the final Master Plan will include updated data. This data will inform future projects.



Figure 7-5: Total Rail Events (2009–Jun 2024)

Summary of Key Prior Studies

The timeline on the following page highlights work completed and incorporated into the development of this Master Plan, including several reports and studies on enhancement ideas collected as part of activities to conduct further research. This appendix outlines key studies and their summarized outcomes, which have contributed to the continued development of Program activities.

Study	Date	Summary	Key Outcomes
Potential At-Grade Crossing Treatments: Final Memorandum	Sep 2023	Presents research on at-grade crossing treatments including pedestrian crossings, left-turn gates, in-pavement lights, increased visibility of the trackway utilizing paint on pavement and/or fencing, audible messaging (verbal messages), alternating (wig wag) headlights on LRV, a navigation safety mobile app, Bluetooth beacons for mobile phones to alert peds near the tracks of oncoming LRV, ROW presence detection, and a V2X vehicle communication system.	<p>Studies helped form the basis for the following projects:</p> <ul style="list-style-type: none"> • Signalized Pedestrian Crossing Upgrades • Trackway Visibility Pavement Markings • Alternating Train Headlights • SMART: Rainier Valley Safe Project Phase 1
MLK Link light rail Automatic Pedestrian Gates: Feasibility Study (Stations – Columbia City, Othello, Rainier Beach)	Sept 2023	Documents the feasibility of installing either parking lot-style ped gates or typical automatic railroad-style gates at existing at-grade pedestrian crossings on the 1 Line at three stations (including five ped crossings) in the Rainier Valley. The study focused on analyzing existing physical space constraints based on the proposed project improvements. Results indicated that it is physically feasible to install either style of gate at S. Alaska St., S. Edmunds St., S. Myrtle St., and S. Othello St. There is a lack of regulatory support or guidance for non-typical installations, which leaves open what type of support infrastructure should be included (i.e., backup power, additional control cabinets). Locating this infrastructure would	<p>Ongoing coordination with SDOT to advance planning and design of automatic pedestrian gate pilot at the three Rainier Valley stations:</p> <ul style="list-style-type: none"> • Phase 1 (Columbia City and Othello) and Phase 2 (Rainier Beach) Automatic Pedestrian Gates project identification • Decision to develop Phase 1 and Phase 2 through design

Study	Date	Summary	Key Outcomes
		<p>require additional study and need to evaluate the need for additional ROW. There is limited room at S. Henderson St., and future work here will need to include traffic analysis and the feasibility of shifting overhead catenary system poles. Installing ped gates controlled by traffic signals would be considered a novel treatment with no industry practice.</p> <p>Using parking lot-style gates would not be considered fail-safe and is not recommended. ST needs to coordinate with SDOT and Federal partners to determine whether a path forward is to install railroad-style ped gates and flashers. The study suggests that adding gates for automobiles would be advisable to provide consistent operation and control.</p>	
<p>Potential AGC Treatments: Research and Evaluation of Grade-Separated Structures Memorandum</p>	<p>Oct 2023</p>	<p>This study assessed the feasibility of eliminating all at-grade crossings between light rail tracks and vehicular and pedestrian at-grade crossings within the Martin Luther King Way Jr Corridor. Three grade-separated options were evaluated along the MLK corridor, including an elevated guideway, tunnel, and open trench option. The study also assessed pedestrian grade-separated options at the three existing stations and two other non-station pedestrian crossings.</p>	<ul style="list-style-type: none"> • Identification of critical utilities underneath tracks in Rainier Valley • Order of magnitude cost estimates for various grade-separated options • Identification of construction phasing duration and impacts on the MLK Jr Way corridor

Table 7-3: Summary of Key Prior Studies

8 Appendix D Rainier Valley At-Grade Crossing Engagement Memo

Memo

July 29, 2024

To:	Goran Sparman, CEO Sound Transit
Thru:	Moises Gutierrez, Deputy CEO, Chief Program Oversight Officer Branden Porter, Acting Chief Safety Officer
From:	Victoria Morris, Acting Project Director - Safety Leda Chahim, Deputy Executive Director - Government & Community Relations Seth Daphne Esmeson, Program Manager - Transit Safety
Subject:	Rainier Valley at-grade crossing community engagement

At-Grade Crossing engagement background

In 2022, Sound Transit (ST) transformed its engagement in the Rainier Valley to be more proactive and intentional than the previous incident-responsive engagement and communication efforts. An important goal of the At-Grade Crossing (AGC) program is to meaningfully engage the Rainier Valley community, with an emphasis on safety as ST’s top priority and one of the agency’s core values. We do this by:

- building and sustaining relationships with community
- increasing two-way communication between community and ST
- establishing ST as a long-term member of the Rainier Valley community.

Centering our work around equitable safety outcomes is critical, and our engagement approach is designed to meet community where they are, providing a diversity of convenient and accessible points of connection. Our AGC program spans all the at-grade segments ST owns and operates, and we brought on an engagement and communications consultant in 2024 to continue to grow our program emphasis in Rainier Valley and beyond. See below for additional information on our previous engagement efforts (i.e. 2022-2023).

Methods and strategies

As part of the current 2024 AGC Engagement Plan, ST is continuing to build on previous engagement strategies to reach community members where they are to inform the future of safety enhancements in the area. We plan to employ a variety of engagement strategies that meaningfully engage communities in the Rainier Valley. Our current engagement plan includes:

- *Qualitative survey*—ST is deploying a survey about safety enhancements made in the corridor, possible improvements, and how ST is communicating about AGC work.
- *Listening sessions*—ST is reaching out to approximately fifty organizations, groups, and businesses in Rainier Valley to listen to concerns about safety in the area and share information about potential safety enhancements and current projects. We’ll also ask about other groups and venues where community gathers to learn about future opportunities to reach communities in the Rainier Valley.

