



Puget Sound Regional Council

REGIONAL TRANSPORTATION PLAN

2022-2050

Appendix C: Maintenance & Preservation

2022





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Puget Sound Regional Council
Information Center
1011 Western Avenue, Suite 500
Seattle, Washington 98104-1035

206-464-7532 | info@psrc.org | psrc.org





Puget Sound Regional Council

REGIONAL TRANSPORTATION PLAN

2022–2050

Adopted May 26, 2022



Regional Transportation Plan 2022-2050

Maintenance, Preservation, and Operations Section

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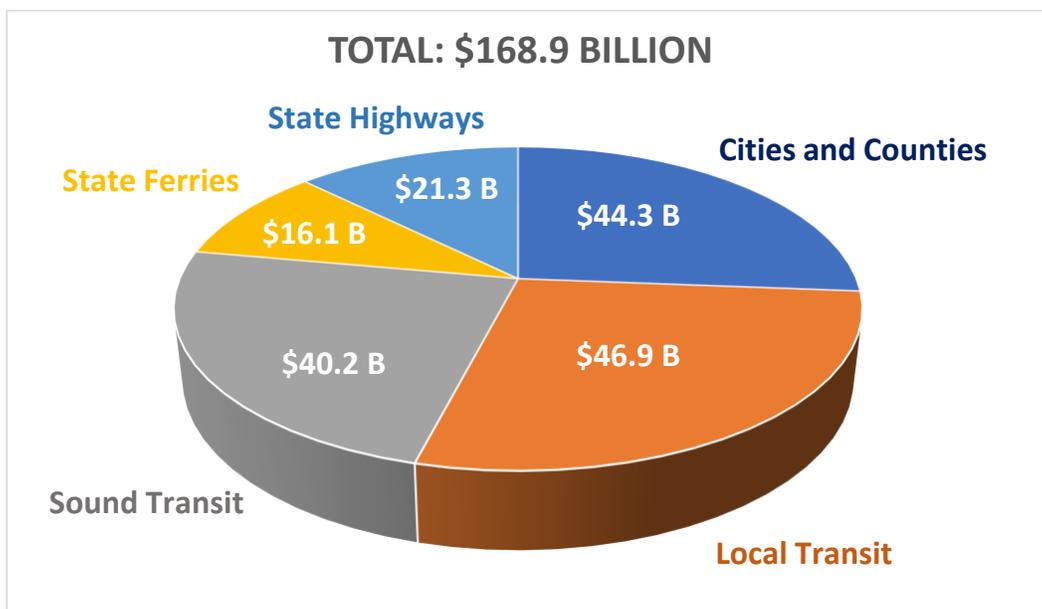
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Methodologies for Developing Maintenance and Preservation Estimates

As shown in Figure 1 below, the plan identifies \$168.9 billion in estimated need to maintain, preserve, and operate the **existing** system, which represents nearly 60% of the total investment planned between 2022 and 2050. (Please note that costs associated with maintaining, preserving, and operating future transportation assets and services are captured in the System Improvements portion of the Financial Strategy).

Figure 1
Maintenance, Preservation, & Operations Expenditure Estimates (\$2022 Constant)



A range of methodologies were utilized to develop expenditure estimates for the various maintenance and preservation categories.

Cities and Counties

Estimating regional maintenance and preservation need is a challenge, in particular for local assets where there are gaps in the data and inconsistencies in how the data is collected. There is limited information available on which to base future maintenance and preservation cost estimates for local jurisdictions. Historically, the plan's financial strategy relied upon a series of programmatic models based on historic expenditures to project maintenance and preservation investment costs for cities and counties. This approach was limited by the fact that it relied entirely on past spending and did not account for projected future need or local planning policies.

Beginning with the 2014 RTP, PSRC began a long-term effort to evolve the way in which future maintenance and preservation needs in cities and counties were estimated, aiming to capture future need based on desired outcomes instead of merely extrapolating historic trends. New methodologies were developed for estimating need for several asset classes: pavement preservation, stormwater drainage, and local signal operations and Intelligent Transportation Systems (ITS). A new outcome-based approach to estimating the maintenance and preservation needs of local bridges and other structures, including culverts, seawalls, and street walls was also developed for the 2018 RTP.



In preparation for the 2022 RTP, PSRC conducted interviews with 15 local jurisdictions to better understand key challenges facing cities and counties. These interviews shed light on local issues and practices and provided other insights that allowed staff to refine and improve on the outcome-oriented methodologies for developing these estimates. The financial strategy reflects refinements to these outcome-based methodologies and incorporates improvements to estimation approaches for additional elements of the transportation system.

Pavement Preservation

The pavement preservation estimation process utilizes local policy and analysis to project costs to achieve and maintain an average Pavement Condition Index (PCI) score of 70 through the life of the plan.

