A. OVERVIEW/PROJECT DESCRIPTION

Stage 1: Project Description

Sound Transit (ST), in partnership with the City of Seattle Department of Transportation (SDOT), is seeking a $2 million SMART grant to improve safety along the Martin Luther King Jr Way South light rail corridor. The Rainier Valley Safe: Technology investments to improve community safety project will plan, implement, and evaluate a real-time safety solution leveraging **intelligent sensor-based infrastructure**, **smart technology traffic signals, and vehicle-to-everything (V2X) communications** to enhance safety for all community members in the pilot project area. This pilot project will test real-time, multimodal detection of various road users with 24/7/365 situational awareness and alerts of potential conflicts that can save lives. The pilot phase will not only provide insights on possible technologies we can implement proactively on a broader scale, but also important data that can be used to inform further safety enhancements to improve safety in the highly disadvantaged community (HDC) through the Rainier Valley.

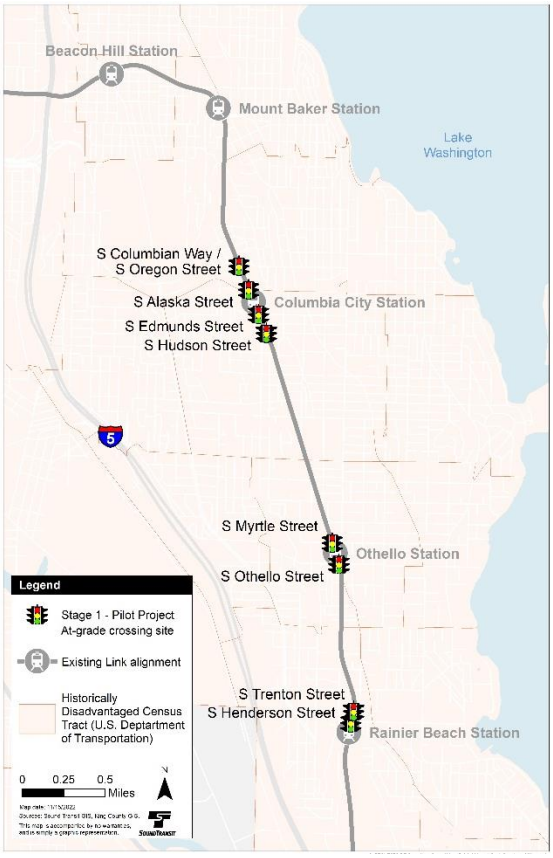

Exhibit 1. Stage 1 Project Area

Issues and Challenges to be Addressed

Safety at At-Grade Crossings: Collisions amongst vulnerable road users, general purpose vehicles, and light rail vehicles in the project area are unfortunately a common occurrence along Martin Luther King Jr Way South. High volumes of traffic and the existence of twenty-eight signalized at-grade rail crossings contribute to these challenges. Current road safety practices rely on reactive analysis of reported collision information every 3 to 5 years and then implementing safety strategies a few years later. This reactive and delayed cycle creates limited opportunity to make meaningful safety improvements that are responsive to lessons learned from incident and accident reporting and does not allow agencies to understand the full picture of collision casual factors in the way the proposed technology does.

Multimodal Efficiency at Signalized Intersections: The existing signal control system uses inductive loops to detect the presence of general purpose and light rail vehicles. This sensor technology lacks the ability to detect all modes. With enhanced multimodal detection, signal controller operators can leverage these inputs to enact signal timing strategies that improve efficiency for active transportation modes and public transit. In addition, data generated from video analytics platforms and advanced transportation controllers can be used to measure the

benefits of Stage 1 and provide a framework for performance measurement on the subsequent Stage 2 of the SMART Grant and for future projects outside the SMART Grant.