Memo

- *Fairs and festivals*—ST is attending fairs and festivals from Columbia City to Rainier Beach this summer share out progress, hear concerns, and collect feedback from community members about safety around tracks and trains in Rainier Valley.
- *Safety ambassadors*—every year during Rail Safety Week, ST staffs a strong presence of safety ambassadors to highlight our safety messaging and spread information about the latest improvements or projects. Moreover, ST Security staff are trained to encourage riders to interact safely around trains throughout the year.
- *Community events, such as transit safety town halls*—as Board members, community, and agency partners schedule community events or town halls, Sound Transit engages with community about current and upcoming projects.

ST is planning to develop a longer-term engagement strategy that will be informed by upcoming Board and community conversations. We are also thinking about how to incorporate additional events informed by our engagement with community-based organizations and partners to broaden our reach—showing up where communities gather, providing interpretation and translated materials, and engaging online and in-person.

Equitable engagement

We understand the importance of reaching communities of color as well as low income, limited English proficiency, and other vulnerable populations that must be centered in our outreach efforts. Centering equity is essential for the success of engagement in Rainier Valley.

One significant barrier to engagement is language and translation. Our qualitative survey is translated into six languages: Arabic, Chinese, Somali, Spanish, Tagalog, and Vietnamese. These languages are the most spoken in Rainier Valley according to our internal GIS analysis using American Community Survey data.

In addition to translating our engagement materials into the most spoken languages, we also offer interpreter services at community briefings and tailored listening sessions. Offering interpretation services is one of many ways that we can tailor our engagement for an organization or community group. Additional ways we tailor our outreach are:

- *Timing*—conventional business hours are not often the most convenient for community members to give feedback. In addition to attending after-hours fairs and festivals, our group listening sessions are available after work hours and weekends. Whichever time works best for community members, we strive to accommodate.
- *Format*—presentation-style briefings are not always the most accessible to community members. From conversations and listening sessions to briefings on specific AGC projects, we can find a way to communicate that works best for community members.
- *Online vs in-person*—not everyone has access to the internet. So, when we collect survey responses or provide information, we offer a physical version of our materials.

Memo

- *Atmosphere*—before hosting listening sessions, we ask: does the venue we chose invite participation and engagement? When we join community members at their events, we ask: does our process reflect, honor, and welcome the community?
- *Location*—town halls on Sound Transit’s campus can be hard for community members to attend, so much of our engagement is designed to meet community members where they are. With that in mind, we think about convenience and ease of accessibility when selecting locations.
- *Partnerships* – Partnering with community-based organizations to join events they already host, or to be the convener can improve comfort amongst attendees and provide valuable insights into the best approach for successful engagement.

Previous engagement from 2022—2023

Annually, the AGC program sponsors events and seeks partnerships in the Rainier Valley as part of the ongoing at-grade crossing programmatic work. Planned activities focus on participating in established community events. During 2022 and 2023 events included:

- Community Safety Walks
- Cinema Under the Stars
- Columbia City Farmer’s Market
- Othello International Festival
- Rainier Beach Back2School Bash
- Rainier Beach Boo Bash
- Rail Safety Week staff ambassador presence in partnership with Operation LifeSaver

Additionally, in 2022, the AGC team contacted over 30 community-based organizations, either located in the Rainier Valley or serving the area, inviting them to participate in conversations with ST staff. The project team held nine virtual community conversations with those who were interested in participating in conversations. The project team also surveyed operators and the ADA community for feedback and collaborated with SDOT to collect enhancement ideas.

In July of 2023, Sound Transit deployed a security emphasis team in the Rainier Valley to enhance overall passenger safety and security at stations. This security team also builds positive relationships, encouraging compliance with laws and regulations, and promoting safety around tracks and trains. In the second half of 2023 the team made 462 crossing education contacts. Overall, this program has received positive feedback from the community.

9 Appendix E Project Pages

The Master Plan projects are organized into four categories:

- **Planning:** Projects that may include activities like diagnostics, studies and analysis, regional coordination and other work that helps to identify potential safety enhancements.
- **Proposed:** Projects under consideration and not yet programmed. They will require further coordination, data analysis, and, in some cases, community engagement and communications. Proposed projects were identified through data analysis, user observations, engineering assessments, and emerging technologies and information.
- **Adopted:** Projects in the development or design phase but not yet fully funded for construction.
- **Fully Funded:** Adopted projects with secured funding and an approved budget for full implementation.

Planning Project

Crossing Evaluation and Safety Analysis at Bridgeport Way S, S 74th St, S 56th St (Sounder Lakewood Subdivision)

Crossing Evaluation and Safety Analysis on 16 At-Grade Crossings (Sounder Lakewood Subdivision)

Data Collection, Inventory, and Input on New Standards (T Line)

Proposed Project

SMART Grant: Rainer Valley Safe Project Pilot, Phase 2

Additional Static Signage and Delineators

Another Train Coming Sign Enhancements

Pedestrian Crossing Upgrades Between Stations

Adopted Project

Automatic Pedestrian Gate Pilot, Phase 1

Automatic Pedestrian Gate Pilot, Phase 2

Another Train Coming Signage Between Stations

Alternating (Wig Wag) Train Headlights

Royal Brougham Way & SODO Busway At-Grade Crossing Upgrades

S Lander St & SODO Busway At-Grade Crossing Upgrades Pilot

S Holgate St & SODO Busway At-Grade Crossing Upgrades Pilot

Fully Funded Project

LRV Audible Warning Modification Project Pilot

Trackway Visibility Pavement Markings Pilot

SMART Grant: Rainier Valley Safe Project Pilot, Phase 1

DRAFT

Crossing Evaluation at Bridgeport Way S, S 74th St, S 56th St

(Sounder Lakewood Subdivision)

Description

This project will conduct a crossing evaluation at three Sounder at-grade crossings in the Lakewood Subdivision, which can include a diagnostic review. A diagnostic review typically involves a detailed, multidisciplinary assessment to ensure the safety, efficiency, and compliance of the crossing. These reviews are critical to identify potential hazards, evaluate operational effectiveness, and recommend potential mitigations. Below is an outline of the key activities involved:

- Preliminary data collection including traffic volumes, safety incidents, and current signage and infrastructure present.
- Conducting site inspections and field reviews, checking the visibility of warning devices and signage from train operator, pedestrian and driver perspectives, and assessing the condition of crossing surfaces.
- Conducting a functional and operational assessment focusing on signal coordination, pedestrian or bicycle movements, analyzing vehicle queue lengths and whether vehicles block the crossing, and observing driver behavior for compliance with signals and signage.
- Conducting risk and safety assessments as needed.
- Collecting interested party input and feedback like rail operators, local government, and community feedback.