An average PCI score of 70 (or local equivalent) was selected as a desired regional outcome based on a review of local measurement approaches and thresholds of what is considered to be “good” condition. Additionally, an average PCI rating score of 70 establishes an outcome close to what could be considered “optimal” management of the system since investing in lower-cost treatments in the “sweet spot” on the pavement deterioration curve results in minimizing lifecycle costs relative to investments made lower on the curve.

The estimates rely on data provided by cities and counties through a survey instrument designed to capture three key components:

- **Existing Conditions:** Respondents were asked to provide detailed existing condition data on their pavement network.
- **Investment Backlog:** Jurisdictions were asked to provide an estimate of the current backlog of roadway preservation needs relative to a desired pavement condition score of 70. This included both deferred maintenance and reconstruction costs.
- **Long-term Pavement Preservation Need:** Respondents were asked to utilize their pavement management systems to develop a cost estimate to maintain an average pavement condition score by facility and pavement type across their jurisdiction of 70.

Approximately 65% of all cities and counties responded to the survey. Based on the data reported through the survey, average costs per lane mile were calculated for the preservation backlog and long-term need. These average lane mile costs and lane mileage data were used to extrapolate estimates for jurisdictions that did not respond to the survey.

The total projected cost for city and county pavement maintenance and preservation in the plan is approximately \$20 billion.

Stormwater Drainage

Stormwater runoff from the transportation system has been an issue of increasing importance in the central Puget Sound region for years. Additional impervious surfaces and inadequate storm drainage and treatment systems are causing significant concerns regarding the impact to Puget Sound.

Stormwater drainage has become a greater issue at the national level, as well, which is reflected in the strengthening of the National Pollutant Discharge Elimination System (NPDES) permitting process. Through 2019 permit requirements were focused primarily on construction activities, with standards



becoming increasingly more stringent over time. Beginning in 2019 and going forward the scope of requirements will widen to include the planning and implementation of retrofits to existing stormwater facilities. In addition, maintenance costs will likely increase as new facilities are built to meet retrofit requirements. As a result, stormwater maintenance and preservation costs are expected to continue to grow through the life of plan.

PSRC's methodology for estimating these costs calculates estimates for NPDES Phase 1 and Phase 2 jurisdictions (which are on different permit schedules) separately. For each phase a growth rate is calculated for the three main BARS (Washington State Auditor's Office Budget and Reporting System) stormwater categories: Maintenance, Preservation/Construction, and Street Cleaning. The growth rates, respectively, are based on the previous ten years of reported BARS data. The last year of actual data for each category is then projected out based on these growth rates.

The total projected cost for city and county stormwater maintenance and preservation in the plan is approximately \$5 billion.

Local Traffic Operations/Intelligent Transportation Systems (ITS)

Traffic operations refers to components that facilitate the flow of traffic through a transportation system. This includes both Intelligent Transportation Systems (ITS) which utilize information and communication technology, such as traffic signals and dynamic messaging signs, and non-ITS traffic control infrastructure, such as traffic circles and speedbumps.

To account for ITS needs, staff engaged PSRC's Regional Traffic Operations Committee (RTOC) to develop and refine a city and county survey similar to the pavement preservation effort. The goal of this survey was to compare what is currently spent on local ITS operations with cost estimates under an "optimal" scenario. Staff included each jurisdictions' more recent reported BARS data for ITS/Traffic Control in their respective survey, and asked them to add to that number to capture optimal scenario need. PSRC worked with RTOC to define "optimal" as an agency being fully staffed and able to carry out all intended functions in a timely manner, including regular maintenance, and all capital components of ITS systems being replaced within their intended lifecycle.

About 60% of all cities and counties responded to the survey. Using the data reported through the survey, average traffic control/ITS costs per traffic signal were calculated and were then used to calculate estimates for jurisdictions that did not respond to the survey.

The total projected cost for city and county traffic control/ITS maintenance and preservation in the plan is approximately \$3.5 billion.

Bridges, Culverts and Other Structures

The condition and stability of thousands of bridges and other structures that support the transportation network is essential to safety and mobility. A new outcome-based approach for estimating maintenance and preservation needs related to this infrastructure was utilized for the 2022 RTP. Separate methodologies were used for bridges, culverts, and "other structures" (e.g. street walls, retaining walls), as described below.

Bridges. The methodology used for locally-owned bridges leverages work WSDOT has developed for their state-owned bridges needs assessment. WSDOT's useful life assumptions and estimated bridge replacement cost rates were applied to estimate bridge replacement timing and costs for locally



owned bridges. Average annual bridge preservation cost estimates were based on the extrapolation of WSDOT data for state-owned bridges, while average annual basic maintenance cost estimates were calculated using industry standard maintenance rates. The development of this methodology occurred through working sessions with the WSDOT Bridge and Structures Office and discussions with regional stakeholders.

