

1. OVERALL PROJECT SUMMARY AND APPROACH

A. Introduction, Proposed Measure, Relevance to Priority Climate Action Plan (PCAP) and Eligibility

The Tri-County Metropolitan Transportation District of Oregon (TriMet) in coalition with Metro Regional Government (Metro) seeks \$8,690,881 in funding from the Climate Pollution Reduction Grants (CPRG) program for the proposal titled “Expansion of Transit Signal Priority for the Regional Transit Fleet.”

This project builds on the Better Bus Program, an existing successful program led by TriMet, the regional transit operator, in partnership with Metro, the region’s Metropolitan Planning Organization. This program works with local jurisdictions to fund design and construction of transit priority investments in areas experiencing transit delay. In the last five years, this program studied and designed hundreds of projects throughout the region and implemented more than 50 projects, serving 39 TriMet routes and addressing 4,400 hours of passenger delay. In the most recent round of project applications in late 2023, 20 candidate projects were submitted, representing 23% of total bus delay in the TriMet system.

Eligibility and PCAP Actions

The CPRG funding we are seeking would expand this established, effective, regionally popular program to fast-track implementation of Next Generation Transit Signal Priority (Next Gen TSP) on multiple bus routes serving Historically Disadvantaged communities that experience transit delay. This strategy will implement Trans-3 of the Metro Preliminary Climate Action Plan: Expand Transit Signal Priority. This project will reduce transportation emissions by reducing vehicle delay and idling, and by increasing mode-shift by attracting more transit riders and improving the transit rider experience.

Transit signal prioritization projects typically involve collaborations between transit agencies, which are responsible for operating transit service and building/maintaining transit-related infrastructure like stops and stations, and the city, county and/or state agencies that own and operate the roadways and signals being improved. Metropolitan planning organizations play a role in identifying locations that could benefit from these improvements and designating funds for transit prioritization projects.

Regional Impact and Actions Underway

This expanded program would use similar criteria as the Better Bus Program’s Call for Partnerships approach, shown below, to select investments. The Better Bus team is currently evaluating corridors with high levels of transit delay through a comprehensive four-step process, as shown in Figure 1, including the use of an updated Bus Delay Analysis Tool.

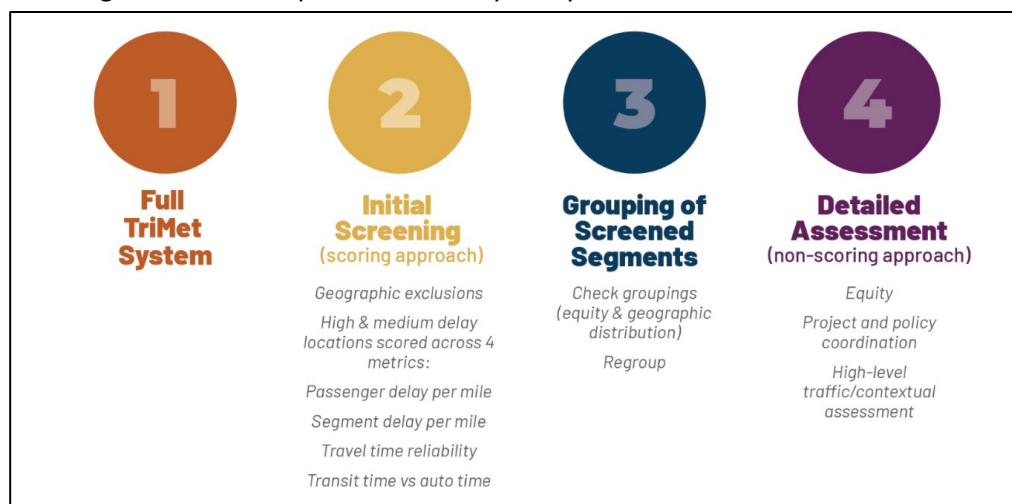


Figure 1: Process for selecting corridors for Better Bus

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The existing approach will be slightly modified to evaluate full corridors for Next Gen Transit Signal Priority Investment, and for the purpose of this grant and expansion of the program. As part of the existing Better Bus Call for Partnerships, the development of the 2023 Regional Transportation Plan and High Capacity Transit Strategy, and the development of the Priority Climate Action Plan to inform this grant opportunity, the project team has already identified multiple corridors that are well-suited to launch full corridor Next Gen TSP during the Period of Performance of this grant.

The Criteria outlined below were applied to determine and prioritize the most viable corridors for investment to maximize cost-effective greenhouse gas reduction to analyze the most likely corridors for investment for this application. Additional analysis and vetting will occur if funds are awarded in partnership with local jurisdictions to consider corridor readiness for implementation.

- **Bus delay:** Corridors with the greatest time difference between a slow (congested) and fast (no traffic) bus trip. TriMet defines free flow travel time as the 90th percentile travel time and congested as the 10th percentile travel time summarized over many trips.
- **High existing air pollution levels:** In 2022-2023, TriMet developed a Clean Corridors Plan to prioritize where zero-emission buses should be deployed. Routes where existing air pollution is the highest, paired with the presence of equity communities based on TriMet's 10 Factor Equity Index, were prioritized. This greenhouse gas analysis by route was used to consider where Next Gen TSP could provide the most benefit from an air quality perspective.
- **Investment will benefit Low Income and Disadvantaged Communities:** The Better Bus Program currently considers: Percent People of Color, median household income, percent poverty level, and Metro Equity Focus Areas, including equity-weighted travel time savings in their assessment. The criteria will also specifically consider the presence of Low Income and Disadvantaged Communities. (Other Attachments *Areas_TriMet-Coalition.xlsx*)
- **Balancing regional investments:** For regional application of this program, the Project team worked to identify corridors across the region in order to improve transit to access opportunities for multiple communities. The representative corridors selected traverse multiple jurisdictions, roadway and signal owners, so that the expansion of this program will build capacity to deliver more of these projects across many agencies.
- **Build on synergies with other projects:** In partnership with state and federal funding programs, local jurisdictions are making significant investments in roadway safety and transit improvements. Making these signal improvements paired with other roadway or transit frequency improvements will contribute to a more transformative corridor investment than signal upgrades alone could produce for a corridor.
- **Investment does not occur on a Tier 1 or 2 High Capacity Transit priority corridor:** The region recently completed an intensive process to prioritize future High Capacity Transit Investments. Tier 1 and 2 corridors are where light rail (MAX) or bus rapid transit (BRT) projects are already, or most likely, to advance into the Capital Investment Grant (CIG) Program for a future transit investment project in the near future. All projects prioritized to fund as part of this project will not be implemented as part of a broader CIG project in the near future.

Application of the six criteria above have identified four transit routes that present the best opportunities to make cost-effective investments and provide the highest greenhouse gas emission reduction over the period of performance for this grant. These four transit corridors are meant to be representative investments to demonstrate most likely impacts from this funding request. These four bus lines represent roughly 8.3% of the daily revenue miles of TriMet's fixed route bus network and traverse several jurisdictions where transit delay is a problem, and where faster, more reliable transit will have a ridership-building and emissions-reducing impact.

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The four bus lines identified from the criteria above are:

- Line 9 on Powell Blvd from Gresham to SE Milwaukie Ave in Portland
- Line 73 in 122nd Ave in Portland
- Line 76 connecting Beaverton, Tigard and Tualatin
- Line 155 on Sunnyside Rd., connecting Happy Valley to Clackamas Town Center

Description of Greenhouse Gas Reduction Measures

The Greenhouse Gas Reduction Measures are based on analysis conducted as part of the PCAP, and an evaluation conducted as part of TriMet's Division Transit Project assessing Transit Signal Priority fuel savings and corresponding greenhouse gas reductions. This analysis quantifies the GHG reduction due to transit travel time savings and reduced idling. The GHG reduction measures factors in the mode shift to transit as a result of investments in transit travel time savings measures.

This measure corresponds to measure Trans-3 in the PCAP for the Portland-Vancouver metropolitan statistical area. As discussed in more detail in Appendix 4 of the PCAP (Other Attachments *MetroPCAP-Trimet-Coalition.pdf*), Metro identified all priority measures included in the PCAP through a screening analysis that qualitatively scored projects with respect to six criteria that aligned with the evaluation criteria for the CPRG implementation grants.

The evaluation criteria for the PCAP was:

- **GHG reduction readiness.** Level of definition of specific features, tasks, or milestones associated with the measure, as well as costs, roles, responsibilities, or timelines associated with each feature, task, or milestone.
- **Quantifiable GHG reductions.** Existence of a sound methodology and research to quantify the GHG reductions from this measure based on the information available.
- **Cost-effectiveness.** Ability to calculate cost-effectiveness for each measure.
- **Scalability.** Potential to scale the measure appropriately to benefit multiple agencies or communities within the MSA based on the extent to which each measure is captured in multiple local CAPs or in regional plans that represent collaboration among local partners. The team also considered input from the Climate Partners' Forum on priorities for their respective communities.
- **Co-benefits.** Documented co-benefits (either in research or in source CAPs) related to health, safety, air quality, resilience, and workforce development.

This strategy was one of the few considered for the PCAP that received the maximum possible number of points that were available through the screening. Below are some of the highlights that distinguished this measure during the development of the PCAP.