- Ensuring regulatory compliance and comparing with most recently adopted agency standards.
- Preparing recommendations for potential mitigations as needed

If additional mitigations are identified as part of the crossing evaluation work, the Program will advance these mitigations, which may require additional budget.

Third-Party Coordination Required

Coordination to conduct the diagnostic is required with state and federal oversight agencies, as well as the local jurisdiction that owns the roadway.

Coordination may be required with local jurisdictions for the installation of traffic monitoring equipment.

Impacts to Public

None

Crossing Evaluation at Bridgeport Way S, S 74th St, S 56th St

(Sounder Lakewood Subdivision)

Project Type

- Planning

Safety Focus Areas



Milestones

- Planning and Development – Q2 2024
- Crossing Evaluation Q1 2025
- Recommendations Q2 2025

Location(s)

- Bridgeport Way S, S 74th Street, S 56th Street

Cost Range

- \$200K - \$250K

Grant Opportunities

Potential Section 130 funding (Federal Railway Highway Crossing Program) or WUTC GCPF funding (Washington Utilities and Transportation Commission Grade Crossing Protective Fund)

Crossing Evaluation at 16 At-Grade Crossings *(Sounder Lakewood Subdivision)*

Description

This project will conduct crossing evaluations at 16 Sounder at-grade crossings in the Lakewood Subdivision, which can include a diagnostic review. A diagnostic review typically involves a detailed, multidisciplinary assessment to ensure the safety, efficiency, and compliance of the crossing. These reviews are critical to identify potential hazards, evaluate operational effectiveness, and recommend potential mitigations. Below is an outline of the key activities involved:

- Preliminary data collection includes traffic volumes, safety incidents, and current signage and infrastructure present.
- Conducting site inspections and field reviews, checking the visibility of warning devices and signage from train operator, pedestrian and driver perspectives, and assessing the condition of crossing surfaces.
- Conducting a functional and operational assessment focusing on signal coordination, pedestrian or bicycle movements, analyzing vehicle queue lengths and whether vehicles block the crossing, and observing driver behavior for compliance with signals and signage.
- Conducting risk and safety assessments as needed.
- Collecting interested party input and feedback like rail operators, local government, and community feedback
- Ensuring regulatory compliance and comparing with most recently adopted agency standards.
- Preparing recommendations for potential mitigations as needed

If additional mitigations are identified as part of the crossing evaluation work, the Program will advance these mitigations, which may require additional budget.

Third-Party Coordination Required

Coordination to conduct the diagnostic is required with state and federal oversight agencies, as well as the local jurisdiction that owns the roadway.

Coordination may be required with local jurisdictions for the installation of traffic monitoring equipment.

Impacts to Public

None

Crossing Evaluation at 16 At-Grade Crossings *(Sounder Lakewood Subdivision)*

Project Type

- Planning

Safety Focus Areas



Milestones

- Planning and Development - Ongoing

Location(s)

- Sixteen at-grade crossings in Lakewood Subdivision

Cost Range

- \$700K - \$1M

Grant Opportunities

Potential Section 130 funding (Federal Railway Highway Crossing Program) or WUTC GCPF funding (Washington Utilities and Transportation Commission Grade Crossing Protective Fund)

Data Collection, Inventory, and Input on New Standards *(T Line)*

Description

This project will develop at-grade crossing design standards for the T Line and may include activities like data collection, peer analysis, and field observations to provide the basis for these standards. The project will also ensure consistency with Sound Transit Link and Sounder design requirements (as applicable) and incorporate lessons learned from other parts of the system. Developing design standards ensures uniform content in the design of T Line at-grade crossings for Sound Transit’s future projects and consistent application of at-grade crossing enhancements. Coordination with the City of Tacoma is critical for this work.

Third-Party Coordination Required

City of Tacoma

Impacts to Public

None

Project Type

- Planning

Safety Focus Areas



Milestones

- Planning and Development, including identifying potential agreements – TBD
- Draft- TBD
- Final - TBD

Location(s)

- At-grade crossings for T Line in downtown Tacoma

Cost Range

- TBD

Grant Opportunities

None

SMART Grant: Rainier Valley Safe Project Pilot, Phase 2

Description

Phase 2 of the Rainier Valley Safe Project, with proposed funding by a USDOT SMART grant in partnership with SDOT, is focused on implementing innovative technology tested in Phase 1 of the Rainier Valley Safe Project Pilot at 28 at-grade crossings. Technologies will be evaluated in Phase 1 and, if determined to be successful, will be included in the wider rollout of Phase 2. The project aims to enhance safety in the MLK corridor for all users while maintaining a high level of access and mobility.

Technologies being tested in Phase 1 and will be considered for Phase 2 include:

- Video analytics
- Vehicle-to-Everything (V2X) communications
- Enhanced signal controllers
- Traffic signal battery backup
- Touchless pedestrian push buttons

If Phase 1 (described in project pages above) is successful, it will provide the basis for the application for Phase 2 of the grant (up to \$15M over 36 months) to roll out technologies to 28 intersections in the MLK Jr. Way corridor. The project will integrate with the existing transportation signal system, providing 24/7/365 real-time data and feedback for multi-modal users in the corridor while refining the V2X concept and possibly replicating at other areas in the Sound Transit system.

