Smart Corridors Signal Upgrade and Transit Signal Priority

Congestion Mitigation and Air Quality Improvement Program
2012 Priority Regional Project – Thurston Regional Planning Council

Executive Summary

This paper documents the project selected by Thurston Regional Planning Council to receive an award of federal Congestion Mitigation and Air Quality Improvement Program funds, the process by which the project was selected, and the benefits expected to accrue to the region.

Project Sponsors

The **Smart Corridors Signal Upgrade and Transit Signal Priority** project is a collaborative effort of six different transportation agencies with support from Thurston Regional Planning Council:

- City of Lacey
- City of Olympia
- City of Tumwater
- Thurston County
- Intercity Transit
- Washington State Dept. of Transportation – Olympic Region

Project Summary

The **Smart Corridors Signal Upgrade and Transit Signal Priority** project ("Smart Corridors Project") will upgrade signals at 83 intersections on or interconnected with the region's premier transit corridor. It includes Transit Signal Priority (TSP) treatments at 42 of those intersections and outfitting of 15 transit vehicles that use this corridor during peak periods to communicate with those signals.

Total project cost is $4,460,665, with $3,185,497 coming from CMAQ funds and $1,275,168 from local sources (29% local match).

The Lacey-Olympia-Tumwater metro area is a maintenance area for particulate matter that is 10 microns or less in size (PM10). This project will reduce particulate matter attributable to tire and brake wear by smoothing traffic flows on this heavily traveled corridor. It will increase transit operating efficiency, reducing the need to add additional buses to maintain headways and increasing on-time performance and reliability. It has the added benefit of reducing tailpipe emissions associated with stop-and-go traffic and idling, and relieving congestion by improving overall operating efficiency of the corridor. It supports long-standing regional transportation and land use policies that aim to improve access and mobility on designated strategy corridors without adding general-purpose vehicle capacity.

This project was identified as a regional funding priority and selected for funding by Thurston Regional Planning Council.

Additional background and technical details are described in the remainder of this packet.

Project Overview

Introduction

This project packet describes Thurston Regional Planning Council's funding priority to receive an award of $3,185,497 in federal Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds. TRPC identified this project as its sole funding priority in July 2012. This package provides: a brief overview of the federal CMAQ program; background on the region's air quality conformity status; an overview of the process by which a corridor technology project was determined to be a high priority for this funding source; a review of Phase 1 analysis which resulted in specific project implementation details; and TRPC considerations in selecting this project for funding. The packet then goes into detail about the individual project components, responsibilities for implementation, and the estimated emissions benefits anticipated from this investment.

CMAQ Program

The Congestion Mitigation and Air Quality Improvement Program, typically referred to as CMAQ (sounds like See Mac), is a federal program supporting two important goals of the U.S. Department of Transportation: improving air quality and relieving congestion. Codified in 23 U.S.C. 149, this program supports achievement of National Ambient Air Quality Standards set forth in the Clean Air Act. The CMAQ program provides funding to help a region like Thurston County ensure air quality issues previously addressed don't reoccur and cost-effectively mitigate congestion.

Air Quality in the Thurston Region

The Thurston region enjoys very good air quality. However, that has not always been true.

In the 1980s, part of the Thurston region had unhealthy air quality that violated the National Ambient Air Quality Standards. The problem was attributed to the particulate matter suspended in wood smoke. That particulate matter – which is called PM10 because it is made up of particulate matter that is 10 microns or less in size – exacerbates respiratory diseases like asthma, particularly for the very young and very old.

In the late 1980s the Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) designated much of the north urban area of Thurston County as a nonattainment area for PM10. This triggered state and federal requirements for mitigating this pollutant.

Since the overwhelming source of this pollutant in the Thurston region was wood smoke, the Olympic Region Clean Air Agency (ORCAA) was put in charge of addressing the problem. Throughout the 1980s and 1990s ORCAA worked to replace inefficient and high-polluting wood burning stoves in homes with more efficient, cleaner burning stoves. Additional measures included restrictions on burning in the urban area, restrictions on using wood burning stoves during meteorological events called thermal inversions, and other efforts to reduce the production of PM10.

ORCAA's efforts, combined with those of the cities and county, succeeded in drastically reducing the levels of PM10 from a maximum of 254 micrograms per cubic meter in 1985 to 47 micrograms per cubic meter in 2000[1]. As a result of this outcome, ORCAA applied to federal and state agencies for a status redesignation from “nonattainment” to “maintenance” area. A status redesignation means that an area has successfully addressed the pollutant(s) it had problems with and is now in the position of preventing its reoccurrence. In late 2000, EPA and Ecology supported the redesignation request. This region has been a maintenance area for PM10 ever since. Today, the total levels of PM10 are less than 1/3 the levels allowed under federal law[2].

One unintended consequence of the success in reducing PM10 levels generated by wood smoke was that federal requirements were now placed on the region’s transportation planning activities[3]. When the concentration of wood smoke was high, the level of PM10 generated by transportation was negligible. However, once wood smoke was significantly reduced air quality sampling monitors were able to detect small amounts of transportation-generated PM10. On average, transportation accounts for less than 25% of the region’s PM10 emissions[4].

Federal and state laws stipulate that transportation activities in the region cannot undermine the improvements to air quality realized through the reduction of wood smoke. This is a standard regulation intended to ensure that the region does not return to a nonattainment status for PM10 as a result of transportation activities. Transportation generates PM10 through a variety of activities, primarily through diesel exhaust, brake and tire wear, and dirt roads. Since the region has no dirt roads in the designated maintenance area, the primary area of focus in complying with these requirements is on diesel exhaust and brake/tire dust.

The federal government provides CMAQ funding to TRPC for projects that alleviate congestion and help ensure that transportation-generated PM10 does not trigger another violation of air quality standards. Under federal law, this region’s funds must be spent on projects that reduce PM10 in the area originally affected by the air quality violations.