- **GHG reduction readiness.** As described elsewhere in this application, TriMet, Metro and other partners have a history of successfully implementing transit signal priority throughout the region. Agencies understand how to implement transit signal priority projects in a way that maximizes greenhouse gas reductions and other project benefits.
- **Potential GHG reductions.** The California Air Pollution Control Officers' *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity (CAPCOA)* includes easy-to-apply methodologies for quantifying this strategy based on well-established research linking transit time savings with increased ridership and mode shift from driving to transit. TriMet and other project partners have collected ample data on similar projects that can be used to estimate time savings and costs.

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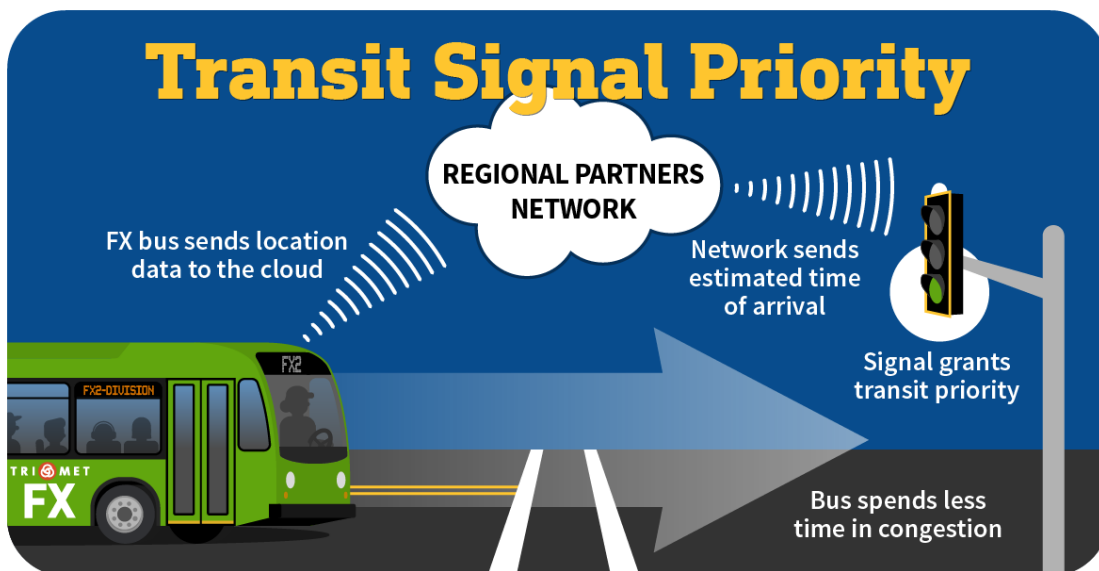
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- **Cost-effectiveness.** Metro's Climate Smart Strategy identifies improving transit service as a high-impact GHG reduction measure. Transit signal priority is the most cost-effective transit-related measure included in the Portland-Vancouver MSA's PCAP because it is the lowest-cost way to significantly improve transit travel times. Other improvements to transit service involve long-term increases to operational costs and/or more extensive capital costs.
- **Scalability.** Many of the climate action plans that provided the source material for the Portland-Vancouver region's PCAP highlight the potential GHG reductions due to improving transit service. Many of these plans also acknowledge that doing so requires collaboration between transit operators, regional planning agencies, and local governments. TriMet and Metro's history of implementing transit signal priority across the metro area demonstrates that this measure is highly scalable – and that identifying TSP projects through a process like the one described in this application is an effective way to ensure that this measure benefits as wide a variety of communities as possible.
- **Co-benefits.** Improving transit speed and reliability has multiple documented co-benefits, including improved air quality along high-frequency transit routes, increased public health and safety (since shifting trips from driving to transit increases physical activity and lowers the risk of collisions), and increased economic development (since transit supports more efficient land use patterns that provide greater opportunities for development). In addition, research by Metro and TriMet shows that low-income residents and people of color are more likely to rely on transit than others, and this project helps people who rely on transit reach a greater number of jobs and other destinations within a reasonable time.

Major Features of Strategy

TriMet's standard buses are equipped with infrared emitters, which communicate with receivers on top of traffic lights to transmit a request to traffic signal control boxes and give buses the green light. TriMet tested and put into service Next Generation TSP in September 2022 on the FX2 Division bus line. This bus line uses wireless communication to transmit the location and speed of a bus and sends it to a cloud server, which allows the system to adapt the phasing of traffic signals to let the bus pass through, as shown in Figure 2.

Figure 2: Next Gen TSP technology improvements



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The old system relied on line-of-sight detection, which means the bus had to clearly be in view of the receiver on the signal ahead. The new system tracks buses in real time using artificial intelligence to time signals. By shortening a red light or extending a green light, buses move through intersections quickly and more reliably.

Most notably, this change reduces bus idling as well as transit travel time and passenger delay. The combined effect of reduced idling and travel time savings paired with ridership growth produces greenhouse gas reductions for each corridor where this approach is implemented. The major features of this strategy to expand Next Generation TSP are to:

- Setup the expanded Better Bus program to deliver corridor-length Next Generation TSP projects
- Refine the project extents, costs, and project implementation schedules in advance of construction
- Train local jurisdiction staff for ongoing testing, deployment and maintenance of NextGen TSP
- License, implement and deploy Next Generation TSP on four bus corridors
- Evaluate and track ongoing effectiveness and begin process to expand to more corridors

Coalition commitment

Metro and TriMet jointly manage the Better Bus program. Metro leads the early phases of the program, with TriMet support, including updating evaluation criteria, updating the Bus Delay Analysis Tool used for project identification, engaging local jurisdictions to identify priorities and potential project locations, and managing the Call for Partnerships process. Once candidate projects are selected, TriMet leads, with Metro support, the project design and project implementation phases.

TriMet and Metro have an existing Intergovernmental Agreement (IGA) managing the Better Bus program. TriMet also has a signed IGA with Oregon Department of Transportation (ODOT) regarding roles and responsibilities for upgrading, monitoring and maintaining ODOT signals that TriMet upgrades to allow for NextGen Transit Signal Priority. TriMet has an IGA with Portland Bureau of Transportation and the City of Gresham in the works for the same purpose. TriMet, as the lead applicant, will submit a Memorandum of Agreement with Metro, coalition partner, regarding the expansion of Transit Signal Priority supported by this grant proposal by July 1, 2024. This agreement will build on the existing IGA for the Better Bus Program.

Though TriMet and Metro are the only formally named Coalition partners for this application, we will work closely with jurisdictional partners and signal owners to document roles and responsibilities for implementation as more projects are selected. Additional details on formal roles and responsibilities are described below in Section 3.c. Metro's Letter of Intent (Other Attachments *Metro_LOI_TriMet-Coalition.pdf*) discusses our commitment to continue our existing partnership through the Better Bus Program and to expand upon that partnership to deliver more Next Generation TSP projects.

This application also includes Letters of Commitment from other project partners, including the City of Portland, TransPort Committee, the Oregon Department of Transportation, Washington County, the City of Beaverton, the City of Gresham, the Street Trust, IBEW, Worksystems Inc. and LYT: the project signals vendor. Our Congressperson from the Fifth District, Oregon has also offered her support. (Other Attachments *Portland_LOC_TriMet-Coalition.pdf*, *ODOT_LOC_TriMet-Coalition.pdf*, *WashCo_LOC_TriMet-Coalition.pdf*, *Beaverton_LOC_TriMet-Coalition.pdf*, *Gresham_LOC_TriMet-Coalition.pdf*, *StreetTrust_LOC_TriMet-Coalition.pdf*, *IBEW_LOC_TriMet-Coalition.pdf*, *Worksystems_LOC_TriMet-Coalition.pdf*, *LYT_LOC_TriMet-Coalition.pdf*, *TransPort_LOC_TriMet-Coalition.pdf* and *5thDistrictOR_LOC_TriMet-Coalition.pdf*).