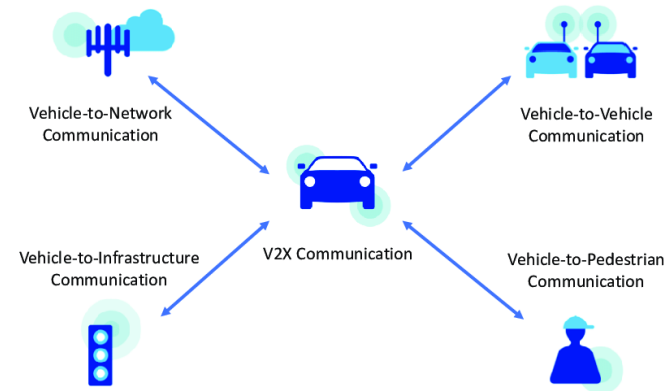
Third-Party Coordination Required

Coordination with SDOT is required to ensure tested technologies do not interfere with existing signals or traffic monitoring technology already active in the corridor. The SDOT traffic department would need to be involved in implementing enhanced signal controllers, battery backups, or any other technology that augments existing signal hardware. The project is also working toward a partnership with the University of Washington to assist with data collection and analysis.

Impacts to Public

Technology installation may require short shutdowns of crossings, less than one day. Temporary detours will be in place.

Figure: Graphic showing examples of V2X communications



SMART Grant: Rainier Valley Safe Project Pilot, Phase 2

Project Type

- Technology

Safety Focus Areas



Milestones

- Phase 2 grant submission: Q2 2025
- If awarded:
- Equipment installation: Q1 2026
- Data collection and testing: Q2 2026
- Pilot completion: 2029

Location(s)

- At-grade crossings on MLK Jr. Way S. and 28 cross-street intersections from S. Walden St. in the north to S. Norfolk St. in the south.

Cost Range

- \$15M

Figure: Touchless pedestrian push button



Additional Static Signage and Delineators

Description

There are several intersections in the corridor where vehicular left turns are prohibited. Currently “NO LEFT TURN” signs are on the signal arm, several feet overhead. The agency has partnered with SDOT, which is considering the installation of traffic delineators and eye-level “NO LEFT TURN” signs at intersections to enhance driver visibility of signage.

The placement of delineators leading to eye-level “No Left Turn” signs provides the opportunity to reinforce the existing “No Left Turn” signage that is high-mounted with traffic signals and other warning signage. The eye-level sign allows the driver to see and process the safety-critical information independent of the array of the other information conveyed at the intersection.

Third-Party Coordination Required

Coordination with SDOT is required to utilize existing poles or signposts and to install delineators at intersections with restricted left turns.

Impacts to Public

Installation of signs and delineators may require shutdowns of traffic lanes for less than one day, impacting vehicle traffic. Detours will be in place.

Project Type:

- Signage enhancement

Safety Focus Area



Milestones

- TBD in coordination with SDOT

Location(s)

- Intersections where left turns are not permitted

Cost Range

- \$400k–\$800K

Grant Opportunities

- None identified

Figure: Example of eye-level “NO LEFT TURN” signage and delineator



Another Train Coming (ATC) Sign Enhancements

Description

This project will replace existing ATC signs at all pedestrian crosswalks in the MLK corridor with an enhanced signage design.

ATC signage is an illuminated LED, dynamic sign. The lower half of the sign (the train icon) is triggered by an approaching train. Both the lower and upper half (ANOTHER TRAIN COMING text) are triggered in the event a second train is approaching. Because these signs are “blank-out,” they are dark when not in use and are meant to garner attention from pedestrians when an alert is triggered.

Based on feedback from current installation locations, the Program will consider modifying the signs to be true ‘Blank-Out’ when not triggered. Currently, the signs can be read under some lighting conditions when not triggered. The Program may also modify the signs so the arrows point left, right, or both directions predicated on the pedestrian/train direction of travel.

Third-Party Coordination Required

Coordination with SDOT would be required to ensure signs follow all applicable SDOT standards. The project would need to be coordinated with the adopted Another Train Coming Signage Between Stations project, as that project will order new ATC signs to replace existing signs at non-station locations.

Impacts to Public

Installation of signs may require the shutdown of crossings for less than one day, impacting pedestrian traffic.

Project Type

- Signage enhancement

Safety Focus Area



Milestones

- Preliminary planning
- Run through assessment in Master Plan Phase 2

Location(s)

- All pedestrian crossings

Cost Range

- \$300k-\$500K

Grant Opportunities

- None identified

Figure: Current Another Train Coming Signs



Pedestrian Crossing Upgrades Between Stations

Description

This project would make multiple improvements at each non-station crossing, which may include straightening the curb-to-curb pedestrian pathway, adding fencing, and removing any existing bedstead barriers to provide a more consistent and predictable crossing experience, especially for persons with disabilities. In addition, the project could install ADA-detectible warning surfaces with STOP HERE markings, flangeway filler, ATC (Another Train Coming) signage, and enhanced pedestrian lighting. These improvements would create more visibility and alert pedestrians to the presence of an approaching train. Flangeway filler also creates a smoother crossing over the trackway for pedestrians, bicycles, and wheelchairs and eliminates much of the gap between the track rail and the adjacent pavement.

A bedstead barrier, also known as a modified Z-crossing, is a channelization method that requires approaching pedestrians to deviate from their approach path in advance of the crossing. These barriers do not provide a straight walking pathway to pedestrians. This creates a longer crossing and may be more challenging to navigate for visually impaired users and those rolling through the intersection.