The white area in the map on the following page describes the PM10 maintenance area defined in federal law. It is an area that roughly coincides with the 1988 city limits of Lacey, Olympia, and Tumwater.

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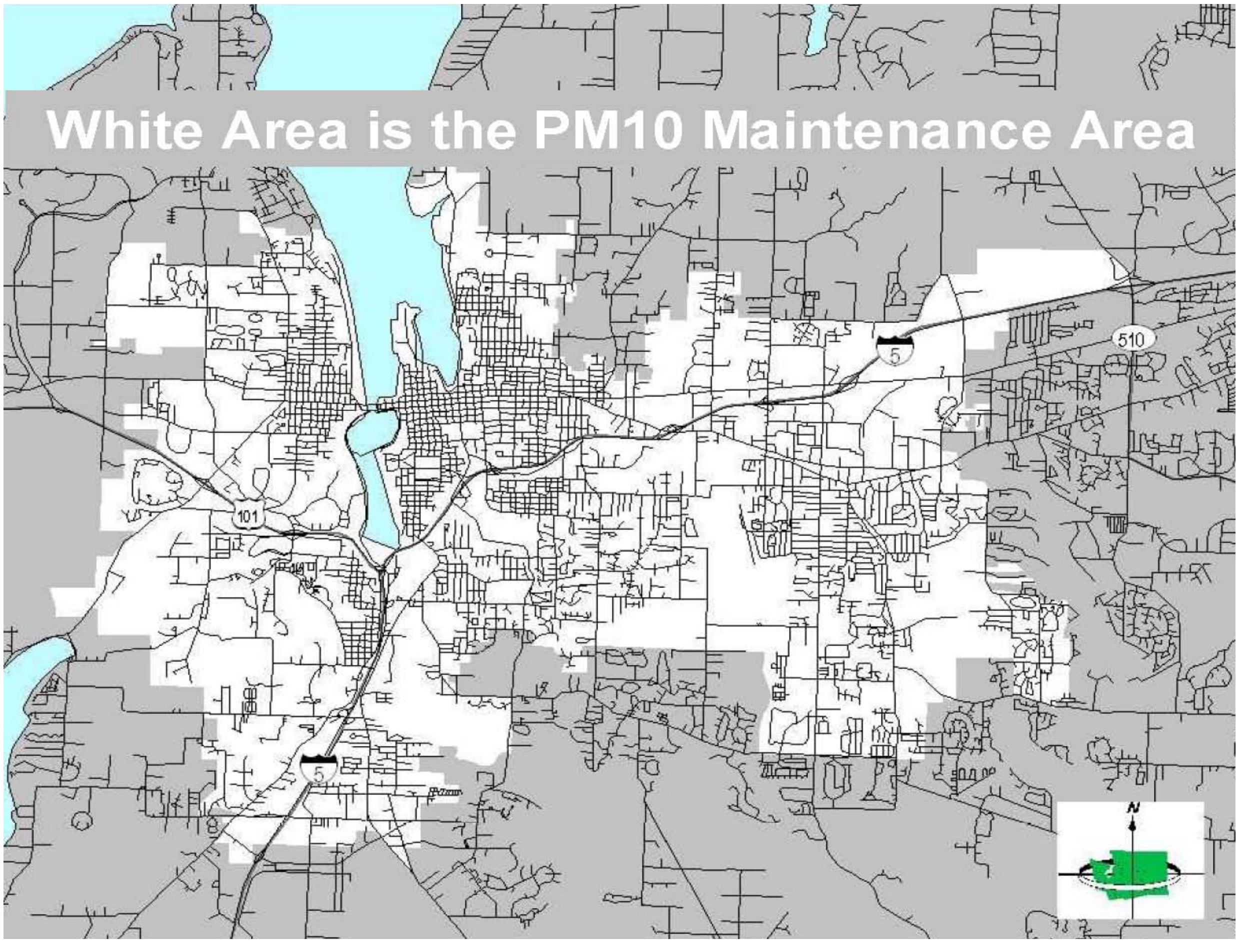
[1] Olympic Region Clean Air Agency (www.orcaa.org). “Air Quality Monitoring, Thurston County, 1985, 1990, 1995, 2000, 2005-2009”

[2] ibid.

[3] In a letter dated January 18, 2005, then WSDOT Chief of Staff Paula Hammond commented to the US Environmental Protection Agency on the deleterious effect of language in the Clean Air Act that had the unanticipated consequence of triggering air quality conformity requirements for Thurston County as a direct result of addressing its air quality problems, and advised that EPA use care in its definitions of “significant” and “de minimus” emissions in future legislation.

[4] Correspondence with Robert Moody, Compliance Supervisor, Olympic Region Clean Air Agency. September 19, 2012.



The State Implementation Plan established a PM10 budget of 776.36 tons per year of PM10 emissions within the maintenance area from transportation sources. TRPC regularly assesses its transportation emissions using models and input parameters defined, reviewed, and approved by EPA and Ecology. Estimated 2010 mobile source PM10 emissions were 474 tons per year for the entire Thurston County region, not just the defined maintenance area; the entire region's projected 2030 PM10 emissions will be approximately 623 tons per year. Then maintenance area – as well as the entire Thurston region – is well within the maintenance area's PM10 budget for the next 20 years and beyond.

A Limited Maintenance Plan is currently under development by ORCAA for submission to state and federal agencies, recognizing the on-going attainment of PM10 levels and the extremely low risk of future exceedances. That plan is expected to be complete by early 2013.

Prioritizing PM10 Project Types for the Thurston Region

TRPC received its first-ever notification of CMAQ funding availability in July 2006. While TRPC had previous experience with federal transportation funding programs, CMAQ represented a very different type of funding. After several briefings with regional policy makers and discussions with the State's Air Quality Consultation Group, a subcommittee of regional policymakers was convened in spring of 2007 to conduct an analysis of CMAQ funding requirements and opportunities specific to the Thurston region. This CMAQ Advisory Committee included elected representatives from the cities of Olympia, Lacey, and Tumwater, Intercity Transit, and a citizen representative from the Transportation Policy Board, and was supported by TRPC staff. The goal was to identify which of the various CMAQ-eligible project types represented the best possible investment opportunity for the region given its PM10 status.