Culverts. The approach for estimating culvert replacement needs was developed in consultation with the Washington State Department of Fish and Wildlife (DFW), the Fish Barrier Removal Board, the Association of Washington Cities, and the Maintenance and Preservation Working Group. Based on these discussions, PSRC estimated that one third of all locally-owned culverts will need to be replaced by 2040 due to either fish passage barrier issues or physical deterioration. An average culvert replacement cost of \$1.5 million was utilized in calculations based on historic DFW data. To determine the total culvert cost estimate, the assumed cost was multiplied by the estimated number of culverts (based on a revised inventory provided by DFW)

Other Structures. PSRC requested estimates from jurisdictions on costs to maintain and preserve other structures that support transportation infrastructure. No usable or pertinent data was received.

In total, the projected expenditure for the maintenance and preservation of city and county structures through 2050 is over \$5 billion.

Other Asset Classes

For asset classes where developing an outcome-based approach was not feasible due to insufficient data, PSRC continued using the approach of extrapolating historic investment trends compiled using BARS data. This dataset includes annual transportation-related expenditure information reported to the State Auditor directly by cities and counties.

Asset classes that received this treatment include bicycle and pedestrian infrastructure, street lighting, roadside development (the right-of-way beyond the outside edge of the shoulder), and several other miscellaneous asset and administrative expenses.

Local Transit

Costs to maintain existing local transit operations were calculated based on observed data from WSDOT's Summary of Public Transportation document, as well as transit agency assumptions. Projected expenditures through 2050 are approximately \$47 billion, which includes operating costs as well as maintenance, preservation, and capital replacement needs associated with transit vehicles, maintenance bases, and other locally-owned equipment and facilities.

Starting with current service hours and total service cost, PSRC applied transit agency assumptions of annual service hour cost increases. Administration and capital outlays were grown at inflation. Costs to maintaining passenger-only ferry service and associated capital costs were provided by King County Metro and Kitsap Transit.

Sound Transit

Costs for maintaining and preserving currently existing Sound Transit service were provided by Sound Transit's finance staff. A total of \$40.2 billion was projected for all operations and maintenance costs associated with currently existing Sound Transit light rail, streetcar, commuter rail, and regional



express bus service.

State Ferries

Washington State Ferries (WSF) staff provided estimates for all costs associated with maintaining current levels of ferry service. Calculated by route, these projections incorporate operating expenses for terminals and vessels, including labor, non-labor, and fuel costs. They also incorporate the projected maintenance and capital preservation needs (including vessel replacement) associated with the terminals and vessels. A total of over \$16 billion in need was estimated through 2050 for maintaining current levels of ferry service within the central Puget Sound region.

State Highways

PSRC worked with the Washington State Department of Transportation (WSDOT) to refresh maintenance and preservation estimates for state highway facilities in the central Puget Sound region. Estimates reflect the breadth of maintenance, preservation, and operations activities carried out by WSDOT, including:

- Toll Operations and Maintenance
- Toll Facility Preservation
- Maintenance and Preservation of Facilities Program
- Targeted Safety Investments
- Highway Maintenance
- Pavement/Roadway Preservation
- Bridge Preservation
- Other Facility Preservation
- Traffic Operations
- Environmental Retrofit – Fish Passage

The total expenditure estimate for maintaining and preserving currently existing state highway facilities in the central Puget Sound region through 2050 is just over \$21 billion.

Asset Management Interview Takeaways

PSRC conducted interviews with 15 jurisdictions between November 2018 and January 2019 to learn more about the spectrum of asset management practices across the region. The array of jurisdictions interviewed are regionally representative in terms of geographic location and population size:

- Bremerton
- Buckley
- Duvall
- Edmonds
- Everett
- Kent
- King County
- Kitsap County
- Pierce County
- Poulsbo
- Puyallup
- Seattle
- Snohomish County
- Sultan
- Tacoma



Key Takeaways

Note: Takeaways discussed in this document are based solely on the universe of jurisdictions listed above.

Pavement Data Collection/Management

- Nearly all jurisdictions use the Pavement Condition Index (PCI) to rate their pavement.
- However, there is significant variation in pavement data collection practices, including vendors used, methodologies applied and intervals between assessments.
 - Among the 10 jurisdictions that contract out, 6 different vendors were named. Several jurisdictions said they regularly switch vendors between assessments
 - Intervals for comprehensive arterial assessments ranged from every 2 to every 8 years among medium-sized and large cities. For smaller jurisdictions assessments were either less frequent or non-existent.
 - Data collection methodologies vary, ranging from windshield assessments to more sophisticated laser technology.
- An array of software programs with different functionality and analysis capabilities are being used to manage pavement data and inform investments
 - Over a dozen different software programs were mentioned by cities as being instrumental to their management of pavement data and assets, including specialized Pavement Management Systems (e.g. Streetsaver), broader Computer Maintenance Management Systems (e.g. Cartegraph), and more conventional programs such as Excel and ArcGIS.
 - All counties utilize the County Road Administration Board’s (CRAB) Mobility program, since it is provided to them at no cost and produces information in the format requested by CRAB.
 - Many jurisdictions use a combination of different programs/modules as part of their asset management approach.
- These differences make “apples-to-apples” comparisons across jurisdictions difficult
 - Based on these interviews and a conversation with CRAB staff, it appears clear that different data collection methods can lead to significantly different condition assessments.
 - As a result, data integrity is not necessarily consistent across jurisdictions or within jurisdictions (when they change their data collection approach)