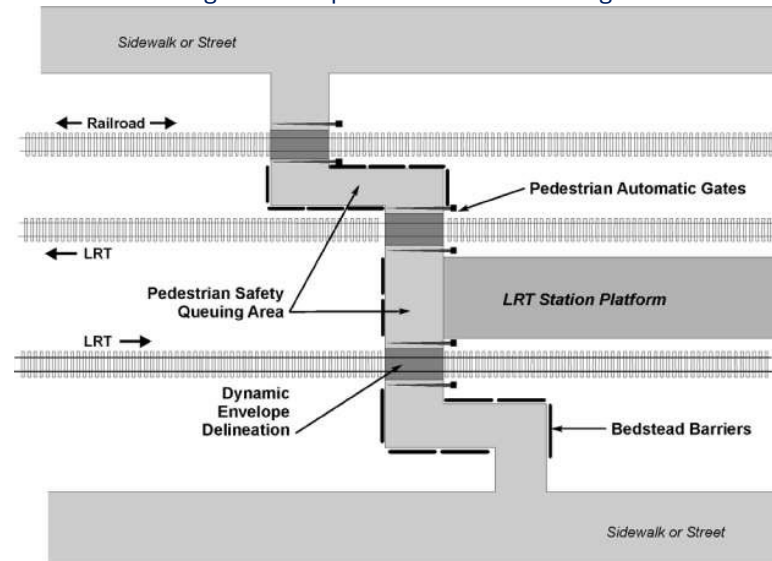
Third-Party Coordination Required

The project will coordinate with SDOT on the following: permitting, controller integration for dynamic LED ATC signs, ADA ramp improvements, detectable warning surfaces, and right-of-way and construction easements.

Impacts to Public

Pedestrian crossings may be closed for up to a week during construction. Adjacent crossings would remain open, allowing nearby options for detoured pedestrians.

Figure: Example of bedstead crossing



Pedestrian Crossing Upgrades Between Stations

Project Type:

- Single enhancement

Safety Focus Area



Milestones

- Preliminary planning
- Run through assessment in Master Plan Phase 2

Location(s)

- TBD

Cost Range

- \$20M-\$40M

Grant Opportunities

- None identified

Figure: Example of Look Both Ways pavement markings



Automatic Pedestrian Gate Pilot, Phase 1 *(Columbia City and Othello Stations)*

Description

This pilot project will install automatic pedestrian gates at the Columbia City and Othello Stations at the north and south pedestrian access points of each station. Automatic pedestrian gates are physical barriers designed to operate in coordination with approaching trains, encouraging pedestrian compliance with traffic signals. Gates are installed on either side of the dynamic envelope at pedestrian crossings and activate when a train approaches the station. Associated infrastructure to support the design may also be included in the project.

The project will also include emergency swing gates that allow pedestrians between the tracks to exit safely if the gates begin to descend, as well as any needed pedestrian and ADA improvements near the project. The gates and signals will require backup battery power for a minimum of 90 minutes. Ongoing data collection will help evaluate the project's impact on safety and the traveling public. The insights gained from this analysis will guide long-term decisions regarding the potential for permanent adoption and expansion to other locations across the system.

Third-Party Coordination Required

The Seattle Transit Way Agreement from 2002 requires formal SDOT approval for these projects. Additional coordination with SDOT has already begun and will need to address several critical aspects of the project to ensure its successful implementation. These include:

- Updates or possible replacement of traffic signal cabinets
- Controlled integration of phased pedestrian crossings, signals for vehicle movements, and train controls
- ADA ramp improvements or installations, including detectable warning surfaces
- Street Improvement Permit
- Battery backup compatibility with traffic signal and train systems
- Construction easements

This project requires Sound Transit and SDOT alignment on the operational feasibility of gates and agreement that no major fatal flaws are present. The schedule includes a project milestone reflecting this consensus point.

Impacts to Public

Installing pedestrian gates may require one or more full rail shutdowns or single tracking events, impacting train service and rider experience. To manage pedestrian traffic during the installation, temporary detours will be in place.

After construction, the public may notice increased noise from the pedestrian gate signal bells and additional lighting due to the new warning lights, especially at night. Potential impacts to all road users are currently being analyzed.

Automatic Pedestrian Gate Pilot, Phase 1 *(Columbia City and Othello Stations)*

Project Type

- Infrastructure

Safety Focus Area



Milestones

- 30% design: Q4 2024
- ST and SDOT consensus on operational feasibility: Q1 2025
- Final design: Q2 2025
- Long lead time equipment procurement: Q2 2025
- Start and end construction: Q2 2026
- Pilot end date: 2028

Location(s)

- Columbia City Station and Othello Station

Cost Range

- \$8M–\$11M

Grant Opportunities

Reconnecting Communities federal grant application submitted September 27, 2024

Figure: Example automatic pedestrian gate with hanging bar

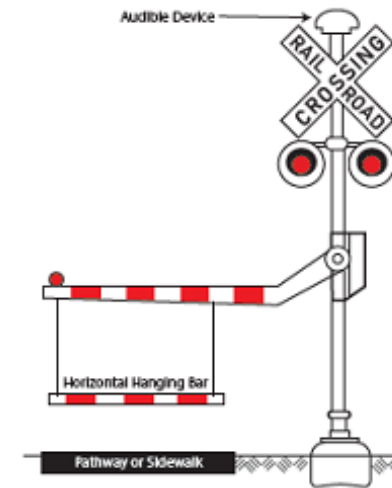
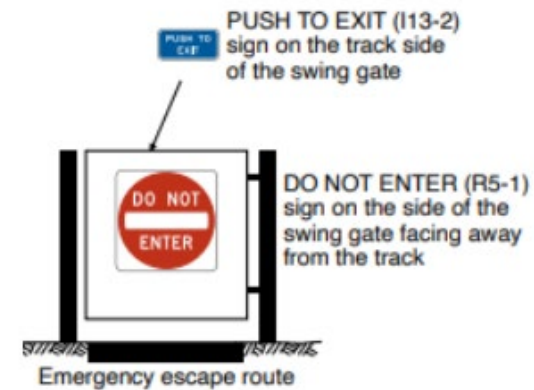


Figure: Example emergency exit swing gate



Automatic Pedestrian Gate Pilot, Phase 2 *(Rainier Beach Station)*

Description

This pilot project will install automatic pedestrian gates at the Rainier Beach station. Automatic pedestrian gates are physical barriers designed to operate in coordination with approaching trains, encouraging pedestrian compliance with traffic signals. Gates are installed on either side of the dynamic envelope at pedestrian crossings and activate when a train approaches the station. Associated infrastructure to support the design may also be included in the project.