Proposed Technologies

Intelligent Sensor-Based Infrastructure: The proposed technology addressing multimodal safety at rail crossings is based on real-time video analytics using artificial intelligence. The solution will transform the current intersection infrastructure with a lack of awareness of road safety issues and potential conflicts to an advanced "smart sensing infrastructure" capable of 24/7/365 situational awareness related to road safety and intersection operational conflicts. When conflicts are detected, safety messages can be broadcast in real-time to vulnerable road users, connected vehicles, warning devices, and advanced transportation controllers. The technology will also collect and report historical near-miss collision information as well as multimodal counts and classifications. This technology will be a key data source for the data collection and evaluation portion of Stage 1.

Smart Technology Traffic Signals: The proposed technology addressing multimodal efficiency at signalized intersections includes upgraded advanced transportation controllers, video detection using video analytics, touchless pedestrian pushbuttons, and cabinet battery backup systems for resiliency and redundancy. The signal control system will be able to measure multimodal demand and optimize intersection operations accordingly. This is specifically useful when implementing signal strategies related to pedestrian surges from special events, light rail and transit signal priority, and emergency vehicle preemption. Having 24/7/365 situational awareness of the pedestrian demand at specific crosswalks and corresponding signal phases offers huge benefits to implement various signal control strategies for enhanced operations. This improves safety as intersections are managed based on the true operational environment.

Stage 2: Desired Outcomes

The proposed technology solutions will be tested for effectiveness in addressing the road safety and efficiency problems within the Stage 1 study area. Stage 2 deployment of these technology solutions will be implemented along the MLK corridor and other regional at-grade crossings to address the issues and challenges outlined earlier. The key desired outcomes of Stage 1 are:

1. Vetting the effectiveness of the proposed technologies to improve safety and resolve efficiency problems within the project area using the data collected
2. Evaluate the scalability of the proposed solutions for stage 2 and regionally
3. Develop scope, schedule, and budget for stage 2 implementation, which includes job training and capacity building for operations and maintenance of proposed technologies

SMART Program

Address Program Goals and Advance the Status Quo

The proposed technology solutions are consistent with the SMART program goals as they leverage technology solutions to improve the safety, efficiency, and accessibility of the multimodal transportation system and advance the state of practice to the benefit of this specific HDC, as well as the broader regional community.

- Plan and implement **intelligent sensor-based infrastructure** using advanced artificial intelligence and V2X technologies to provide actionable safety and operational insights that are not possible with the current infrastructure.

- Plan and implement **advanced traffic signal systems** for multimodal operational control that is not currently possible due to legacy signal hardware limitations.
- Deploy **advanced data analytics** at intersections for continuous data collection and on-going, proactive insight to collision (safety) and delay (efficiency) casual factors.

B. PROJECT LOCATION

This pilot project Stage 1 grant will plan and implement technology at 11 Seattle Department of Transportation (SDOT) signalized intersection surrounding three Sound Transit light rail stations along Martin Luther King Jr Way in Seattle, Washington as shown on Exhibit 2. The study area was selected to include intersections located in an HDC area of focus where Sound Transit and SDOT are working with the community to improve safety. These communities are also experiencing high collision rates and feature diverse operational environments. The study area includes 35 census tracts, of which 31 are categorized as Historically Disadvantaged Communities (HDCs).