Pavement Investment Prioritization

- Pavement preservation investments are typically decided based on some combination of various factors, including condition data
 - While condition data and (in some cases) subsequent analysis via a Pavement Management System typically factors significantly into investment decisions, other key variables sometimes include:
 - Availability of funding/grants with specific criteria;
 - Political considerations;



- Schedule alignment with other utilities work;
- Overlap with priority networks (e.g. transit, freight);
- Geographic proximity to other planned work; and
- Subjective assessment by staff based on a common understanding of need.
- There is significant variation across jurisdictions in terms of how condition data and other factors are weighted in investment decisions.
- Arterials and local streets are often handled differently, per the factors listed above and depending on the jurisdiction.
- While most jurisdictions strive to make proactive investments, many are forced to be more reactive due to glaring needs
 - There was general agreement among interviewees that taking a proactive approach to asset management is preferable, if possible. The concept of the "maintenance curve" and potential benefits of lifecycle planning appear to be well understood.
 - In practice, some jurisdictions (e.g. Puyallup, Snohomish County) are able to both dedicate substantial resources to preventative maintenance (i.e. "keeping good roads good") while others must take a more reactive approach and focus primarily on addressing their rehabilitation backlog and roadways that have the greatest need (i.e. the "Worst First" approach).

Other Takeaways Re: Pavement

- Smaller jurisdictions are different; they have minimal resources and tend to rely more on local knowledge than quantitative data to make investment decisions
 - The smaller the jurisdiction, the less frequently they tend to collect system-level data and the less precise that data is.
 - Smaller jurisdictions are less likely to have specialized software for asset management.
 - The two smallest jurisdictions we spoke with (Buckley and Sultan) base investments on a more qualitative, shared understanding among staff of where the need is. Regular maintenance is generally limited to filling potholes.
- A number of jurisdictions are currently attempting to transition towards more sophisticated asset management programs, however a lot of research and work is required to determine what works best
 - Desired changes include:
 - Improving data collection methodology and increasing frequency;
 - Obtaining and utilizing more effective asset management software and pavement modeling systems; and
 - Developing and adopting more strategic, long-term pavement management plans
- Aside from the counties there is little contracting and partnering occurring between different jurisdictions



Costs/Dedicated Resources

- There was general agreement among jurisdictions that there are not enough available funds to meet the outstanding maintenance and preservation need
 - There was a consensus that existing local mechanisms, funding competitions, and grant opportunities are generally not enough to meet the current level of need.
 - Local funding mechanisms for maintenance and preservation investments that were cited include transportation levies, Transportation Benefit Districts, various utility funds, sales tax, business and occupation taxes, and other mechanisms.
- There are several additional challenges that jurisdictions face in funding pavement maintenance and preservation projects
 - ADA compliance requirements and Complete Streets initiatives have led to an increase in overlay costs per square-foot.
 - Jurisdictions that have a disproportionate amount of truck travel along their road network must more frequently resort to rebuilding roadways, which is more expensive than rehabilitation.
 - State-level policy changes can have negative ripple effects on local maintenance and preservation investments
 - E.g. one jurisdiction that relied heavily on sales tax for maintenance and preservation lost significant revenue when the Department of Revenue switched from a destination-based to an origin-based model, adversely impacting their ability to address need.
- Most jurisdictions do not have full-time staff dedicated entirely to asset management

Structures

- Managing bridges is a significant challenge for a few large jurisdictions that own many of them, but the majority of jurisdictions either own a small number or none at all
- Bridge data collection is more streamlined than pavement due to WSDOT reporting requirements and availability of Bridgeworks software
- Several jurisdictions are attempting to address challenges with culverts, including fish passage barriers and deteriorating structural conditions

Sidewalks

- Some jurisdictions have data (e.g. Seattle, Bremerton) but most do not. This is increasingly becoming an issue with ADA plans being required

Traffic Signals

- Some contract with the state or county for maintenance while others maintain signals in house

Stormwater Facilities

- Meeting continually evolving NPDES stormwater requirements is a significant challenge
- The transportation portion of stormwater costs are not typically parsed out in jurisdiction budgets