The project will also include emergency swing gates that allow pedestrians on the tracks to exit to safety if the gates begin to descend, as well as any needed pedestrian and ADA improvements near the project. The gates and signal will require backup battery power for a minimum of 90 minutes. Ongoing data collection will help evaluate the project's impact on safety and the traveling public. The insights gained from this analysis will guide long-term decisions regarding the potential for permanent adoption and expansion to other locations across the system.

Third-Party Coordination Required

The Seattle Transit Way Agreement from 2002 requires formal SDOT approval for these projects. Additional coordination with SDOT includes:

- Updates or possible replacement of traffic signal cabinets
- Controlled integration of phased pedestrian crossings, signals for vehicle movements, and train controls
- ADA ramp improvements or installations, including detectable warning surfaces
- Street Improvement Permit
- Battery backup compatibility with traffic signal and train systems
- Right-of-way and construction easements
- Potential relocation of a station art installation
- Potential relocation of an Overhead Catenary System pole

This project requires Sound Transit and SDOT alignment on the operational feasibility of gates and agreement that no major fatal flaws are present. The schedule includes a project milestone reflecting this consensus point.

Impacts to Public

Installing pedestrian gates may require one or more full rail shutdowns or single tracking events, impacting train service and rider experience. To manage pedestrian traffic during the installation, temporary detours will be in place.

After construction, the public may notice increased noise from the pedestrian gate signal bells and additional lighting due to the new warning lights, especially at night. Potential impacts to all road users are currently being analyzed.

Automatic Pedestrian Gate Pilot, Phase 2 (Rainier Beach Station)

Project Type

- Infrastructure

Safety Focus Area



Milestones

- 30% design: Q2 2025
- ST and SDOT consensus on operational feasibility: Q3 2025
- Final design: Q4 2025
- Construction procurement: 9 months
- Start construction: Q3 2026
- End construction: Q1 2027
- Pilot end date: 2028

Location(s)

- Rainier Beach Station

Cost Range

- \$6M–\$10M

Grant Opportunities

- Still evaluating potential grant opportunities / None identified at this time

Figure: Example automatic pedestrian gate with hanging bar

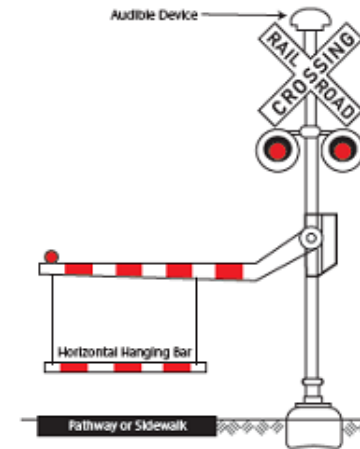
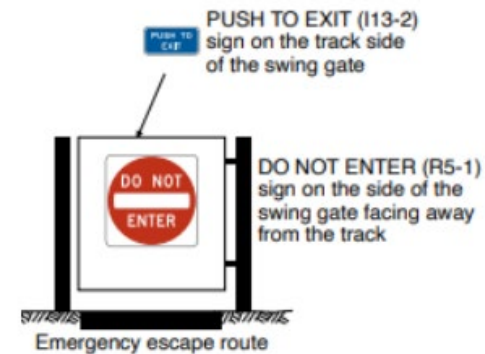


Figure: Example emergency exit swing gate



Another Train Coming Signage Installation Between Stations

Description

The project will replace all existing signs with train icons with the new “another train” warning signs at all non-station crosswalks in the MLK corridor. Signs alert pedestrians of approaching trains and highlight when a second train is approaching from the other direction. This project will support signage consistency at all crossings, not just those adjacent to stations.

ATC signage is an illuminated LED, dynamic sign. The lower half of the sign (the train icon) is triggered by an approaching train. Both the lower half and the upper half (ANOTHER TRAIN COMING text) are triggered in the event a second train is approaching. Because these signs are “blank-out,” they are dark when not in use and are meant to garner attention from pedestrians when an alert is triggered.

Third-Party Coordination Required

Coordination with SDOT is required to integrate into the traffic signal system and ensure signs follow all applicable SDOT standards.

Impacts to Public

Installation of signs may require shutdowns of crossings for less than one day, impacting pedestrians and occasionally vehicles. Temporary detours will be in place.

Figure: Current Another Train Coming Signs



Another Train Coming Signage Installation Between Stations

Project Type

- Signage enhancement

Safety Focus Area



Milestones

- 30% design: completed Q2 2024
- Final design: Q4 2024
- Construction procurement: 6 months
- Start construction: Q3 2025
- End construction: Q4 2025

Location(s)

- Non-station crosswalks in the MLK corridor

Cost Range

- \$2M–\$3M

Grant Opportunities

Connecting Communities

Alternating (Wig Wag) Train Headlights

Description

The project will retrofit existing LRVs, or trains, with the capability to flash headlights in an alternating pattern (aka wig wag) when audible warnings like train bells or horns are deployed.

Alternating train headlights are a visibility mechanism that strobes train headlights on/off or high/low when a train approaches an intersection and the train’s audible signals are deployed. Industry studies indicate that trains equipped with alternating headlights are detected sooner by pedestrians and vehicles. Other peer agencies, such as Metro Transit in Minneapolis, have implemented alternating headlights, and coordination is ongoing with them to inquire about lessons learned, implementation strategies, and successes.

Third-Party Coordination Required

None

Impacts to Public

No impact. Alternating headlight functionality would be installed while trains are not in service.

Project Type

- Train enhancements

Safety Focus Areas



Milestones

- Begin manufacture integration: Q3 2024
- Retrofit complete: Q1 2026

Number of Vehicles

- 62 Series 1 Kinkisharyo LRVs
- 124 Series 2 Siemens LRVs

Cost

- \$2.5M

Grant Opportunities

- None identified

Figure: Wig Wag Train headlights as implemented by Metro Transit



Royal Brougham Way & SODO Busway At-Grade Crossing Upgrades Pilot

Description

This project will install automatic pedestrian gates and other safety enhancements based on the new 2023 AGC Standards and will serve the pedestrian track crossings on the north and south sides of the intersection. Automatic pedestrian gates are physical barriers designed to operate in coordination with approaching trains, increasing compliance with pedestrians stopping and enhancing pedestrian safety. Gates are installed on either side of the dynamic envelope at pedestrian crossings and activate when a train approaches the intersection. Updated signage, ATC LED signage, flangeway filler, and other pedestrian improvements are included.