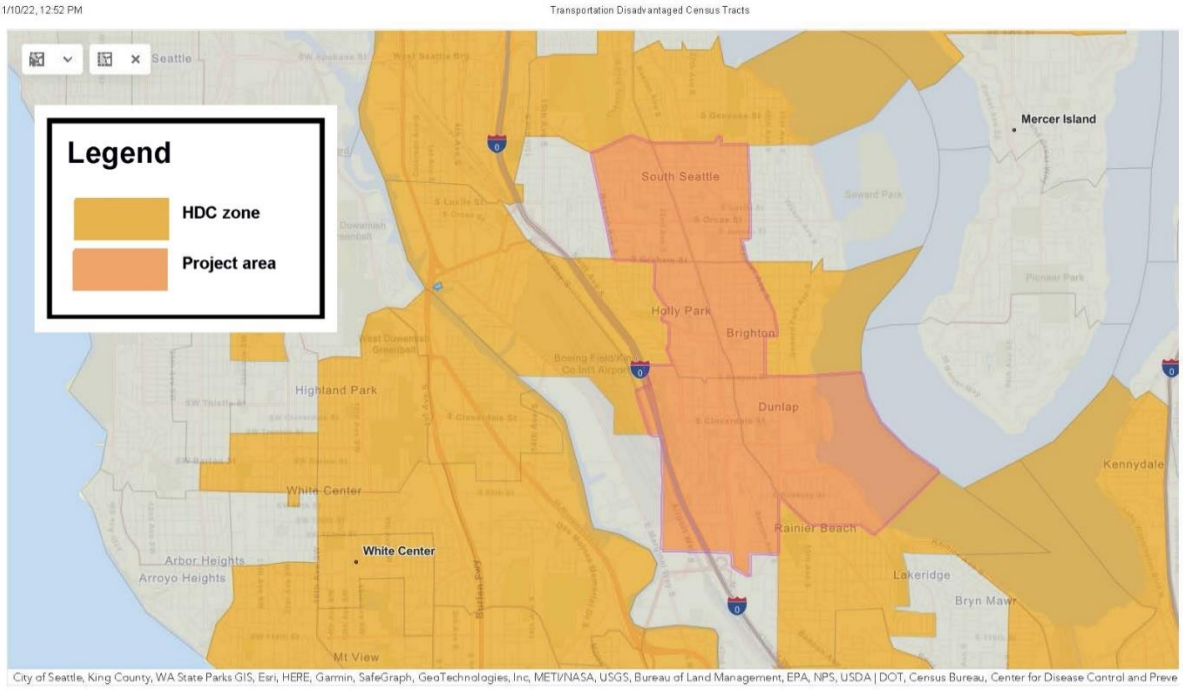

Exhibit 2. Stage 1 Historically Disadvantaged Communities

C. COMMUNITY IMPACT

According to the Historically Disadvantaged Community (HDC) Status Tool, the project study areas are located entirely in HDCs (Exhibit 2). Of the five census tracts surrounding the stations, all include communities of color having higher concentrations of people whose incomes are below the federal poverty threshold. Eventual implementation of the proposed technologies throughout the study area will provide significant benefits to area residents in the form of improved safety, reliability, accessibility, and efficiency across transportations system users and

modes. Benefits will be directly measurable thanks to the continuous data collection and monitoring afforded by the cloud-based system and the use of AI technology. The project is not expected to bring negative externalities to residents, transportation system users, or nearby businesses and organizations. Rather, this collaborative effort between SDOT and Sound Transit is responsive to broad community requests for action to address safety. As metrics are analyzed, SDOT and Sound Transit will use established community engagement processes to report outcomes and course correct if necessary.

D. TECHNICAL MERIT OVERVIEW

Identification and Understanding of Problem to be Solved

The highly disadvantaged community (HDC) of the Rainier Valley in south Seattle experiences many safety incidents and near misses between vulnerable road users (pedestrians and bicyclists), vehicles, and light rail vehicles. The Sound Transit Link light rail travels at-grade for 4.2 miles along Martin Luther King Jr Way South crossing 28 signalized intersections. From 2017 to 2022, this fast-growing community with mixed-use developments, low-income housing, community services, schools, and public spaces logged ***879 total collisions, of which, 16 were serious injury and 5 fatalities***.

Dr. Shaquita Bell, Senior Medical Director for the Odessa Brown Children's Clinic, located in the heart of this project area, has been vocal with Sound Transit and SDOT officials about the urgency of the community safety situation. She pointed out to staff in a recent virtual meeting that MLK highways/byways are always located in predominantly Black and low-income parts of town in each city, disproportionately impacting our black, brown, immigrant and refugee communities in South Seattle.