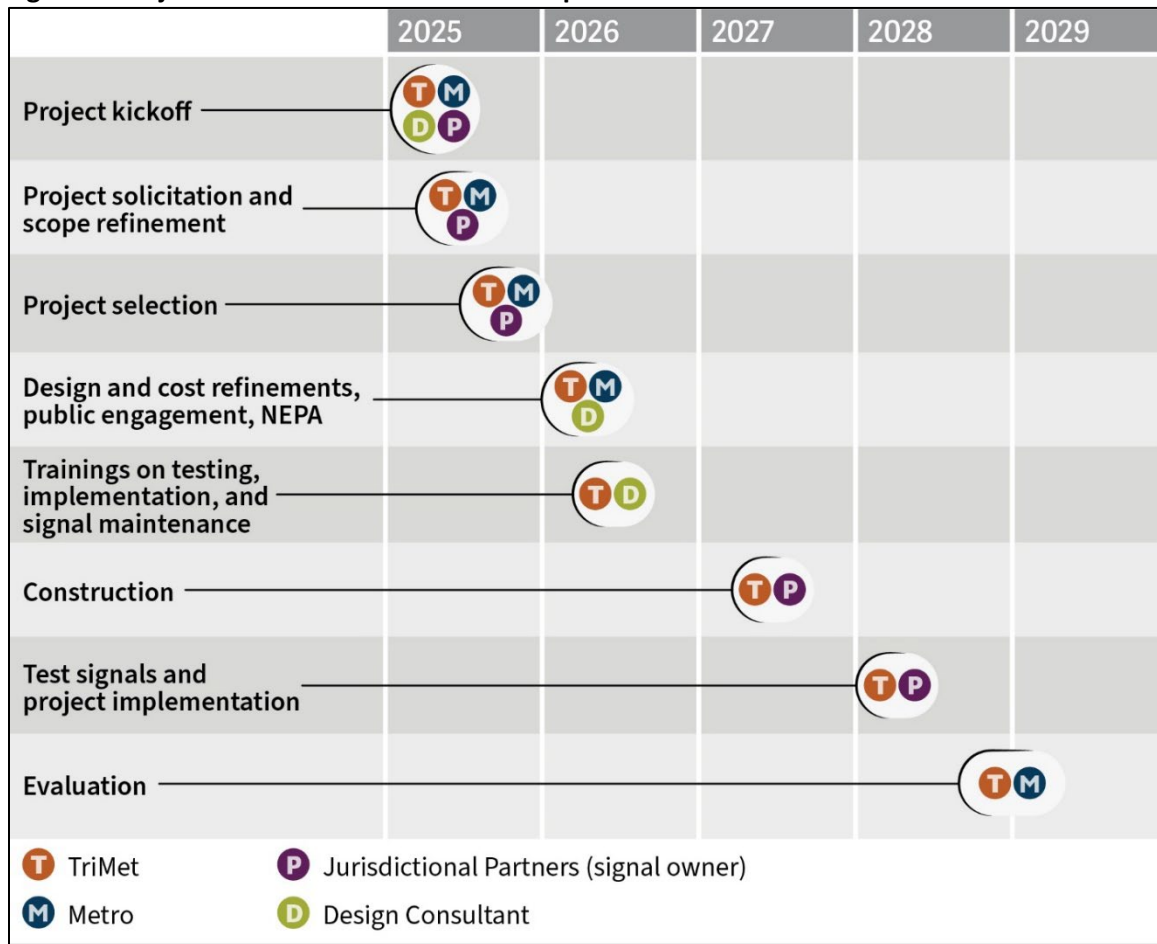
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Implementation schedule

Figure 3 provides an implementation timeline for activities funded by this grant.

Figure 3. Project timeline for Next Gen TSP implementation



Assumptions and Risks

The project timeline above assumes that Next Gen TSP can be deployed on four bus lines by mid-2028. These lines were selection based on early project scoping, with feedback from partners, based on the criteria outlined in Section 1. Upon further project refinement, the actual corridors may change based on constructability and cost refinements. The selection criteria will remain the same but could slightly change the emissions numbers and the communities impacted if the specific corridors where projects are implemented shift. Several assumptions regarding GHG savings are based on the findings of fuel savings from the Division Transit Project, and ridership gains based on travel time savings based on the CAPCOA methodology. Next Gen TSP alone is likely to lead to these fuel savings and ridership gains, but GHG will be stronger when paired with other service or capital improvements.

TriMet and Metro are very familiar with delivering projects with federal funds and the need to achieve NEPA approval during design process. Based on the known scope of this project, we expect that these projects would be Documented Categorical Exclusions since there will be no Right of Way acquisition and ground disturbance will be minimal. The NEPA process could add time to the schedule above if unexpected issues arise, but we are adept at working through this process. There would also likely be a need to include traffic analyses that have recently been completed on these corridors for NEPA analysis.

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B. Demonstration of Funding Need

Need for Climate Pollution Reduction Grant Funding

Next Gen TSP is a cost-effective investment to improve transit travel time and reliability improvements, but there are limited funding opportunities available to provide both the program setup, infrastructure, software and design funds to make corridor-length TSP investments happen outside of larger scale Capital Investment Grant Projects. This CPRG Implementation grant will provide crucial support for improving transit travel time, reducing vehicle idling and increasing mode shift to transit, while maximizing the use of our limited labor resources and reducing pollution in overburdened communities. Without this funding, TriMet and Metro will be unable to expand the Better Bus program to deliver these larger scale projects, and will continue to take a piecemeal approach to seek funding for segments of corridors without the capacity to grow the program to deliver more emissions-reducing projects at scale.

Pursuit of Other Funding

There are several programs from which we have sought funds to implement similar projects in the past, but funding to support an ongoing program to deploy these projects and partnerships regionally has not been possible.

We will continue to seek discretionary funding, but to achieve more significant GHG reductions, we must secure funding to scale up existing programs to deliver projects more quickly, rather than take a piecemeal approach to seek funding for one corridor at a time. CPRG implementation funding will create a scalable approach to deliver multiple projects concurrently, and build a training and implementation program for upgrading signals which is not likely to be funded through other programs focused on smaller scale technology improvements or specific corridor investments.

Funding sources that have supported Next Gen TSP:

- The **Better Bus** program, administered and funded jointly by Metro and TriMet, provides \$10 million in state and regional funds for planning and construction of transit roadway or signal prioritization projects. These funds have supported some signal improvements in the past but not a corridor scale level of investment to yield more significant greenhouse gas emissions reduction. Current program funding from State Transportation Improvement Funds and the region's annual federal fund allocation can support small projects for roadway spot improvements to address transit delay, but does not have the capacity to support corridor-scale signal investments. Metro and TriMet will coordinate on any Better Bus eligible projects that are submitted for CPRG implementation grant funding to ensure that these projects do not seek duplicative funding from both sources.
- The **Carbon Reduction Program** administered by USDOT is a new federal program created under the Bipartisan Infrastructure Law. This program distributed \$18M in funding to the Portland Metro region to use over 5 years. Next Generation TSP on one TriMet bus line was one of the projects the regional partners chose to prioritize for funding in 2023. Though this could be a source for future funding to support Next Generation TSP if this program continues, new funds will not become available again until 2028.
- **FHWA Advanced Transportation and Congestion Management Technologies Deployment initiative:** This funding source established the Next Gen Cloud based TSP system in the Portland Region, implementing the system on the FX2 Division Route. The lessons learned and experience implementing Cloud based TSP on this route, will be applied when implementing Cloud Based TSP on the proposed routes in this grant request. Critical lessons were learned in the first implementation that will now be applied in subsequent deployments. The configuration of the

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system includes enhanced cyber security controls. The FHWA Advanced Transportation and Congestion Management Technologies Deployment Initiative allowed and funded the base system that will be expanded on with the EPA Grant. This program is now known as the Advanced Transportation Technologies and Innovative Mobility Development (ATTIMD)/Advanced Transportation Technology and Innovation (ATTAIN). TriMet applied to the FY2023-2024 ATTAIN program to add cloud connectivity to its fleet of Light Rail Vehicles.

- **FTA [Capital Investment Grants](#) (CIG)** are a critical source for supporting transit capital improvements, including signal prioritization. Signal prioritization is often a part of CIG projects, but there are few sources of funding to implement transit signal priority on its own, independent of broader changes to the right of way, which can make it challenging to accelerate signal priority projects in spite of their cost-effective GHG reductions. The selection criteria for the CIG program discourage agencies from using other state or federal sources to make transit priority improvements on corridors that they intend to submit as candidates for CIG funds, so this measure is focused on corridors with existing transit delay that are not currently top priorities for near-term CIG projects.
- **FTA's [Integrated Mobility Innovation](#) (IMI)** program funds new technology approaches that benefit mobility, potentially including transit signal priority projects. However, IMI focuses on relatively small-scale demonstrations of innovative new approaches, whereas the expansion of the program requested in this application would support larger-scale implementation of proven technologies, so there is minimal risk of overlap between the two.

C. Transformative Impact

Next Gen TSP is a cost-effective investment that the region can make in order to facilitate many co-benefits that can have a transformative impact on the region's residents. The most direct benefit of Next Gen TSP is travel time savings and increased reliability. These benefits both improve service for existing transit riders and attract new transit riders by making transit more competitive with driving, which in turn result in reductions of greenhouse gas emissions. The travel time savings and increased reliability also improve access to opportunities, including making more jobs and services accessible within a 45-minute transit trip. Combining investments in TSP with other signal upgrades and improvements to help transit riders get to bus stops more safely will allow these projects to offer tangible co-benefits beyond the TSP investment itself.

Additionally, all of these changes can result in equity benefits by locating Next Gen TSP investments in Equity Focus Areas, and/or along transit lines that serve larger populations of historically disadvantaged communities. The program's Bus Delay Analysis Tool can be used to identify locations where this would be the case. As the team evaluates corridors best suited for Next Gen TSP investments, we will also consider how these investments could build on other access to transit or safety projects to create a more transformative impact, such as the work already occurring through the Outer Powell Transportation Safety Improvement Project or the 122nd Ave Safe Streets for All Project in Portland. Improvements that help transit riders get to bus stops more safely make streets safer for everyone.

Degree of Impact

This funding will support the design, communications infrastructure, training, testing, implementation and evaluation of transit signal priority on 4 corridors with upwards of 125 intersections across the region, serving tens of thousands of transit riders daily.

This project builds on a successful program by creating a way to implement Next Generation Transit Signal Priority at a regional scale. It creates a structure that builds capacity for cities and counties to

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make cost-efficient investments and also trains their workforce to carry out the testing, signal improvements and evaluation of the investments made through this grant.