The project will also include emergency swing gates that allow pedestrians who are on the tracks to exit to safety if the gates are down as well as any needed pedestrian and ADA improvements near the project. The gates and signal will require backup battery power for a minimum of 90 minutes. Ongoing data collection will help evaluate the enhancements' impact on both safety and the traveling public. This will inform long-term decisions about permanent adoption and installation at other locations across the system.

Third-Party Coordination Required

Coordination with Seattle DOT has already begun and will need to address several critical aspects of the project to ensure its successful implementation. These include:

- Updates or possible replacement of traffic signal cabinets
- Controlled integration of phased pedestrian crossings, signals for vehicle movements, and train controls
- ADA ramp improvements or installations, including detectable warning surfaces
- Street Improvement Permit
- Battery backup compatibility with traffic signal and train systems
- Right-of-way and construction easements

Impacts to Public

The installation of pedestrian gates may require one or more full rail shutdowns or single tracking events, impacting train service and rider experience. To manage pedestrian traffic during the installation, temporary detours will be in place. After construction, the public may notice an increase in noise from the pedestrian gate signal bells and additional lighting, especially at night, due to the new warning lights

Royal Brougham Way & SODO Busway At-Grade Crossing Upgrades Pilot

Project Type

- Infrastructure

Safety Focus Areas



Milestones

- 30% design – Q1 2024
- Final design – Q4 2024
- Construction completed - Q4 2025
- Pilot end date – Q4 2027

Location(s)

- Royal Brougham Way @ SODO Busway

Cost

- \$4M - \$5M

Grant Opportunities

- None identified

S Lander St & SODO Busway At-Grade Crossing Upgrade Pilot

Description

This project will install new pedestrian surface treatments at three track crossings on the north (2) and south (1) sides of the intersection. In addition to enhancements that provide a smoother crossing over the trackway, the work will include the installation of ADA-detectable warning surfaces with STOP HERE markings, flangeway filler, and ATC (Another Train Coming) signs.

Third-Party Coordination Required

Coordination with Seattle DOT has already begun and will need to address several critical aspects of the project to ensure its successful implementation. These include:

- Controlled integration for dynamic LED ATC signs
- ADA ramp improvements or installations, including detectable warning surfaces
- Street Improvement Permit
- Right-of-way and construction easements

Impacts to Public

The installation of these enhancements may require one or more full rail shutdowns or single tracking events, impacting train service and rider experience. To manage pedestrian traffic during the installation, temporary detours will be in place.

Project Type

- Infrastructure

Safety Focus Areas



Milestones

- 30% design – Q1 2024
- Final design – Q4 2024
- Construction completed - Q4 2025

Location(s)

- S Lander St @ SODO Busway

Cost

- \$1M - \$2M

Grant Opportunities

- None identified

Figure: Example Another Train Coming signs



S Holgate St & SODO Busway At-Grade Crossing Upgrades

Description

This project will install new pedestrian surface treatments at two track crossings on the north and south sides of the intersection. In addition to enhancements that provide a smoother crossing over the trackway, the work will include the installation of ADA-detectable warning surfaces with STOP HERE markings, flangeway filler, and ATC (Another Train Coming) signs.

Third-Party Coordination Required

Coordination with Seattle DOT has already begun and will need to address several critical aspects of the project to ensure its successful implementation. These include:

- Controlled integration for dynamic LED ATC signs
- ADA ramp improvements or installations, including detectable warning surfaces
- Street Improvement Permit
- Right-of-way and construction easements

Impacts to Public

The installation of pedestrian swing gates may require one or more full rail shutdowns or single tracking events, impacting train service and rider experience. To manage pedestrian traffic during the installation, temporary detours will be in place.

Project Type

- Infrastructure

Safety Focus Areas



Milestones

- 30% design – Q1 2024
- Final design – Q4 2024
- Construction completed - Q4 2025

Location(s)

- S Holgate St @ SODO Busway

Cost

- \$700k - \$1M

Grant Opportunities

- None identified

Figure: Example Another Train Coming signs



LRV Audible Warning Modifications Pilot Project

Description

The Audible Warning Modification Pilot Project was implemented in October of 2022 and included increasing the volume of the existing Link LRV high bell by about five to six decibels. Standard operating procedures require LRV operators to enact the high bell at every at-grade crossing intersection on Martin Luther King Jr. Way. The bells are activated manually by the operator. The intent of the increase in volume of the high bell is to better alert vehicles and pedestrians to approaching trains.

Third-Party Coordination Required

None

Impacts to Public

The public may notice the slight increase in volume through the corridor. Implementation was during non-revenue operation, and traffic was not impacted.

Project Type

- Train Enhancements

Safety Focus Areas



Milestones

- Data collection and design specifications: complete
- Final analysis and report: complete
- Pilot end date: Q1 2025

Location(s)

- At-Grade Crossings on MLK Jr. Way S., including Columbia City, Othello, and Rainier Beach stations.

Cost

- N/A

Trackway Visibility Pavement Markings Pilot

Description

This pilot project will install high-visibility pavement markings within the LRT dynamic envelope. The dynamic envelope is the region between and immediately adjacent to the tracks at a grade crossing. The project will also include new “DO NOT STOP ON TRACKS” signage. The goal of piloting the markings is to reduce the number of vehicles that come to a stop within the dynamic envelope, thus reducing the possibility that a vehicle is present on the tracks when a train approaches and to increase general visibility of the trackway encouraging drivers, pedestrians, and cyclists to pay attention regardless of the presence of a train.

Markings will provide visual contrast from the surrounding concrete or asphalt surface and utilize slip-resistant material. Two types of markings will be piloted—markings that adhere to jurisdictional traffic standards —Dynamic Envelope and Do Not Block pavement markings guidelines and markings.