Guidance from the Federal Highway Administration, the Environmental Protection Agency, and the WA State Department of Ecology indicated that diesel engine retrofits represented the most cost-effective use of CMAQ funds for areas working to mitigate transportation-generated PM10. The CMAQ Advisory Committee looked closely at diesel engine retrofits as well as idle reduction programs. In addition to programs targeting diesel exhaust they looked at projects that could reduce tire and brake wear. All told, they evaluated four general project types: diesel engine retrofits; idle reduction programs including auxiliary power units (APU) on trucks and truck stop electrification (TSE); traffic signal upgrades and optimization; and transit signal priority.

Diesel Retrofit

When they researched opportunities for diesel engine retrofit, Advisory Committee members learned that statewide funding programs were available through the Department of Ecology, some of which were administered by Ecology but most of which were administered by ORCAA. These programs, which required only a simple application requesting the funds and no local match, had already completed the retrofit of most public agency vehicles throughout the county, not just within the maintenance area. This included all public agency fleet vehicles, transit vehicles, and school buses. Additional funding was available for heavy-duty vehicles[5]. The only vehicles not eligible for these retrofits were those vehicles with a remaining functional lifespan of three years or less. After exploring diesel engine retrofits, Advisory Committee members concluded that since generous funding was already available from the state for this very purpose, these project types should not be a high funding priority for limited regional CMAQ funds.

Idle Reduction

The Advisory Committee spent considerable time exploring ways in which idle reduction programs could benefit the region's PM10 maintenance area. They looked at the various technologies and means of reducing truck idling, including installation of auxiliary power units on private trucks, truck stop electrification, and regulatory measures like "no idling" ordinances. The region was experiencing an increase in distribution centers, which seemed to offer a targeted opportunity. But all of the distribution centers were outside of the maintenance area. Additionally, since the trucks were privately owned and operated outside the PM10 maintenance area as much or more so as within the maintenance area, installation of auxiliary power units was deemed infeasible to administer with questionable PM10 benefit within the maintenance area.

[5] TRPC staff helped Ecology to get the word out, working with all jurisdictions within the entire region, as well as the Port of Olympia and the LOTT Clean Water Alliance to ensure all of the region's partners took advantage of this no-cost-to-locals opportunity to retrofit diesel-powered vehicles. (August 2007)

The other type of idle reduction technology evaluated was truck stop electrification[6]. The region has only one designated truck stop, which is privately owned and located outside of the PM10 maintenance area. Additionally, research indicated that trucks are outfitted with a variety of on-board electrification systems, further complicating the ability to identify a single truck stop electrification technology that could work for all rigs. These factors led the Advisory Committee to determine that truck stop electrification was impractical and not a priority project type for the region to pursue.

Having determined that opportunities to reduce diesel particulate were either redundant (diesel engine retrofit) or impractical (auxiliary power units or truck stop electrification), and satisfied that federal ultra-low sulfur diesel fuel standards provided an additional level of diesel PM10 reduction[7], the Advisory Committee turned to project types that could reduce brake and tire wear.

According to Department of Ecology emissions modeling input for Thurston County, tire and brake wear generate .0096 and .0125 grams per vehicle mile traveled, respectively. This is 46% of transportation-generated PM10 emissions. The CMAQ Advisory Committee evaluated opportunities to reduce excessive tire and brake wear by improving traffic flow[8].

Signal upgrades and Optimization

The first of these project types was traffic signal upgrades and optimization. Traffic signal optimization is a cost-effective approach to reduce congestion by improving signal timing and coordination. This in turn helps to reduce stop-and-go traffic, excessive braking, and unnecessary idling. FHWA notes that inefficient signal systems account for 5 – 10% of all traffic delay, and estimates that the benefit to cost ratio for these project types is as high as 40:1[9]. Fewer stops and less delay save time, money, and reduce air pollution[10].

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[6] Staff also considered shore power to reduce idling of ocean-going vessels at dock at the Port of Olympia. According to the Puget Sound Maritime Air Forum – Maritime Air Emissions Inventory (prepared by Starcrest Consulting Group, LLC. April 2007), "hotelling" accounted for less than 1% of all maritime diesel emissions at the Port of Olympia, with the majority of diesel particulate matter emissions generated while in transit. The Port served 19 ocean-going vessels in 2005, which were estimated to have generated about 1 ton total of diesel particulate matter; idling at dock accounted for 1% of that, or 20 pounds in 2005. Ocean-going ships served by the Port of Olympia generated .001% of all diesel particulate matter from maritime sources in the State. The CMAQ Advisory Group did not focus on shore power for ocean-going vessels.

[7] Significant reductions in sulfur content in diesel fuel began to be implemented in 2000, vastly reducing the particulate matter contained in diesel emissions. Sulfur content went from 310 parts per million (ppm) before 2000 to 15 ppm by 2007 for on-road vehicle fuel; sulfur content was reduced to 15 ppm for locomotive and marine diesel fuels by 2012. [40 CRF 80, sections 500-620]

[8] The two primary causes of vehicle tire and brake wear are attributed to vehicle miles of travel (VMT) and to stop-and-go traffic that generates excessive braking. TRPC and its member agencies are committed to reversing the growth in per capita VMT through "Smart Growth" land use policies combined with aggressive multi-modal and travel demand management programs in place since the early 1990s. The Task Force focused on the other cause of excessive tire and brake wear, stop-and-go traffic.

[9] FHWA "Congestion Reduction Toolbox: Improve Service on Existing Roads." www.fhwa.gov/congestion/toolbox/service.htm

[10] As cited in "Cost and Benefit of Transportation Specific MS4 and Construction Permitting," when WSDOT converted existing traffic signal systems to 2070 controllers and coordinated traffic signal systems in congested areas, they reduced average vehicle delays by 1 second and saved 12.261 metric tons of CO2. [Environmental Corridor Management, NCHRP 25-25, Task 63. June 2010.]