This project will transform the market by making these investments at a regional scale, outside of Capital Investment Grant projects, so that city and county partners can take an incremental approach to corridor transformation and improving transit. This program can be implemented in coordination with other roadway investments for improving transit travel time and or in combination with transit vehicle electrification to further reduce emissions from transportation to lead to transformative impacts for air quality in the region. Additionally, TriMet, Metro and local jurisdictions have limited local and regional sources for funding that can be invested in Next Gen TSP improvements. This funding can help leverage existing funding and allow for substantially more investment in Next Gen TSP than would otherwise occur. This in turn can leverage other improvements identified through the Better Bus program and other local plans, providing a multiplier effect for the benefits of those investments.

2. IMPACT OF GHG REDUCTION MEASURES

Explanation of Reduction Calculations

The Technical Appendix (Attachment *Techappx_TriMet-Coalition.pdf*) explains the calculations, methodology and assumptions for the greenhouse gas calculations. The calculations are attached in a separate spreadsheet (Attachment *GHG_calcs_TriMet-Coalition.xlsx*). The projects funded by this proposal are estimated to yield an average annual emissions reduction of 868 MT CO₂e annually, beginning in September 2028.

Table 1: Reduction in GHG Emissions

Greenhouse Gas	2030 Emission Reductions from TSP on 125 signals across 4 bus routes, implemented by September 2028	2050 Emission Reductions from TSP on 125 signals across 4 bus routes
Carbon dioxide equivalent (CO ₂ e)	(2,024)	(19,375)
Carbon dioxide (CO ₂)	(2,017)	(19,309)
Methane (CH ₄) ^b	(4)	(34)
Nitrous oxide (N ₂ O)	(3)	(32)
Other high-GWP gases	N/A	N/A

*Results are based on known tailpipe methane and nitrous oxide. Lifecycle emissions calculations are likely to include additional greenhouse gases but data is only available as CO₂e (not split) and are assumed to be majority CO₂.

a. Magnitude of GHG Reductions from 2025 through 2030: 2,024 MT CO₂e

The magnitude of GHG reductions are calculated based on the four illustrative corridors most likely to be selected based on the selection criteria. The specific areas of the region where these reductions may change slightly, but the scale of GHG reductions should be comparable to this magnitude. These reductions are based on a September 2028 implementation timeline. The durability of these reductions should continue to grow as ridership increases and as other corridor improvements are made outside of this grant that are expected to grow ridership and improve transit travel time savings, leading to decreased fuel usage for buses. These calculations are based on the number of daily TriMet revenue miles using TSP as a percentage of overall TriMet daily revenue miles for the illustrative routes we are analyzing.

b. Magnitude of GHG Reductions from 2025 through 2050: 19,375 MT CO₂e

The reductions from mode shift to transit and TriMet fuel savings that are described above are expected to last through at least 2050. TSP projects involve permanent changes to infrastructure that help buses move through traffic more quickly than cars, and the resulting advantage in bus travel times drive mode shift and VMT/GHG reductions. Even if the region grows and the volume on the roadways increases, it is safe to assume that TSP will continue to help buses operate faster relative to cars, and therefore continue to deliver these GHG benefits.

c. Cost Effectiveness of GHG Reductions: \$449 per ton through 2050

With a total project cost of \$8,690,881, these benefits are incredibly cost-effective at a cost of \$449 per ton through 2050. Transportation accounts for the largest share of our region's GHG emissions and investing in transit is a high-impact GHG reduction strategy. Investing in Next Generation TSP at a corridor-scale is a very cost effective measure in the Metro PCAP. Other strategies may cost less, but the impact of this strategy greatly reduces emissions. The cost-effectiveness of this investment is focused on the ability to implement this strategy on its own with only CPRG funding. Expanding this existing program with CPRG funding can start producing GHG reductions in the short-term without requiring other sources of funding, but will support the program expansion to facilitate adding TSP to more corridors in the future should more funds become available.

3. ENVIRONMENTAL RESULTS – OUTPUTS, OUTCOMES, AND PERFORMANCE MEASURES

A. Expected Outputs and Outcomes

Outputs:

Transit routes will run more reliably and reduce GHG emissions as operations systems improve. The sequence of tracking project outputs will include:

- **Identify delay:** Four bus lines experiencing transit delay are monitored and data is stored for analysis
- **Engagement:** Community engagement is ongoing, growing the number of included individuals and communities, prioritizing disadvantaged travelers through culturally informed communications
- **Training:** Five local jurisdictions participate in training, design and testing workshops to build capacity for project delivery and implementation for this, and future projects
- **Infrastructure:** 125 signalized intersections are upgraded by trained professionals working on advanced controllers (hardware) and connected with high-speed data communications (fiber optics)
- **Software:** Upgrading licenses with LYT TSP software provider, subsidizing cost to add up to five jurisdictional partners of this project, enabling expansion (the same software can be used in future projects)
- Number of projects completed, miles of bus lines served by Next Gen TSP, transit time savings, number of residents and communities within a short walk/roll to the four bus lines
- **Project reporting:** semi-annual progress reports and one final report

Outcomes:

The climate, public health of residents, traveling public and local transportation operators are the recipients of the outcomes from this project. The four transit lines will operate using up to 14% less

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diesel, ridership will increase, more people will ride transit (including those who would otherwise switch to driving after encountering reliability issues), and transportation operators will have improved capabilities. Project outcomes includes:

- Reduction of 2,024 MT CO₂e 2025-2030
- Reduction of 19,375 MT CO₂e 2030-2050
- Weekly average ridership, assessed from Automatic Passenger Counters on each vehicle, analyzed each quarter
- Improved capabilities for local jurisdictions to deliver more projects on their own and to proactively upgrade infrastructure in advance of corridor investment projects such as future FX projects to reduce costs
- Improved public health resulting from annual reductions in co-pollutants (see Table 2 below).
- 42% of signal improvements to reduce transit delay made in LIDAC communities

Table 2: Reduction in Co-pollutants

Co-pollutant	Annual reductions (kg)	Annual reductions (kg) in CEJST Tracts (42%)	2030 reductions (kg)	2030 reductions (kg) in CEJST Tracts (24%)
NO _x	(540)	(229)	(50)	(21)
PM _{2.5}	(7)	(3)	(2)	(1)
PM ₁₀	(8)	(3)	(2)	(81)
VOCs	(214)	(91)	(44)	(19)
CO	(4,434)	(1,881)	(1,682)	(714)
Black carbon	(3)	(1)	(3)	(1)
Organic carbon	(1)	(1)	(1)	(1)

The assumptions and calculations for co-pollutant reductions included above are detailed in the Technical Appendix (Attachment *Techappx_TriMet-Coalition.pdf*).

B. Performance Measures and Plan

The Project Management Team (PMT) will track project milestones, outputs and outcomes. The PMT includes TriMet, Metro and Consultant. The plan to apply performance measures uses a variety of metrics that are already in practice by project partners.

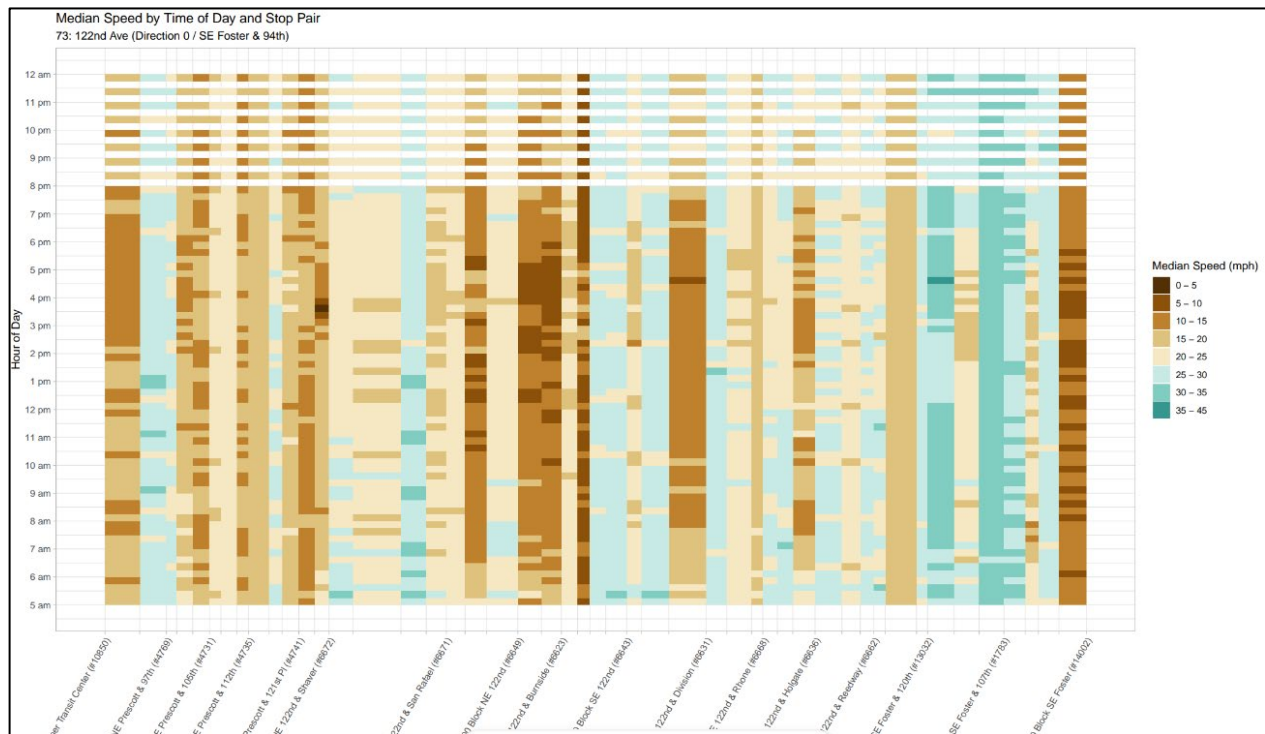
Identify Delay Before/After Projects

TriMet and Metro will evaluate metrics that are already being collected today to analyze delay and reliability using visualizations. On a given day, TriMet can collect as many as 500,000 stop and event data records across the system through existing automatic vehicle location and passenger counter systems. A useful visualization of transit delay and reliability along a bus line is the following example from TriMet Line 73. In Figure 4, the “Median Speed by Time of Day and Stop Pair” graphic shows areas with a brown vertical line representing all-day delay in terms of median speed, generally at signalized intersections. NextGen TSP will increase median speed and the metric can be visualized by less brown after projects are implemented.