Third-Party Coordination Required

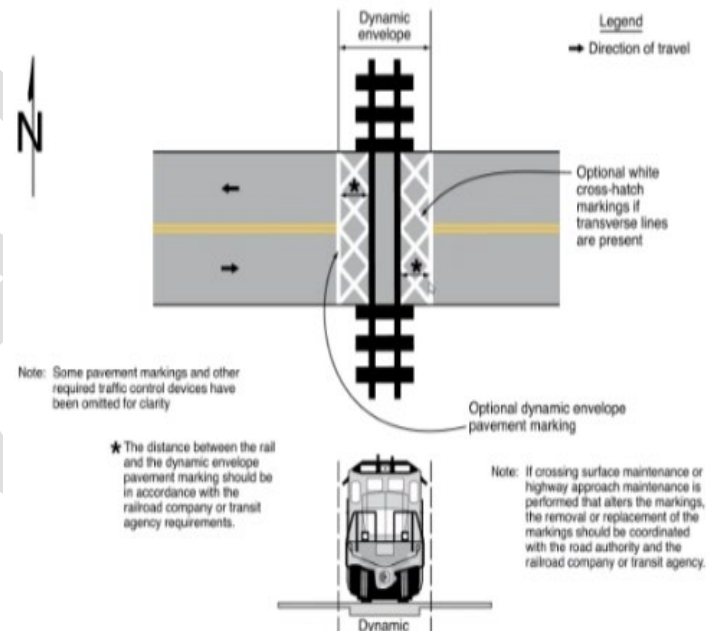
Coordination with SDOT is required in the following areas:

- Street Improvement Permit
- Ensure pavement markings meet SDOT standards for not conflicting with existing pavement markings in the area (e.g., bike lanes, lead lines, crosswalks)
- Responsibility for maintenance and periodic marking refresh

Impacts to Public

Installation of pavement markings may require shutdowns of crossings for less than one day, impacting vehicles, pedestrians and Link light rail service. Temporary detours will be in place.

Figure: Example of LRT dynamic envelope



Trackway Visibility Pavement Markings Pilot

Project Type

- Pavement markings

Safety Focus Areas



Milestones

- 30% design: Q3 2024
- Final design: Q4 2024
- Start construction: Q4 2024
- End construction: Q3 2025
- Pilot completion (includes data collection): 2027

Location(s)

- Pilot FRA example pavement marking: S Dawson Street and S Brandon Street
- Pilot MUTCD example pavement marking: S Kenyon Street and S Cloverdale Street

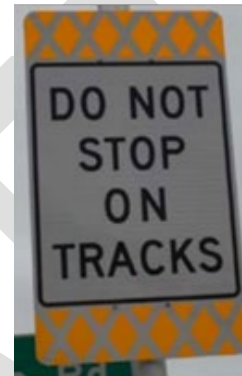
Cost Range

- \$800k–\$1M

Grant Opportunities

- None identified

Figure (left): Sample DO NOT STOP ON TRACKS signage
Figure (right): Sample dynamic envelope pavement markings



SMART Grant: Rainier Valley Safe Project Pilot, Phase 1

Description

Phase 1 of the Rainier Valley Safe project, funded by a USDOT Strengthening Mobility and Revolutionizing Transportation (SMART) grant and secured in partnership with SDOT, is focused on testing innovative technology in the MLK corridor. The project aims to enhance safety for all users while maintaining a high level of access and mobility.

The project will test the following technologies:

- Video analytics
- Vehicle-to-Everything (V2X) communications
- Enhanced signal controllers
- Traffic signal battery backup
- Touchless pedestrian push buttons

Evaluation of this project will inform applicability to employ technologies at a larger and systematic scale. If Phase 1 is successful, it could lead to submitting an application for Phase 2 of the grant (up to \$15M over 36 months) to roll out technologies on a broader scale, integrating with the existing transportation system and refining the concept such that it could be replicated by others.

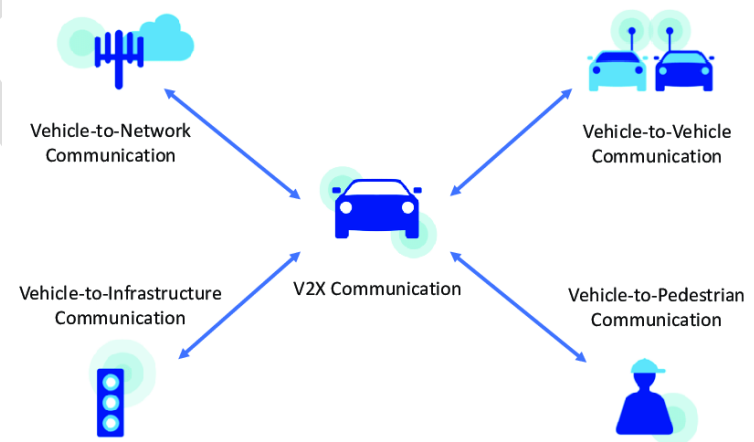
Third-Party Coordination Required

Coordination with SDOT is required to ensure tested technologies do not interfere with existing signals or traffic monitoring technology already active in the corridor. The traffic department would need to be involved in implementing enhanced signal controllers, battery backups, or any other technology that augments existing signal hardware. The project is also working toward a partnership with the University of Washington to assist with data collection and analysis.

Impacts to Public

Technology installation may require short shutdowns of crossings, less than one day. Temporary detours will be in place.

Figure: Graphic showing examples of V2X communications



SMART Grant: Rainier Valley Safe Project Pilot, Phase 1

Project Type

- Technology

Safety Focus Areas



- Data collection and design specifications: Q1 2024
- Final analysis and report: Q2 2025
- Equipment procurement: Q3 2025

Location(s)

At-Grade Crossings on MLK Jr. Way S. at these cross streets:

- S Columbian Way / Oregon Street
- S Alaska Street
- S Edmunds Street
- S Hudson Street
- S Myrtle Street
- S Othello Street
- S Trenton Street
- S Henderson Street

Cost Range

- \$2.5M

Figure: Touchless pedestrian push button