As the Advisory Committee looked at this type of project, it considered that five different agencies operated different traffic control devices along the region's primary urban corridor. Lacey, Olympia, Tumwater, Thurston County, and WSDOT Olympic Region all have signal systems that control traffic along the Martin Way / 4th / State / Capitol Way / Capitol Boulevard corridor. Some of these signal systems are quite old. Regional policy established in 1998 intended to align transportation and land use objectives restricts the width of urban arterials to two general purpose travel lanes in each direction, relying instead on maximizing system efficiency to maintain mobility. Traffic signal upgrades and optimization could reduce tire and brake wear by improving traffic flow while advancing regional transportation and land use policies.

Transit Signal Priority

The second traffic flow project type evaluated by the Advisory Committee was Transit Signal Priority, or TSP. TSP projects work in conjunction with signals to provide a short amount of "extended green" time to transit vehicles operating within specific parameters. For example, a transit vehicle running slightly behind schedule during certain hours of the day may be granted a few extra seconds as it approaches an intersection to clear it through before the light turns red, helping transit to maintain its headways.

Intercity Transit was adding an additional bus to high frequency routes during evening peak periods due to congestion delays that impacted its schedule reliability on the region's premier transit corridor. Reducing transit delay and increasing its overall reliability can encourage more people to use transit and reduce the number of buses needed to maintain headway, benefitting both air quality and corridor congestion while supporting local and regional land use policies.

At that time, recent TSP implementation in Pierce County provided some insights into the analysis, hardware and software, engineering, installation, and administration that would be required[11]. That study, along with 2004 research by ITS America, indicated that TSP was a promising option for corridor mobility but that it would also require new relationships between Intercity Transit and local jurisdiction traffic engineers.

After reviewing the most promising project types associated with PM10 reduction, the CMAQ Advisory Committee determined that a combination of signal upgrades and optimization paired with Transit Signal Priority on the region's primary urban corridor / premier transit corridor would offer the greatest potential to reduce PM10 while also addressing traffic congestion and supporting core regional transportation and land use policies.

The Advisory Committee presented its findings to the Transportation Policy Board in September 2007. The Policy Board considered the findings and recommended to TRPC that a "Smart Corridors" systems analysis and design project be funded to identify what specific components would be needed to reduce

[11] Phillips, Eric. "Partnering: A Transit Signal Success Story." Pierce Transit. October 2004. Mr. Phillips also attended an RTOG work session to present the operational benefits and discuss with RTOG members the challenges and lessons learned from implementation.

PM10 along the corridor by improving traffic flow. The intent was to identify the appropriate combination of signal upgrades and optimization measures and Transit Signal Priority applications to relieve mounting traffic congestion and stop-and-go traffic generating increased brake and tire wear and associated PM10.

The Policy Board also expressed its interest in concentrating federal funds, minimizing the proliferation of small, federally-funded projects that have a disproportionately high share of administrative costs. The goal was to maximize on-the-ground value of project funds. Considering the contiguous nature of the corridor and signal systems, this would mean a single, coordinated pilot program as opposed to five or six individual initiatives, further underscoring the need for regional coordination.

TRPC reviewed the work of the CMAQ Advisory Committee and considered the Transportation Policy Board recommendation in December 2007. TRPC concurred with the Policy Board finding that a corridor-based technology project that improves traffic flow with a combination of signal improvements and Transit Signal Priority represented the highest priority investment to address PM10. TRPC approved Phase 1 of “Smart Corridors” to conduct the systems engineering analysis and design necessary to identify the optimal package of investments and procedures for smoothing traffic flow in the corridor. A single, coordinated regional approach was directed to maximize the initial utility of the CMAQ investment, keeping administrative costs as low as possible while promoting inter-jurisdictional coordination and collaboration on this corridor-based arterial management project.

Phase 1 of “Smart Corridors” was presented for public review and comment and amended into the Regional Transportation Plan and into the Regional Transportation Improvement Program.

The next section summarizes the systems engineering analysis and design process through which the current CMAQ investment package was developed.

“Smart Corridors” Systems Engineering Analysis and Design Phase

“Smart Corridors” Phase 1 was allocated $667,500 in 2007 to develop a regional concept of traffic operations and the related details of an implementation investment package consistent with regional ITS (“Intelligent Transportation System”) architecture and with state and federal guidelines. FHWA staff expert in systems operations and signal systems were enlisted to provide guidance, education, and oversight. Close coordination with WSDOT Highways and Local Programs staff helped ensure compliance with state and federal funding requirements. Because an interconnected, coordinated corridor technology project had never been undertaken in the Thurston region, TRPC retained the IBI Group to facilitate the process and guide local agencies through the signal systems analysis and design process. Following are some highlights of that process.

- A Regional Traffic Operations Group (RTOG) was convened[12]. The RTOG is made up of traffic engineers, signal operations staff, and transit staff from Lacey, Olympia, Tumwater, Thurston County,

[12] A “Smart Corridors” web page was created on TRPC’s website (http://trpc.org/regionalplanning/transportation/projects/Pages/SmartCorridors.aspx). It provides a running record of the RTOG process and extensive resources for RTOG members.

WSDOT Olympic Region, and Intercity Transit. These are all the system operators who control or provide general purpose transportation service on the target corridor. The RTOG represents a new approach to regional coordination and will continue to function into the foreseeable future.

- James Colyar and Paul Olson from FHWA conducted a Regional Traffic Operations Assessment with the RTOG early in this process to establish a baseline understanding of the characteristics and condition of the urban traffic signal system, and to provide guidance in developing a regional concept of traffic operations. Resources available and committed to signal maintenance and operations were evaluated for each jurisdiction through a detailed survey and follow-up personal interviews. Mr. Olson also arranged a Mobile Hands-on Traffic Signal Timing (MOST) training session for the RTOG in October 2010. Fifteen members of the RTOG participated in the three-day training provided by FHWA.