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Figure 4: All-day delay before NextGen TSP visualization



Agencies with LYT software, and those joining this project, will collect before/after data. Agencies enable before-data collection from traffic signals and buses prior to TSP deployment. TriMet, City of Portland and LYT will share existing methods for data collection with local agencies as they join new projects.

Many methods for transit delay performance measures were established in 2023. Kittelson and Associates conducted an independent evaluation of TriMet's first deployment of Next Gen TSP on the FX-2 Division bus line. Without before data, agency partners agreed to turn the Next Gen TSP system off after seven months to collect baseline data (May 15 to May 24, 2023). Metrics were analyzed that will apply to future projects, as shown in Table 3.

Table 3: Sample of evaluated TSP results

Metric	Description	Measured results from TriMet FX-2 Division (first TSP deployment)
Travel time savings	Analysis of bus GPS locations (automated vehicle location (AVL) data sent every 2 to 4 seconds)	10% reduction for TSP section, 6% reduction across entire route
On-time bus arrivals	Analysis of bus arrivals on-time, early, or late compared to published schedules (on-time performance at bus stops with time points)	11 percentage-point increase in on-time bus arrivals (from 65% to 76%)

During some hours of the day, vehicle speeds increased on the FX-2 Division so much that schedule writers are making adjustments to reduce early arrivals. LYT software uses bus location data fused with traffic signal data to calculate additional performance metrics, as shown in Table 2.

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Table 4: Additional TSP performance metrics

Metric	Description	Measured results from TriMet FX-2 Division (first TSP deployment)
Red light delay <ul style="list-style-type: none"> • Averaged daily route-wide • Averaged daily by intersection • Averaged daily per vehicle 	Cumulative red light delay encountered by vehicles serving a given route and direction. Bus stop dwell time is excluded.	2-minute-average reduction in red light delay per trip
Green light success <ul style="list-style-type: none"> • Averaged daily route-wide • Averaged by time of day 	Rate of success of when a transit vehicle arrived at an intersection and received a green light without stopping (must be traveling faster than 1.5 mph).	8 percentage point increase in green light success

LYT calculated the metrics above using TriMet's publicly shared route, stop, and schedule data (using the General Transit Feed Specification (GTFS) data standard), along with the real-time, high-resolution Automatic Vehicle Location (AVL) system (data collected from TriMet's onboard INIT COPILOTpc2 devices approximately once every two to four seconds per vehicle).

Project Delivery Performance

The Project Management team will coordinate, track and report the outputs referenced above that assure successful implementation. Tracking and metrics for those outputs include:

- Community engagement, facilitated by TriMet and Metro's communications and equity staff, recorded through TriMet's Contact Relationship Management system
- Trainings, facilitated by Metro's TSMO program through an established workgroup to invite, recorded through training agendas with goals, materials covered, attendee lists and number of trained individuals
- Upgraded signalized intersections, recorded through existing TriMet and Metro GIS inventory
- Upgraded LYT TSP licenses and software installations, recorded by TriMet Intelligent Transportation Systems staff, adding to an inventory of partner-agency capabilities
- Number of projects completed, miles of bus lines served by NextGen TSP, number of residents and communities within a short walk/roll to the four (4) bus lines, facilitated by the PMT and recorded in project tracking

Project Outcome Performance

The most important performance measures are the outcomes for our climate, public health, traveling public and the local transportation operators.

Climate

- TriMet already collects and regularly reports on its agency emissions reduction calculations as part of its own Climate Action Plan, and as performance monitoring for existing Transit Signal Priority projects. Applying the Climate Action Plan, the structures are in place to collect, evaluate and report on GHG reductions for the purposes of this grant.
- The PMT will analyze more granular results. For example, TriMet FX-2 Division Next Gen TSP system showed that buses burned 14% more diesel when the system was off. LYT used EPA's Greenhouse Gases Equivalencies Calculator in their method to convert gallons of diesel fuel to grams of CO₂ emissions. The FX-2 Division Kittelson and Associates report analyzed if there were

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any impacts on private vehicles, bicycles, and pedestrians traveling along the corridor, approaching and/or crossing the corridor. The analysis was based on more than a week of data when the NextGen TSP system was turned off to record data for comparison.

- Private vehicle travel times remained relatively constant based on probe-vehicle data (INRIX XD). Among all the segments and time-of-day scenarios analyzed, the most travel time added was 36 seconds while the most decreased travel time was also 36 seconds. Overall commutes on SE Division Street from Portland to Gresham and from Gresham to Portland showed similar increases and decreases of less than one minute. The highest observed increase in delay for vehicles crossing the corridor was six (6) seconds. Kittelson and Associate findings are that Next Gen TSP “...did not significantly impact vehicle travel time on the cross streets over the course of the day at these major intersections.”
- City of Portland established a best-practice traffic signal logic that took into account bicycle and pedestrian crossings. Kittelson and Associates’ findings were that the signal logic resulted in “...metrics close to the baseline (TSP Off) condition.”
- Metro also regularly tracks regional GHG emissions from transportation through updates to Oregon’s GHG inventories, regional monitoring and reporting of federally-required performance measures (including meeting a new federal requirement to track and report GHG emissions generated on the National Highway System, reporting regional vehicle miles traveled per capita, and through periodic plan updates that include reporting on baseline vehicle miles traveled and greenhouse gas emissions. These reports are generally too aggregated to capture the benefits of individual modes or projects, so Metro also reports on progress in implementing the region’s strategies to reduce transportation GHG emissions in Appendix J of the Regional Transportation Plan. This reporting includes additional details on transit service and on the share of households and jobs located near frequent transit. Appendix J, combined with the other sources above, may capture the benefits of increasing transit signal priority when next updated in 2028.

Public Health

- Improved public health resulting from reductions in co-pollutants (Referenced above)

Low Income/Disadvantaged Communities (LIDAC) benefits

- The PMT will compare against the intended results that 42% or more of signal improvements to reduce transit delay are made in LIDAC communities. The PMT will employ CPRG tools and will include updates in each progress report.

Ridership

- Weekly average ridership, assessed from Automatic Passenger Counters on each vehicle, will be analyzed each quarter and updated in progress reports. Additional metrics used for the purpose of isolating project results include:
 - *Directional route miles* measures the service quantity along route segments
 - *Maximum on-board daily load* measures the daily passenger load on the segment with the highest passenger throughput
 - *Reductions in passenger delay per mile* measures the cumulative passenger-weighted delay along a segment group; includes values for all-day, AM peak, and PM peak

Local Operators

- In addition to tracking the outputs (e.g., training, LYT licenses), the PMT will update progress reports with descriptions of problems or challenges raised by local agencies and resolutions. The PMT will be proactive in resolving concerns by engaging local agency staff and technical experts at the region’s TransPort committee of technical experts. Being proactive will establish a level of

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trust that is necessary for TriMet and the local agency to enter into an Intergovernmental Agreement to support the longevity of Next Gen TSP operations.

C. Authorities, Implementation Timeline, and Milestones

Roles, responsibilities and implementation authority

There is a process already underway to bring on consultants for this work and outline the roles and responsibilities of all involved partners. Operations IGAs have already been completed with ODOT and are underway with the cities of Portland and Gresham for ongoing tracking, monitoring and maintenance of the existing TSP system in the region. The roles and responsibilities of each partner are discussed below.

Project Managers

- A.J. O'Connor, TriMet Director of Intelligent Transportation Systems
- Caleb Winter, Metro Program Manager for Transportation System Management & Operations (TSMO)
- Consultant Project Manager: Solicitation planned for Summer 2024, in accordance with federal procurement guidelines.

TriMet Roles:

- Lead applicant and will Co-lead the project solicitation, design and selection process with Metro
- Manage Traffic Engineering Consultant
- Manage Coordination between Consultants, Traffic Agency Partners, TriMet Operations and LYT, TSP Vendor
- Coordinate and train bus operators on utilizing TSP
- Directly track and report on the greenhouse gas emission reductions achieved as part of this project due to transit travel time savings and ridership growth
- TriMet has the authority to track and measure greenhouse gas emissions from vehicles

Metro Roles:

- Co-lead the project solicitation, design and selection process with TriMet
- Collect and analyze annual data regarding mode shift to transit and evaluate program effectiveness
- Support the project evaluation and reporting process through data analysis and partner coordination

Traffic Partner Agencies' Roles:

- Program and configure Traffic Controllers for NextGen TSP
- Participate in TSP testing with TriMet and LYT, the TSP Vendor
- Troubleshoot and correct with TriMet and TSP Vendor any issues found during testing
- Approve testing phases
- Signal owners have the authority to make signal upgrades, and participate in testing for these signal upgrades. In some cases, an updated IGA will be required to define roles, responsibilities and milestones.