From listening sessions previously held with those communities, Dr. Bell asked SDOT and Sound Transit to recognize that concerns about vehicle and pedestrian safety in the corridor are not new, and the gravity of the current situation is the consequences of how the safety concerns voiced by that community went unheard by transportation officials for decades. ***This project addresses the need to respond to the community and develop safety improvements to reduce fatalities and serious injuries along this corridor***.

Appropriateness of Proposed Solution

Safety at At-Grade Crossings - Intelligent Sensors

Situational Awareness – The proposed solution and demonstration project will deploy smart high-definition day and night sensing and artificial intelligence technologies to detect, classify, and track the trajectory, speed, acceleration, and location of all road users in real-time at 10 times per second. This will allow real-time situational awareness regarding the movement and potential conflicts that may lead to collisions between light rail vehicles, pedestrians, bicyclists, general purpose vehicles, freight, and transit vehicles.

Real-time Alerts – The proposed solution and demonstration project will generate and broadcast, through V2X industry-standard safety message sets in real-time, to vehicles and vulnerable road users, to alert them of potential safety conditions, as well as actuate dynamic warning systems (audible, rapid flashing signs, etc.), and signal control systems.

Historical Reporting – The proposed solution and demonstration project will provide 24/7 reporting of safety issues, including near-miss conflict detection and automated traffic data collection and analytics. This information provides both planners and operators with access to data not otherwise available as well as additional tools to monitor and evaluate various mitigation solutions in an automated manner helping them become more proactive in addressing safety issues.

Multimodal Efficiency at Signalized Intersections - Smart Signals

Multimodal Signal Operations – The proposed solution and demonstration project will deploy advanced transportation controllers and multimodal video detection to identify intersection presence of all modes. Signal operators can then implement timing strategies that prioritize certain modes like pedestrians and transit.

Real-time Signal Timing Strategies – The proposed solution and demonstration project will integrate with the advanced transportation controllers with the V2X technology providing the controller real-time safety information and supporting signal operations strategies like extending an all-red phase to allow pedestrians to clear the crossing before an opposing green.

Expected Benefits

Implementation of the proposed technologies will provide significant benefits to area residents and the community while aligning with the SMART Program Goals as summarized below.

SMART Program Goals	**Project Approach**
Safety and Reliability	**Intelligent sensor-based infrastructure** provides real-time safety situational awareness and operational insights that can be actioned to inform multimodal road users and optimize traffic movements at signalized intersections.
Resiliency	**Smart technology traffic signals** include installation of battery backup systems to continue operations during a catastrophic event where power service is lost, and evacuation timing plans are critical.
Equity and Access	**Smart technology traffic signals** provide enhanced, speedy, and reliable transit service serving a highly disadvantaged community. This expands access for underserved and disadvantaged populations by improving access to jobs, education, and other essential services,
Climate	**Smart technology traffic signals** allow the use of advanced traffic signal control strategies to optimize the movement of the various road users. This creates a more efficient and reliable multimodal transportation system that reduces congestion and emissions.
Partnerships	**Advanced data analytics** allows the seamless collection and sharing of intersection safety and operational data within and between jurisdictions.

E. PROJECT READINESS OVERVIEW

Feasibility of Workplan

The proposed project under this Stage 1 SMART Grant will be completed in 18 months as detailed below (Exhibit 3). The proposed project tasks, task details, budget, and schedule are provided in Appendix II, Budget Narrative. ST and SDOT are committed to completing the project within the 18-month schedule and will be compliant with all SMART grant administrative and reporting requirements. In addition, this work approach will incorporate workforce development training opportunities for ST and SDOT staff.