- A mesoscopic, dynamic traffic assignment model (Dynameq) was developed to augment the regional travel demand model. By its purpose and design, a regional travel demand model is incapable of evaluating corridor operations. The Dynameq model enables operational analysis of queuing, turning movements, and delays at intersections along the length of the corridor. It will enable TRPC to monitor over time the actual effect of signal upgrades, signal optimization, and Transit Signal Priority on travel delay and travel speed along the length of the corridor, as well as the impacts on major intersecting corridors.

- An inventory and thorough evaluation of the existing traffic signal system was conducted, including inventories of hardware and operating software for the entire corridor and interconnected signals on adjacent facilities.

- An inventory was conducted of onboard transit technologies and the master routing system[13].

- Representatives from candidate signal technology firms attended a full-day workshop with the RTOG to go over features of their various controllers and firmware, and to respond to questions. Each firm brought hardware and software samples, enabling RTOG members to evaluate and compare features of the various technologies.

- IBI consultants collaborated with RTOG members in developing system specs compatible across different operating agencies for controller software and worked with agency representatives to identify critical hardware needs. This process resulted in agreement among agencies on a single, standardized platform for this and future signal investments throughout the metro area.

- Priority signals and signal clusters were identified for upgrade in the implementation phase, including high value locations for Transit Signal Priority treatment. Data sharing agreements were developed, and optimization plans established.

[13] Intercity Transit has made steady progress in implementing the transit element of the regional ITS architecture over the past decade. A challenge is to make the signal system as “smart” as the transit system. The analysis in Phase 1 illuminated the remarkable progress made by the region’s transit agency in modernizing its fleet management, traveler information, and data collection systems.

Final project details include signal upgrades at 83 intersections, with Transit Signal Priority added to 42 of the most critical intersections for transit. It also includes upgrading 15 buses using this corridor during peak periods to enable them to communicate with the signals based on established vehicle priority protocol. Additional buses will be retrofitted in the future as funds allow.

This project is the foundation for future signal improvements throughout the metropolitan area.

TRPC Considerations in Project Selection

TRPC affirmed its commitment to the Smart Corridors implementation phase in July 2012. This resulted from policy maker work in May and June to review project prioritization criteria. At that time, the Transportation Policy Board reviewed its earlier work. As when it recommended Phase 1 funding in 2007, the Policy Board reaffirmed that reduction of PM10 and alleviating traffic congestion on the region's primary urban corridor is the highest funding priority for allocating CMAQ funds. In light of pending redesignation in early 2013 as a "limited maintenance area" due to the minimal PM10 emissions experienced in the region, policy makers also recognized that this may be the only allocation of CMAQ funds the region will receive.

Policy makers identified the importance of investing in a project with long-term mobility benefits for the corridor that furthers other established transportation and land use objectives and which can be leveraged for future investments from other sources.

A proposal to retrofit older fire trucks that did not meet minimum "useful life" qualifications for Ecology funding was considered; however, that proposal was not considered a high funding priority because it provided no congestion relief, and it would not result in a long-term benefit to the region. The Transportation Policy Board recommended that TRPC award the full allocation of CMAQ funds to implementation of the Smart Corridors technology project.

In July 2012, TRPC considered the Policy Board recommendation as well as the fire district proposal, and concurred with the recommendation before them.

Project Details

Smart Corridors Signal Upgrade and Transit Signal Priority Project will result in upgrades to 83 signalized intersections owned and maintained by five different agencies (Lacey, Olympia, Tumwater, Thurston County, and WSDOT Olympic Region) along, or interconnected with, the 11-mile long Martin Way / 4th / State / Capitol Way / Capitol Boulevard corridor. It also includes Transit Signal Priority features on 42 of those intersections that are most critical for maintaining transit headways as well as upgrades to 15 intercity Transit buses that use that corridor during peak periods. Intersection-specific details by jurisdiction are attached.

All intersections are located on federally-classified routes and meet all signal warrants. The project design meets basic eligibility requirements and is in compliance with Titles 23 and 49 CFR.

Funds awarded through this 2012 CMAQ project selection process will be obligated during FFY 2013 (before September 30, 2013).

Project Benefits

The **Smart Corridors Signal Upgrade and Transit Signal Priority Project** will support maintenance of National Ambient Air Quality Standards by reducing PM10 emissions associated with tire and brake wear caused by excessive stop-and-go traffic and improving overall corridor congestion.

Specifically, the smart Corridors Project will not:

- Cause or contribute to any new violation of the federal air quality standards for PM10
- Increase the frequency or severity of any existing violation of the standards
- Delay timely attainment of the standards

Federal law stipulates that projects selected for CMAQ funding estimate air quality benefits for the criteria pollutants associated with a region, which in the Thurston region is PM10. Where possible, those benefits are to be quantified using credible and replicable methods, relying on approved assumptions and models in place for the region.

The approved EPA model used by TRPC to determine air quality conformity (MOBILE 6.2) is not capable of estimating PM10 benefits associated with mobility improvements. PM10 is an increasingly insignificant concern to EPA[14] and so few resources are directed towards tools that can provide this level of quantified estimation and associated benefit cost analysis.

TRPC staff evaluated dozens of different traffic flow improvement air quality emissions analyses resulting from CMAQ reporting requirements. In every case, PM10 benefits were "NR" - that is, Not Reported. That is because approved emissions models and methodologies do not quantify benefits associated with reducing tire and brake wear when evaluating traffic flow improvements such as signal optimization and transit Signal Priority projects. The focus of traffic flow emissions models and the associated reporting is on pollutants other than PM10 (e.g. VOC and NOx).