Traffic Engineering Consultants' Roles:

- 3,500 hours total will be required in consultant support, divided among a Principal in Charge, a Project Manager and a Senior Engineer from Traffic Engineering Consulting firm

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- Provide project management and coordination assistance among TriMet and Traffic Agency Partners
- Provide expert technical, policy, and practical guidance; using industry knowledge and experience to inform recommendations and materials; supporting management of scope, schedule, budget, and work activities
- Create and manage a requirements matrix to ensure vendor is meeting project requirements. Provide Project Coordination which includes, but is not limited to, scheduling meetings, taking notes, drafting reports and presentations, information organization, and follow-up/task management

Transit Signal Priority Vendor (LYT) Role:

- Assist Traffic Agencies in the optimal configuration of their traffic controls for NextGen TSP
- Participate and document all phases of testing of new TSP implementations with traffic agencies and TriMet
- Provide licenses for any new Traffic Controllers
- Provide training for new users of the LYT real time and data analytics web portal

Implementation Timeline and Milestones

- **Spring 2025:** Complete screening and selection process to identify routes that will be improved with TSP; continue ongoing community engagement.
- **Fall 2025:** Document the selection process and identified projects that will be moved forward for implementation. Include estimates of number of signals and length of route sections to be improved.
- **Spring 2024 – Fall 2026:** Collect and document “before” data for transit travel times, ridership, passenger delay per mile, green light success rate, and maximum on-board daily load for selected routes to establish baselines to compare the project performance against; begin training; distribute LYT software licenses.
- **Fall 2027:** Document the number of signals improved and length of route sections improved for all selected projects, and separate by “completed” or “in progress”
- **Fall 2028:** Collect and document “after” data for transit travel times, ridership, passenger delay per mile, green light success rate, and maximum on-board daily load for selected routes to identify improvements based on the implementation of Next Gen TSP. Complete final report.

4. LOW-INCOME AND DISADVANTAGED COMMUNITIES

A. Community Benefits

As identified through public engagement conducted during development of [Metro’s 2023 Regional Transportation Plan](#) and [2018 Regional Transit Strategy](#), communities want more fast, frequent, reliable, and affordable transit connections throughout the Metro region. Implementing transit signal prioritization directly reduce delays benefit to Low Income and Disadvantaged Communities (LIDACs) in the following ways:

- **Improved access to key destinations.** Investments in reducing transit delays help riders reach a greater number and variety of essential destinations including jobs, education, and healthcare in a reasonable amount of time.
- **Affordable transportation.** Car ownership is expensive. Reliable and rapid public transportation offers a lower cost alternative to single-occupancy vehicles.

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This measure would be implemented on specific transit corridors identified in the Better Bus program framework discussed in this application and the Metro PCAP. Table 5 below shows the LIDAC Census tracts that are located along transit corridors eligible to implement these improvements by county. These tracts were identified using the Climate and Economic Justice Screening Tool (CEJST). Census tracts are labeled as “disadvantaged” if they score above the associated socioeconomic threshold (65th percentile) *and* above the identified burden threshold (90th percentile on all categories except high school education, which has a 10th percentile threshold) within in any of the eight identified burden categories: Climate Change, Energy, Health, Housing, Legacy Pollution, Transportation, Water and Wastewater, and Workforce Development.

Table 5: LIDAC Tracts located along TriMet bus routes eligible for TSP installation

County	LIDAC Census tracts
Multnomah	41051010304; 41051010405; 41051010410; 41051010411; 41051010408; 41051010001; 41051004001; 41051007300; 41051007600; 41051007400; 41051005100; 41051010600; 41051001101; 41051000602; 41051008600; 41051001602; 41051008301; 41051008302; 41051008100; 41051009302; 41051008202; 41051009201; 41051008400; 41051009000; 41051009202; 41051009301; 41051009701; 41051009101; 41051009606; 41051009604; 41051009603; 41051009803; 41051009605
Washington	41067030700; 41067031100; 41067031300; 41067031402; 41067031706; 41067032003; 41067032005; 41067032409; 41067032501
Clackamas	41005021900; 1005022108

Table 6 shows the LIDAC Census Tracts that are within walking distance (1/2 a mile) of the four specific corridors identified in this application.

Table 6: LIDAC Tracts within walking distance of corridors identified for TSP installation

Corridors/counties	Affected LIDAC Census tracts	Miles/% of route in LIDAC Tracts
Line 9: Powell Blvd Gresham to Portland	41051010001; 41051009803; 41051009101; 41051009000; 41051008400; 41051008302; 41051008301; 41051001101	9.53 Miles or 52.79% of the route is in LIDAC Census Tracts
Line 76: Beaverton - Tigard - Tualatin	41067032005; 41067032003; 41067030700; 41067031300; 41067031100	6.33 miles or 44.82% of the route is in LIDAC Census Tracts
Line 73: 122 nd Avenue Parkrose to Lents in Portland-	41051000602; 41051009000; 41051008400; 41051008202; 41051009201; 41051009302; 41051008100	4.61 miles or 46.95% of the route is in LIDAC Census Tracts
Line 155: Happy Valley to Clackamas Town Center	Though this route does not directly serve LIDAC Census Tracts, the route is important for transit dependent communities in Clackamas County, serving a major medical center and essential workers.	

The representative corridors outlined above have several unique characteristics that will serve disadvantaged communities who are likely to travel to key destinations in these corridors, whether or not the community members live there.

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Line 9 on Powell Blvd from Gresham to SE Milwaukie Ave in Portland. Line 9 is a major frequent service route with average scheduled trips running every 10 minutes. The On-Time Performance (OTP) reporting shows that excessive wait time on line 9 has a weekday average of 22 minutes, and TriMet is currently measuring the peak service as having 29 minutes of excessive wait time. Based on the 2021 US Census, line 9 has essential jobs by residence address, as 64% of the population. This line supports disadvantaged communities as most of this line lies within TriMet's identified equity areas. Based on the research in [TriMet's Clean Corridors Plan](#), several lines have been identified to have elevated levels of Diesel Particulate Matter (DPM), which can be made worse by buses and traffic idling at intersections. The Powell corridor that line 9 travels on is measured to have the highest count of DPM in the TriMet service area. The [Outer Powell Transportation Safety Project](#) is also making significant safety and access to transit investments that will continue to improve transit in the corridor.

Line 73 connecting Parkrose to Lents along 122nd Ave in Portland. This frequent service bus line serves many transit-dependent communities and connects some of the region's lowest-income residents with access to jobs, services, and opportunities. The [122nd Ave Safe Streets for All Project](#), funded by a USDOT Safe Streets for All grant, is underway and investing in access to transit and safety improvements along the corridor. Currently, the On-Time Performance (OTP) reporting shows a weekday average excessive wait time of 18 minutes and a peak ridership time having an excessive wait time of 25 minutes. Per the Clean Corridors Plan referenced above, this line has shown elevated levels of DPM, which can be made worse by buses and traffic being idle at intersections.

Line 76 – connecting Beaverton, Tigard, and Tualatin. Line 76 has been identified in the Forward Together Revised Service Concept for increased service and expansion of the line in 2025, creating a connection between the Tualatin area and Oregon City. Currently, TriMet's On-Time Performance (OTP) measurements show this line having excessive weekday wait times averaging 26 mins, and during the peak, the excessive wait time is measured at 36 mins. Based on the 2021 US Census, block line 76 has essential jobs by residence address, and 66% of the population resides within this line. This line provides service through significant pockets of disadvantaged communities and connects this population from Beaverton through Tualatin and to a major medical center in Tualatin.

Line 155 on Sunnyside Rd. connects Happy Valley to Clackamas Town Center. Line 155 runs East/West, connecting the City of Happy Valley to a significant retail and essential services destination at Clackamas Town Center and providing service to medical providers at Kaiser Sunnyside Medical Center. Essential workers make up 70% of the population that lives in close proximity to line 155, and 88% of essential job locations are near this line.

Implementing TSP to improve community benefits

The proposed strategy will focus on implementing and quantifying the following benefits specifically for disadvantaged communities:

- Transit travel time savings makes transit more competitive than driving
- Reduced emissions from both vehicles and transit fleet

The existing Better Bus program uses the following Equity measures to evaluate and prioritize investments in transit. These, in addition to the LIDAC information, will be considered as a basis for evaluating equity as projects are prioritized and evaluated for implementation.

- Passenger activity in Equity Zones – Identifies the percent of boardings and alightings for all routes passing through a segment group that occurs within TriMet's equity zones (based on TriMet's Equity Index)

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- Density of low/moderate wage workers – Density per square mile of jobs within a quarter mile of each segment group where employees make less than \$3,333 per month (based on LEHD)
- Maximum line-level Equity Index score – highest length-weighted TriMet Equity Index score of the lines that pass through a segment group

The implementation of the strategy will also seek to minimize and avoid dis-benefits for communities impacted by the project such as:

- Impacts from construction
- Potential for slower travel times for non-transit users. TriMet's analysis of the Division Transit Project's TSP has shown that there are not significant negative impacts for other vehicles, or cross-traffic that may lead to higher emissions due to idling.