Exhibit 3. Stage 1 Grant Deployment Schedule

Task		Year 1				Year 2	
		Q1	Q2	Q3	Q4	Q1	Q2
1	Project Management and Stakeholder's Coordination	■	■	■	■	■	■
2	Workforce development and job training	■	■	■	■	■	■
3	Systems Engineering	■					
4	Evaluation and Data Management Plan	■					
5	Procurement, Installation, Configuration, and Testing		■	■			
6	Pilot (System Demonstration)			■	■	■	■
7	Data Collection, Analytics, and Evaluations				■	■	■
8	Draft Implementation Report			■	■		
9	Final Implementation Report					■	■

In the first three months of the project, ST will develop an evaluation and data management plan that identifies data-driven performance measures to be used for evaluation and validation of the proposed pilot project. The planning and prototyping process will refine the concept based on performance evaluation and will assist in building consensus with project partners and stakeholders on what solution is desired for a larger deployment.

Community Engagement and Partnerships

During Phase 1 of Sound Transit and SDOT's Rainier Valley engagement strategy in the Fall of 2021, the project team contacted over 30 community-based organizations either located in the Rainier Valley or serving the area to invite them to participate in conversations with Chief Safety Officer, David Wright, and other Sound Transit staff. The team met with members from the following organizations in the area:

Asian Counseling Referral Service, Bike Works, Deaf Blind Service Center, Filipino Community of Seattle, HopeLink, Mercy Housing, Participatory Active Transportation for Health in South Seattle (PATHSS), Seattle Neighborhood Greenways, Seattle Neighborhood Greenways Rainier Valley Chapter- Rainier Valley Chapter of SNG, Seattle Police Crime Prevention Coordinator, Southeast Effective Development (SEED), and South King County Mobility Coalition.

Sound Transit will continue to build on these relationships with community partners in the Rainier Valley as we move into Phase 2 of our engagement plan by focusing on what matters to the community, improving communications, and enhancing safety. Sound Transit seeks to establish the agency as a long-term, active member of the Rainier Valley Community in partnership with SDOT. The following are the team's engagement goals and principles:

- Trusted and continuous resource
- Responsive and transparent, two-way communications
- Active participant in neighborhood and agency initiatives
- Acknowledgement of ST history within the community In Phase 2 we will conduct community engagement with a safety focus and implement inclusive strategies that build awareness of the work to enhance crossing safety throughout the system.

ST and SDOT are committed to creating, promoting, and maintaining an accessible community in conjunction with the Civil Rights Act of 1964, Americans with Disabilities Act of 1990, and Section 504 of the Rehabilitation Act of 1973.

Leadership and Qualifications

Sound Transit and the Seattle Department of Transportation (SDOT) have a long history of working together on major projects around the Puget Sound region. These projects include rebuilding the transit tunnel under downtown Seattle to accommodate high-capacity light rail transit, constructing miles of new bored tunnels and at-grade light rail network, and expanding Sound Transit's bus rapid transit system on city streets.

The leadership team of the SMART grant Stage 1 project will be supported by key staff and technical experts from both agencies that include:

Anna Huntington, Deputy Director of Safety from Sound Transit, Sanjeev Tandle, Civil Engineering Manager from Sound Transit and Jason Cambridge, Transportation Technology Manager from SDOT

Together the leadership team, technical staff and other supporting team members have the combined experience and expertise to successfully plan and implement the proposed SMART grant project. This team will also support the planning and vision for the future expansion and full implementation of the Stage 2 SMART grant project.

The public partnerships will be primarily between Sound Transit and the Seattle Department of Transportation (SDOT) per the Letters of Commitment. The grant project will also likely include other public partnerships with other departments within the City of Seattle, such as Seattle City Light and Seattle Department of Information Technology to support implementation of the technology projects. There will also likely be private partnerships with technology vendors to test and protype their technologies, including opportunities to modify and improve their products to meet Sound Transit's and SDOT's needs and requirements to improve safety and efficient mobility. These private partnerships may include in-kind services and equipment that could help reduce the cost of implementation of the SMART grant project.

In addition to the partnerships described above, Sound Transit and SDOT will also bring on consultant teams that have technical expertise and experience in the implementation of many of the prototype technology projects that are included in this SMART grant proposal. These technologies have been successfully tested and implemented in other areas of the country.