Leading national resources for mobile source emissions were consulted for guidance. This included Federal Highway Administration, California Air Resources Board, and Texas Transportation Institute. TRPC also looked at methodologies deployed by the Denver region council of Governments (Colorado), Metropolitan Transportation Commission (MTC), the Puget Sound Regional Council (PSRC), and the Montana Department of Transportation (MDT)[15].
TRPC staff also reviewed research conducted by ICF International[16] and the National Cooperative Highway Research Program[17], as well as the Transportation Research Board's *Transportation Research Record.*

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[14] According to the "2012 Ambient Air Monitoring Network Report" produced by the Department of Ecology (Publication no. 12-02-008, page 13), the EPA revoked the annual PM10 standard in 2006 due to lack of evidence linking health problems to long-term exposure to coarse particle pollution.

[15] According to a FHWA / MDT research project (FHWA.MT-04-002/8175), "The most cost-effective projects [for PM10] tended to be paving projects and projects associated with purchasing air quality equipment with traffic flow projects the next most cost-effective."

[16] ICF International. "Multi-Pollutant Emissions Benefits of Transportation Strategies." Prepared for FHWA, publication number FHWA-HEP-07-004. November 2006.

TRPC staff looked at research on brake wear particulate matter emissions in an effort to develop a replicable, quantifiable estimation of PM10 benefits associated with corridor-level traffic flow improvements[18], including research from other countries[19]. This research revealed that there are two main approaches for determining emission factors for non-exhaust sources and the contributions they make to particulate matter. These are direct measurements (either in *situ* or under controlled laboratory conditions) and receptor modeling. Neither of these are practical for an MPO to use in estimating the benefits associated with a CMAQ project.

The most definitive insight was from the federal highway Administration's "Multi-Pollutant Emissions Benefits of Transportation Strategies" analysis, which indicates that signal synchronization and roadway intersection improvements have a downward effect on PM10 emissions, though it does not quantify those benefits: "In general, traffic flow improvements that reduce congestion should reduce emissions of most pollutants by improving the flow of traffic and minimizing stop-and-go conditions and idling."[20]

Since quantifiable emissions benefits are not practicable in the current context, TRPC relied on an uncomplicated logic: tire and brake wear generate about 46% of the PM10 emissions in the Thurston Region according to WA State Department of Ecology inputs for the MOBILE6 air quality emissions model. Improving the capacity of signal systems to respond to traffic flows and better accommodate transit, further increasing overall system efficiency, has the effect of reducing stop-and-go traffic and encouraging alternatives to the single-occupancy vehicle by improving transit service reliability and efficiency, which in turn has the effect of reducing braking. Therefore, improving signal systems has a positive correlation with PM10 emission reduction.

For More Information

For more information on Thurston Regional Planning Council's 2012 CMAQ project selection process or this project documentation, please contact:

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[17] NCHRP, Report 535. "Predicting Air Quality Effects of Traffic-Flow Improvements." 2005.

[18] Cadle, Steven H., et al. "Brake Wear Particulate Matter Emissions." General Motors Research and Development Center and AEROTEK Laboratory Services. As published in Environmental Science Technology, September 2000. On average, 35 % of brake pad mass loss is emitted as airborne particulate matter. The observed wear rates correspond to vehicle emission rates of 5.1 – 14.1 mg/mi. On average, 86% of the airborne particulate matter was 10 milligrams or less in size (PM10); 63% was 2.5 milligrams in size or less (PM2.5). Analysis of airborne particulate matter showed very few inhalable fibers.

[19] Barlow, T.J., et al, TRL Limited. "Non- Exhaust Particulate Matter Emissions from Road Traffic: Summary Report." Prepared for DEFRA and the devolved Administration under Project CPEA23/SPU82. Department for the Environment, Food, and Rural Affairs, Scottish Executive, Welsh Assembly Government, and the Department of Environment in Northern Ireland. April 2007.

[20] http://www.fhwa.dot.gov/environment/air_quality/conformity/research/mpe_benefits/mpe0

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October 4, 2012

Lon Wyrick, Executive Director
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Thank you for this opportunity to review and comment on the proposed "Smart Corridors Signal Upgrade and Transit Signal Priority Project." We appreciate the coordination between TRPC and the Olympic Region Clean Air Agency (ORCAA), especially as your agency worked to identify priority project types that would provide the greatest value in addressing PM10 within the maintenance area. Addressing PM10 in the maintenance area will also benefit the airshed by reducing the generation of PM2.5 which is a more restrictive standard.

As you know, retrofit of diesel engines and exhaust systems is considered the most cost-effective way to treat transportation-generated particulate matter. However, this region had already funded those retrofits through ORCAA and the Department of Ecology programs by the time TRPC was authorized to program CMAQ funds. TRPC was thorough in its research, evaluating and identifying alternate project types that will improve PM10 emissions while providing long term congestion relief. Improving traffic flow while supporting increased transit efficiency is a good choice for this region.

We understand that the models available to you are incapable of estimating PM10 emissions benefits associated with improved traffic flow. However, we find the logic behind your qualitative reasoning to be sound. Smoothing out the flow of traffic on the region's most heavily traveled urban corridor reduces stop-and-go movements, thereby reducing brake and tire wear. This will indeed reduce transportation-generated PM10/PM2.5 in the maintenance area.

Though Thurston County is well below the PM10 standard, PM2.5 is a pollutant of concern in the urban area. The "Smart Corridors" project will enhance future opportunities to reduce PM levels as these signal upgrades and coordinated timing patterns are expanded throughout the urban area.

ORCAA is in the process of establishing a Limited Maintenance Plan for the Thurston region, which we expect to submit for approval in early 2013. It is hoped that this plan will relieve TRPC of some of its PM10 transportation conformity requirements, commensurate with the excellent air quality this region enjoys. In the meantime, projects such as this "Smart Corridors" signal program help us in our continued efforts to maintain and improve air quality in the region.