B. Community Engagement

The Better Bus program is informed by several cycles of outreach that have highlighted the role that transit plays in meeting the needs of Black, Indigenous, people of color, people with low incomes, and other marginalized people in the Portland region. Metro's PCAP, which provides the basis for this application, summarized this outreach, which included:

- Outreach on the general transportation needs and priorities of people of color, people with low incomes, and other marginalized people conducted through several successive regional transportation plan updates and summarized in the [outreach materials for Metro's 2023 update to the Regional Transportation Plan](#). Both [individual focus groups convened by community partners](#) and a [regional forum of culturally-specific organizations](#) identified improving transit service as a priority.
- Local climate action plans, which often highlight climate actions that benefit the marginalized people living in the community. Many of the local climate action plans that looked at GHG reduction actions through an equity lens highlighted the benefits of improving transit service.
- Plans and outreach conducted by community-based organizations related to climate and equity. Many of these documents highlight how improving transit service reduces GHG emissions while also benefitting the many people who rely on transit.

More details on the information above can be found in Appendix 1 of the PCAP for the Portland-Vancouver Metro area (MetroPCAP_TriMet). In addition, Metro engaged a variety of culturally-specific and community-based organizations in the process of developing the PCAP, and these engagements repeatedly confirmed the mutual equity and climate benefits of improving transit service. See Appendix 5 of the PCAP for more information.

The Better Bus program focuses on smaller scale, localized projects. It is designed to tap in to existing outreach plans and processes that local jurisdictions already have in place, so that the appropriate communities can have the opportunity to be meaningfully engaged in the process. For example, a Better Bus project located in East Portland will have a very different set of stakeholders than a project in the southwestern suburb of Tigard, and the program can benefit from the expertise, connections, and engagement processes local planners in Portland and Tigard have established to involve these stakeholders. TriMet also conducts extensive public outreach twice a year around future service changes, in which feedback is also sought on capital investments such as these. We also conduct outreach to all neighborhoods as part of federally required NEPA outreach regarding upcoming construction projects.

5. JOB QUALITY

This funding will support hiring of consultants and contractors to support the installation, testing and implementation of Next Generation TSP. TriMet has a strong history of success working with disadvantaged businesses on its construction and contracting projects. TriMet's 2022 Division Transit Project achieved a record-setting 75% involvement by businesses owned by minorities, women and other historically disadvantaged groups. This was the first major TriMet project to include Next Generation TSP and this Capital Investment Grant-funded Bus Rapid Transit project included over two dozen DBE contractors. TriMet has a demonstrated history of engaging diverse community members in our workforce and business practices. We adopted our first goals for engaging minority- and women-owned businesses in 1982. The Federal Transit Administration has looked to our program as a national model for improving diversity in transportation contracting.

TriMet and Metro have formally agreed to implement the [Construction Careers Pathway](#) (C2P2) program, which will ensure that jobs created under this project will provide reliable career pathways for women and BIPOC workers in the construction trades. The C2P2 framework, summarized in Figure 6, provides standardized goals and approaches to developing workforce equity while providing flexibility in implementation approaches, and covers the entire life-cycle of workforce development, from strategic planning and goal-setting to recruitment, training, and retention. Any jobs created through this project will fall under TriMet's implementation of C2P2, which includes specific steps to ensure that jobs created to deliver projects will provide career-ladder opportunities for women and BIPOC workers.

Figure 6: Construction Career Pathways framework summary



Source: [Construction-Career-Pathways-Framework-case-study-20220603.pdf \(oregonmetro.gov\)](#)

Construction Career Pathways Framework: A case study in job creation for a just society

6. PROGRAMMATIC CAPABILITY AND PAST PERFORMANCE

a. Past Performance and Reporting Requirements

TriMet has full legal authority to develop and maintain transit projects and transit service within the tri-county district. In the past 14 years, TriMet has successfully managed \$1,584,220,084 in FTA formula funds (Sections 5307, 5337, 5339, 5310, 5316, 5317, 5309, and CARES, CRRSAA and ARP Act funds), while simultaneously managing \$1,496,481,408 in FTA Discretionary and Regional Flex funds from FHWA. TriMet consistently reports a high bond rating for new and replacement of capital related projects.

TriMet has the technical, legal and financial capacity to implement this project, and the description below demonstrates the recent history of implementing forward-thinking innovations and steady growth, while bringing in all of our major federally funded projects on time or ahead of schedule, and on or under budget.

1. FY2018 5309 Small Starts – Division Transit Project

- The Project is a 15-mile bus rapid transit line from Portland's Central Business District east to Gresham. The project includes three miles of Business Access and Transit (BAT) lanes, as well as sidewalk, intersection, and bicycle facility improvements, 42 stations, transit signal priority, real-time bus arrival information, and the purchase of 31 new 60-foot articulated buses.
- Assistance Agreement Number: OR-2020-001
- FTA Capital Investment Grant, Small Starts Funding: \$87,413,950
- Assistance Listing Number: 20.500.
- Funding Agency Contact: Linda Gehrke, FTA Region 10 Administrator (currently Susan Fletcher)
- Reporting: This project is still active and all Federal funds have not been spent at this time. All required quarterly Milestone Project Reports (MPRs) and Federal Financial Reports (FFRs) have been submitted on time and accepted by the FTA without follow up comments/questions.

2. FY2019 Section 5309 CIG Small Starts for TriMet's MAX Red Line Extension & Reliability Improvements Project

- The Project is a 7.8-mile extension of the existing MAX Red Line light rail transit (LRT) line from the current end of line station at Beaverton westward to Hillsboro. The Project includes additional track and station reconstruction at the existing Gateway Transit Center (GTC) and Portland International Airport (PDX) stations to accommodate double tracking; the purchase of four new light rail vehicles; track, switch, and signalization work; construction of an operator break facility at Hillsboro; and construction of a new storage track at Ruby Junction Rail Yard.
- Assistance Agreement Number: OR-2021-036
- FTA Capital Investment Grant, Small Starts Funding: \$99,999,999
- Assistance Listing Number: 20.500
- Funding Agency Contact: Linda Gehrke, FTA Region 10 Administrator (currently Susan Fletcher)
- Reporting: This project is still active and all Federal funds have not been spent at this time. All required quarterly Milestone Project Reports (MPRs) and Federal Financial Reports (FFRs) have been submitted on time and accepted by the FTA without follow up comments/questions.

3. FY2019 5339(c) Low or No Emission Bus Project

- This project will provide for the acquisition and development of up to (3) zero emission battery electric buses with battery packs and related costs.
- Assistance Agreement Number: OR-2020-016

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- FTA funding: \$2,088,579
- Assistance Listing Number: 20.526
- Funding Agency Contact: Linda Gehrke, FTA Region 10 Administrator (currently Susan Fletcher)
- Reporting: This project is still active and all Federal funds have not been spent at this time. All required quarterly Milestone Project Reports (MPRs) and Federal Financial Reports (FFRs) have been submitted on time and accepted by the FTA without follow up comments/questions.

4. TriMet Next Generation Transit Signal Priority

- Mobility management is a new effort to provide frictionless, reliable and convenient travel available to all. This new philosophy is prompting new approaches to transportation service delivery that move beyond traditional transit system operations to a more holistic and comprehensive approach with an emphasis on highly reliable and fast high occupancy transit. TriMet in close cooperation with regional traffic partners at the City of Portland, Metro and others surrounding cities is seeking to implement a Next Generation Transit Signal Priority (TSP) System, that will allow for reliable and fast high occupancy vehicle travel in TriMet's service area.
- Assistance Agreement Number: ODOT Agreement #33825
- ODOT funding: \$2,380,000
- Assistance Listing Number: 20.200
- Funding Agency Contact: Jeff Flowers, ODOT Program & Funding Services Manager
- Reporting: This project is still active and all Federal funds have not been spent at this time. All required quarterly Milestone Project Reports (MPRs) and Federal Financial Reports (FFRs) have been submitted on time and accepted by the FTA without follow up comments/questions.

5. EPA Climate Pollution Reduction planning grant (Metro)

- Metro is leading a \$1 million EPA Climate Pollution Reduction planning grant (CPRG) for the Portland-Vancouver Metropolitan Statistical Area (Clackamas, Clark, Columbia, Multnomah, Skamania, Washington, and Yamhill Counties). Under this grant, Metro will inventory and forecast regional greenhouse gas (GHG) emissions; identify projects that reduce these emissions, and analyze the GHG reductions, implementation readiness, and other co-benefits of these projects.
- Agency Contact: Danielle Shannon, Program Officer
- Reporting: Metro is midway through this grant, which runs from 2023 to 2027, and has delivered the two deliverables due under the project to date. Plan and the Priority Climate Action Plan (PCAP) – on time and consistent with EPA's requirements. Metro's final PCAP is posted both on EPA's website and on Metro's website. Additionally, Metro submitted its only progress report due under this project to date on time and consistent with EPA's requirements in January 2024.

TriMet is good steward of public funds. Our Annual Comprehensive Financial Reports (ACFR) and Single Audits have resulted in clean opinions with no findings on any of our federal awards. TriMet has also had clean FTA Triennial Reviews. In addition, TriMet has a good history of reporting timely and accurately all annual and/or quarterly Progress reports to the Federal Transit Administration or ODOT as required.

The detailed final report shall be submitted to EPA within 120 calendar days of the completion of the period of performance, in March 2030. The final report will include a summary of the GHG reduction measures implemented, outputs and outcomes achieved, and costs of the measures. In addition, the final report shall report the total GHG emissions and other pollutants reduced (in general and in low-income and disadvantaged communities), provide a summary of community engagement, and discuss the problems, successes, and lessons learned from the implementation of the GHG reduction measures

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that could help overcome structural, organizational, or technical obstacles to implementing a similar project elsewhere.

b. Staff Expertise

This program is already appropriately staffed at both Metro and TriMet to be able to support the implementation of the expansion of the Better Bus Program. New NextGen TSP corridors can be delivered through coordinated planning and implementation efforts and existing partnerships already underway through the Transport Committee.

Metro facilitates TransPort, which is made up of city, county and state licensed Professional Engineers (PE), Professional Traffic Operations Engineers (PTOE) and Associate Systems Engineering Professionals (ASEP). They are joined by research professors with PhDs in Engineering, Data Science and related fields. TransPort grew from regional deployments of Intelligent Transportation Systems (ITS) in 1993 to a formalized body, integrated into regional planning since 2005. Today, TransPort provides one of the best assets to this project through their spirit of collaboration. Discussions on evolving to a Next Generation of Transit Signal Priority began in 2016 and the path forward was voted on in 2017. That vote included the vehicle-to-center system in use today and part of the region's Intelligent Transportation Systems Architecture. TriMet's FX-2 Division bus line was the first to deploy this technology and through multi-agency collaboration, trust was built between TriMet, Portland, Gresham and ODOT. In the months following the September 2022 start of service, these agencies developed Intergovernmental Agreements to ratify the relationship, ensuring the longevity of system operations into the future.

Key staff below outline the staff capacity and expertise necessary to deliver these projects in the period of performance for this grant. TriMet and Metro are well-equipped with a strong team of existing staff to carry out the work identified in this grant.

A.J. O'Connor is the Director of Intelligent Transportation Systems at TriMet, and the co-chair of Transport, a formally recognized consortium of road and transit operator agencies. Transport is charged with implementing the adopted 2021 Transportation System Management and Operations Strategy, which includes the expansion of Next Generation TSP. A.J. is responsible for the major Information Technology systems that deliver transit service to the street and include; Bus Dispatch, Rail Control, Land Mobile Radio, Electronic Fare Collection, CCTV and Transit Signal Priority. He manages contracts with consultants and vendors to implement the expansion of TSP in the region. In 2022-2023, he managed the analysis and evaluation of Division Transit Project's evaluation of transit and vehicle travel times, cost-effectiveness and greenhouse gas reduction which informed the approach for the expansion of TSP in the region. A.J. has 37 years of Transit IT experience, and received a Bachelor of Arts and Masters in Public Administration from Lewis and Clark College.

Caleb Winter is a Senior Transportation Planner for Metro, the Metropolitan Planning Organization for the Greater Portland, Oregon region. Caleb began his career at TriMet to evaluate the region's transportation demand management program. Caleb evaluated the program's reductions in auto trips and the related reduction in nitrogen oxides, volatile organic compounds, particulate matter, air toxics and carbon pollution. When he moved on to Metro in 2006, Caleb connected this work to Metro's to build programs to advance racial equity, improve travel-time reliability, improve safety and reduce carbon emissions. He managed regional allocations of Federal Transit Administration funds to support these initiatives. In 2014, Caleb became TSMO Program Manager and administered regional allocations of Federal Highway Administration funds. Projects include upgrades to traffic signalized intersections, linking them through high-speed data communications to an upgraded central system and providing real-time information to travelers. He led the update of the 10-year strategy in 2021 and now his focus

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turns to implementation. He is continuing partnerships with community-based organizations to increase transportation options, and convening transportation system engineers to deploy technology innovations such as Next Generation Transit Signal Priority.

Cara Belcher is a Senior Project Manager/Senior Transit Engineer and TriMet's Project Manager for the Better Bus Program. Cara is a licensed professional engineer with over twenty years in the transportation industry. Prior to joining TriMet Cara was a member of her former firm's Bus Rapid Transit Technical (BRT) Excellence center and her work centered around the design of BRT systems nationally including work for MARTA, Houston METRO, VIA, Lane Transit District, Seattle Department of Transportation, Fresno Area Express, C-TRAN, Pierce Transit, Lane Transit District, and TriMet. Cara is happy to bring her experience with the design of BRT systems work to improve bus speed and reliability in the Portland Metro area.

Alex Oreschak is a Senior Transportation Planner for Metro, and Metro's Project Manager for the Better Bus Program. He worked on the previous iteration of Better Bus (Enhanced Transit Concepts) for Metro, and has NEPA analysis experience with the Division Transit Project, Earthquake Ready Burnside Bridge Project, Interstate Bridge Replacement Program, I-205 Toll Project, Regional Mobility Pricing Project, and TriMet's Better Red Project. Prior to joining Metro, Alex worked for four years at the Maricopa Association of Governments in Arizona.

TriMet's **Transit System Support Services** department is responsible for tabulating, analyzing, and reporting on performance data for the agency including greenhouse gas emissions calculations. The department completes an annual inventory of greenhouse gas emissions using a tool developed by Good Company/Parametrix. These results are published internally and in TriMet's public facing Climate Action Plan. Transit System Support Services has 25+ years of data analysis experience in the transit space and is made up of several staff members who have advanced degrees in engineering, transportation, and systems science. Transit System Support Services also partners with colleges and universities on analytical requests that are interesting but outside the immediate scope of the transit agency. They regularly consult with other industry experts (e.g. Good Company/Parametrix, APTA, etc.) as needed when the analytical question exceeds the expertise in the department. This group is currently led by **Miles Crumley, MS** who is the Manager of Service Performance and Analysis and the Interim Director of Transit System Support Services. Miles took the lead on the first agency carbon inventory with the help of Good Company/Parametrix three years ago and has a background in physics and systems science.

6. BUDGET

a. Budget Detail

Please see the Budget Narrative (Attachment *Budget_TriMet-Coalition.pdf*) and Budget Spreadsheet (Attachment *Budgetcalcs_TriMet-Coalition.xlsx*) for a more detailed description of all funding by category and activity.

Table 7: Project Budget

Budget Category	Expense detail	Total
Personnel and Fringe	TriMet staffing and fringe benefit costs associated with this project are not included in this budget	\$0
Equipment	Controller upgrades for up to 125 signals	\$693,000

Expanding Transit Signal Priority for the Regional Transit Fleet
TriMet-Metro Coalition CPRG Implementation Grant Work plan

	Communications and/or fiber upgrades for up to 125 signals	\$2,428,641
Contractual	Consultant design and project management contract	\$800,000
	License, setup, testing, deployment and optimization of Next Generation TSP signals	\$3,037,990
Other: Sub-awards	Sub-awards to support for signal owners to cover the costs of training, testing and configuring controllers for Next Gen TSP implementation.	\$1,531,250
Other: Sub-awards to Metro	Sub award to Metro for Project Manager staff time (Senior Transportation Planner @ \$99,348/yr .15 FTE for 5 years with salary increases, fringe and overhead)	\$200,000
	Total Funding Request	\$8,690,881

b. Expenditure of Awarded Funds

The Better Bus program, managed in part by TriMet Major Projects, is an established partnership between TriMet, Metro and local jurisdictions to plan, design, and construct relatively low-cost and quickly implementable transit capital projects to improve transit travel time, reliability and capacity, and pedestrian and bicyclist safety. Transit Signal Priority (TSP) is a core treatment type in the Better Bus program and the program is currently developing several TSP projects with various local jurisdictions. The Better Bus program, with key support from TriMet's Intelligent Transportation Systems (ITS) group and the TriMet Program Management group within TriMet Engineering & Construction (E&C) division is the primary program within TriMet for the delivery of TSP projects on TriMet's fixed-route bus system. If awarded, these funds would increase scalability of an already successful, established program that is in compliance with federal expenditure and allowable cost requirements. TriMet operates on the cost reimbursement method, in that allowable expenditures are incurred prior to drawing down federal funds. The Coalition also has the management structure in place to manage all stages of the project lifecycle.

As noted above, TriMet plans to sub-award part of this grant to Metro and other local jurisdictions in partnership of this project. TriMet has established internal controls that adhere to Sub-recipient Monitoring Requirements in the Uniform Guidance, 2 CFR 200.331-.333, including performing Risk Assessments, on-going monitoring to ensure allowable expenditures, and compliance with Single Audit requirements.

c. Reasonableness of Costs

This project budget was designed with a focus on seeking funds to expand the existing Better Bus Program, to build capacity for more agencies to install and maintain TSP on their signal systems, and to conduct the required hardware and software upgrades to implement the projects at a corridor-wide scale. Personnel and fringe expenses are not included in this project budget because those staff can be supported by other resources. This request is focused on line items harder to fund by other programs to expand upon a successful program in order to focus on building this regional capacity to deliver more TSP corridors with more significant and cost-effective greenhouse gas reductions. In addition, TriMet has the expertise to comply with federal procurement requirements to ensure costs are necessary, reasonable, allowable for the grant, and expended within the performance period, as outlined in the Uniform Guidance, 2 CFR 200.