Sincerely,

Francea L. McNair
Executive Director
Olympic Region Clean Air Agency

thurston smartCORRIDORS

Project Signal Inventory and Proposed Technology Improvements

Revised: October 4, 2012 (v3)

Intercity Transit - Transit Signal Priority System

System Component	Description	Quantities*
Onboard Systems	Installation of On-Vehicle TSP Logic, Emitter, and Related Components	15 Vehicles
Roadside Systems	Installation of roadside vehicle detection antenna/receiver and logic unit in signal controller cabinet	42 Intersections
Central Systems	Implementation of TSP central management software and related backend upgrades	Lump Sum

* Estimated Quantity. Based on future engineering design, Vehicle/Intersection quantities may be adjusted to maximize benefit.

Notes:

- Locations, quantities, and proposed improvements indicated below are conceptual design estimates developed to support regional project funding allocation.
- Quantities and technology upgrade requirements are based on agency-reported existing conditions inventory and conceptual engineering cost estimates.
- Equipment locations, costs, and coverage are subject to field verification, design, and engineer's cost estimate during detailed project enginering.
- Specific Transit Signal Priority implementation locations shall be determined duringdetailed project engineering.
- Communications improvements/upgrades to be determined during detailed project engineering based on existing field conditions and communcations alternatives assessment.

Thurston County - 4 Project Signals

Street 1	Street 2	Signal Interconnect Group	Signal ID	Owned by	Operated by	Maintained by	On Transit Route?	Smart Corridors Project Controller Upgrade/Replacement	Smart Corridors Controller Cabinet Replacement	Smart Corridors Central Software System
Martin Way	Carpenter Road	Martin Way Interconnect Group	Mart6	Thurston Co	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Martin Way	Kinwoood Street	Martin Way Interconnect Group	Mart7	Thurston Co	Thurston Co	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Martin Way	Hensley Street/Ranger Drive	Martin Way Interconnect Group	Mart8	Thurston Co	Thurston Co	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Martin Way	Kingham Street	Martin Way Interconnect Group	Mart9	Thurston Co	Thurston Co	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software

WSDOT - 9 Project Signals

Street 1	Street 2	Signal Interconnect Group	Signal ID	Owned by	Operated by	Maintained by	On Transit Route?	Smart Corridors Project Controller Upgrade/Replacement	Smart Corridors Controller Cabinet Replacement	Smart Corridors Central Software System
Plum Street	Henderson Boulevard / I-5 On/Off Ramps	City of Olympia Downtown Core	OD26	WSDOT	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033; activate TSP logic	None	Maintain integration with upgraded City of Olympia QuicNet
Martin Way	I-5/Martin Way I/C Ramps-NB	Martin Way Interconnect Group	Mart2	WSDOT	Lacey/WSDOT	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Martin Way	I-5/Martin Way I/C Ramps-S+C11B	Martin Way Interconnect Group	Mart3	WSDOT	Lacey/WSDOT	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Marvin Road	I-5 NB On/Off Ramps	Marvin Rd Interconnect Group	Marv6	WSDOT	Lacey/WSDOT	Lacey	No	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Marvin Road	I-5 SB On/Off Ramps	Marvin Rd Interconnect Group	Marv7	WSDOT	Lacey/WSDOT	Lacey	No	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		Potential interconnect to City of Lacey new Econolite Centracs Central System Software
Pacific Avenue	I-5 SB On/Off Ramps	Olympia Pacific Avenue	OP2	WSDOT	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033; activate TSP logic	None	Maintain integration with upgraded City of Olympia QuicNet
Pacific Avenue	I-5 NB On/Off Ramps	Olympia Pacific Avenue	OP3	WSDOT	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033; activate TSP logic	None	Maintain integration with upgraded City of Olympia QuicNet
Trosper Road	I-5 SB On/Off Ramps	Tumwater - Trosper Road Group	TT4	WSDOT	Tumwater	Tumwater	No	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		None
Trosper Road	I-5 NB On/Off Ramps	Tumwater - Trosper Road Group	TT5	WSDOT	Tumwater	Tumwater	No	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		None

City of Olympia - 37 Project Signals

Intersection	Street 2	Signal Interconnect Group	Project Signal ID	Owned by	Operated by	Maintained by	On Transit Route?	Smart Corridors Project Controller Upgrade/Replacement	Smart Corridors Controller Cabinet Replacement	Smart Corridors Central Software System
4th Avenue	Plum St	City of Olympia Downtown Core	OD35	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
4th Avenue	Capitol Way	City of Olympia Downtown Core	OD4	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
4th Avenue	Washington Street	City of Olympia Downtown Core	OD5	Olympia	Olympia	Olympia	No	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
4th Avenue	Franklin Street	City of Olympia Downtown Core	OD6	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
4th Avenue	Adams Street	City of Olympia Downtown Core	OD7	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
4th Avenue	Cherry Street	City of Olympia Downtown Core	OD8	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
Capitol Way	5th Avenue	City of Olympia Downtown Core	OD16	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
Capitol Way	Legion Way	City of Olympia Downtown Core	OD17	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
Capitol Way	Union Avenue	City of Olympia Downtown Core	OD18	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
Capitol Way	11th Avenue	City of Olympia Downtown Core	OD19	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuikNet software to support TSP and enhanced coordination
Capitol Way	14th Avenue	City of Olympia Downtown Core	OD20	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Capitol Way	Maple Park Avenue	City of Olympia Downtown Core	OD21	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Capitol Way	21st Avenue	City of Olympia Downtown Core	OD22	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Capitol Way	City of Olympia Downtown Core	OD11	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Washington Street	City of Olympia Downtown Core	OD12	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Franklin Street	City of Olympia Downtown Core	OD13	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Adams Street	City of Olympia Downtown Core	OD14	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Plum/East Bay Drive	City of Olympia Downtown Core	OD15	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
4th Avenue	Eastside Street	City of Olympia State/4th/ Martin Way	O4	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
4th Avenue	Central Street	City of Olympia State/4th/ Martin Way	O5	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
4th Avenue	Fir Street	City of Olympia State/4th/ Martin Way	O6	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
4th Avenue	Pacific Avenue	City of Olympia State/4th/ Martin Way	O7	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Martin Way	Phoenix Street	City of Olympia State/4th/ Martin Way	O11	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Martin Way	Ensign Road	City of Olympia State/4th/ Martin Way	O12	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Martin Way	Lilly Road	City of Olympia State/4th/ Martin Way	O13	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Martin Way	Sleater-Kinney Road	City of Olympia State/4th/ Martin Way	O14	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Martin Way	Kasey Keller Drive	City of Olympia State/4th/ Martin Way	O15	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Fir Street	City of Olympia State/4th/ Martin Way	O10	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination

State Avenue	Puget Street	City of Olympia State/4th/ Martin Way	O8	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
State Avenue	Central Street	City of Olympia State/4th/ Martin Way	O9	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Lilly Road	Stoll Road	City of Olympia State/4th/ Martin Way	O1	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Lilly Road	Ensign Road	City of Olympia State/4th/ Martin Way	O2	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Lilly Road	St Peter's Hospital	City of Olympia State/4th/ Martin Way	O3	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Pacific Avenue	Boulevard Road	City of Olympia State/4th/ Martin Way	O16	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Pacific Avenue	Pattison Road	Pacific Avenue	OP1	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Pacific Avenue	Fones Road	Pacific Avenue	OP4	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination
Pacific Avenue	Lilly Road	Pacific Avenue	OP5	Olympia	Olympia	Olympia	Yes	Replace existing controller with 2070 controller operating software version 2033	None	Upgrade Existing McCain QuicNet software to support TSP and enhanced coordination

City of Tumwater - 12 Project Signals

Street 1	Street 2	Signal Interconnect Group	Signal ID	Owned by	Operated by	Maintained by	On Transit Route?	Smart Corridors Project Controller Upgrade/Replacement	Smart Corridors Controller Cabinet Replacement	Smart Corridors Central Software System
Capitol Blvd	Sunset Way/Carlyon Avenue	Tumwater - Capitol Blvd	TC1	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	Custer Way/North Street	Tumwater - Capitol Blvd	TC3	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	"E" Street	Tumwater - Capitol Blvd	TC4	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	Linwood Avenue	Tumwater - Capitol Blvd	TC5	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	"X" Street	Tumwater - Capitol Blvd	TC6	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	Dennis Street	Tumwater - Capitol Blvd	TC7	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	Israel Road	Tumwater - Capitol Blvd	TC8	Tumwater	Tumwater	Tumwater	Yes	Activate TSP Logic in existing ASC/3	None	None
Capitol Blvd/Old Hwy 99	Tumwater Boulevard	Tumwater - Capitol Blvd	TC9	Tumwater	Tumwater	Tumwater	Yes	Activate TSP Logic in existing ASC/3	None	None
Cleveland Avenue SE	Custer Way SE / North Street SE	Tumwater - Capitol Blvd	TC2	Tumwater	Tumwater	Tumwater	Yes	Replace ASC/2 Controller with ASC/3 Controller	None	None
Capitol Blvd	Tropser Road	Tumwater - Trosper Road Group	TT1	Tumwater	Tumwater	Tumwater	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		None
Capitol Blvd	Lee Street	Tumwater - Trosper Road Group	TT2	Tumwater	Tumwater	Tumwater	Yes	Replace Controller with ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		None
Trosper Road	Littlerock Road	Tumwater - Trosper Road Group	TT3	Tumwater	Tumwater	Tumwater	Yes	Replace Controller with ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		None

City of Lacey - 24 Project Signals

Street 1	Street 2	Signal Interconnect Group	Signal ID	Owned by	Operated by	Maintained by	On Transit Route?	Smart Corridors Project Controller Upgrade/Replacement	Smart Corridors Controller Cabinet Replacement	Smart Corridors Central Software System
6th Avenue	Woodland Square Loop	Central Lacey Interconnect Group	CL14	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
6th Avenue	College Street	Central Lacey Interconnect Group	CL15	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
6th Avenue	Golf Club Place	Central Lacey Interconnect Group	CL13	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
College Street	3rd Avenue	Central Lacey Interconnect Group	CL16	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Lacey Blvd	Clearbrook Drive	Central Lacey Interconnect Group	CL11	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Lacey Blvd	College Street	Central Lacey Interconnect Group	CL7	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Lacey Blvd	Ruddell Road	Central Lacey Interconnect Group	CL9	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	Franz St.	Central Lacey Interconnect Group	CL10	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	Carpenter Road	Central Lacey Interconnect Group	CL12	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	South Sound Way SE	Central Lacey Interconnect Group	CL3	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	Sleater Kinney Road	Central Lacey Interconnect Group	CL4	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	Fred Meyer Entrance	Central Lacey Interconnect Group	CL5	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	College Street	Central Lacey Interconnect Group	CL6	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software
Pacific Avenue	Ruddell Road	Central Lacey Interconnect Group	CL8	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assemblies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3		New Econolite Centracs Central System Software

Sleater Kinney Road	6th Avenue SE	Central Lacey Interconnect Group	CL1	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Sleater Kinney Road	7th Avenue SE	Central Lacey Interconnect Group	CL2	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	College Street	Martin Way Interconnect Group	Mart1	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	Galaxy Drive	Martin Way Interconnect Group	Mart10	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	Hawks Prairie Shopping Complex Entrance	Martin Way Interconnect Group	Mart11	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	Martin Village West Entrance	Martin Way Interconnect Group	Mart4	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	Desmond Drive	Martin Way Interconnect Group	Mart5	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Martin Way	Marvin Road	Marvin Rd Interconnect Group	Marv1	Lacey	Lacey	Lacey	Yes	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Marvin Road	Hawks Prairie Shopping Complex Entrance	Marvin Rd Interconnect Group	Marv4	Lacey	Lacey	Lacey	No	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software
Marvin Road	Quinault Drive	Marvin Rd Interconnect Group	Marv5	Lacey	Lacey	Lacey	No	Replace Controller Cabinet Assembies with Econolite NEMA ASC/3 TS2 Type 1 Controller, or 2070 Controller operating ASC/3	New Econolite Centracs Central System Software