

SDOT PAVEMENT CONDITION UPDATE - 2011 JULY 14

Seattle's Pavement Network

As of 2010, Seattle has an inventory of 3,952 lane-miles (12-ft) of street pavements. These totals do not include alleys or parking lots, which have never been inventoried. The busiest streets, arterials, account for approximately 1,540 lane-miles of the system. Arterials are the city's most critical connectors and are the principal means by which people and goods move about the city. The remaining 2,412 lane-miles are non-arterials, which carry lower volumes, but nonetheless serve a variety of users. Most non-arterials are residential, but some also support commerce and industry in areas such as the Greater Duwamish, Ballard, the International District, and First Hill.

Pavement Condition Rating Methodology

SDOT uses the Metropolitan Transportation Commission (MTC) pavement management system and rating methodology. The MTC rating method is based on the Pavement Condition Index (PCI) rating procedure developed by the US Army Corps of Engineers in the 1970's and described in ASTM standard D6433. It provides engineers and decision-makers with a rational, objective measure of street condition. The procedure was designed to be repeatable and well-correlated with the judgment of experienced pavement engineers.

The PCI method measures the occurrence of several pavement distress types and assigns a PCI score based upon the density (area affected) and severity of the observed distress. Structural, environmental and other types of pavement distresses are captured in this process. The PCI scale ranges between 100 and 0. A PCI of 100 represents a pavement completely free of distress; a PCI of 0 corresponds to a pavement that has failed completely and can no longer be driven safely at the designed speed. Pavement Condition Ratings (PCRs) are associated with ranges of PCI. Table 1 shows the range of PCI values to which each rating corresponds based on the ASTM D6433 scale.

Table 1. Pavement Condition Ratings and Pavement Condition Index Ranges

Pavement Condition Rating (PCR)	Pavement Condition Index (PCI)
Good	86-100
Satisfactory	71-85
Fair	56-70
Poor	41-55
Very Poor	26-40
Serious / Failed	0-25

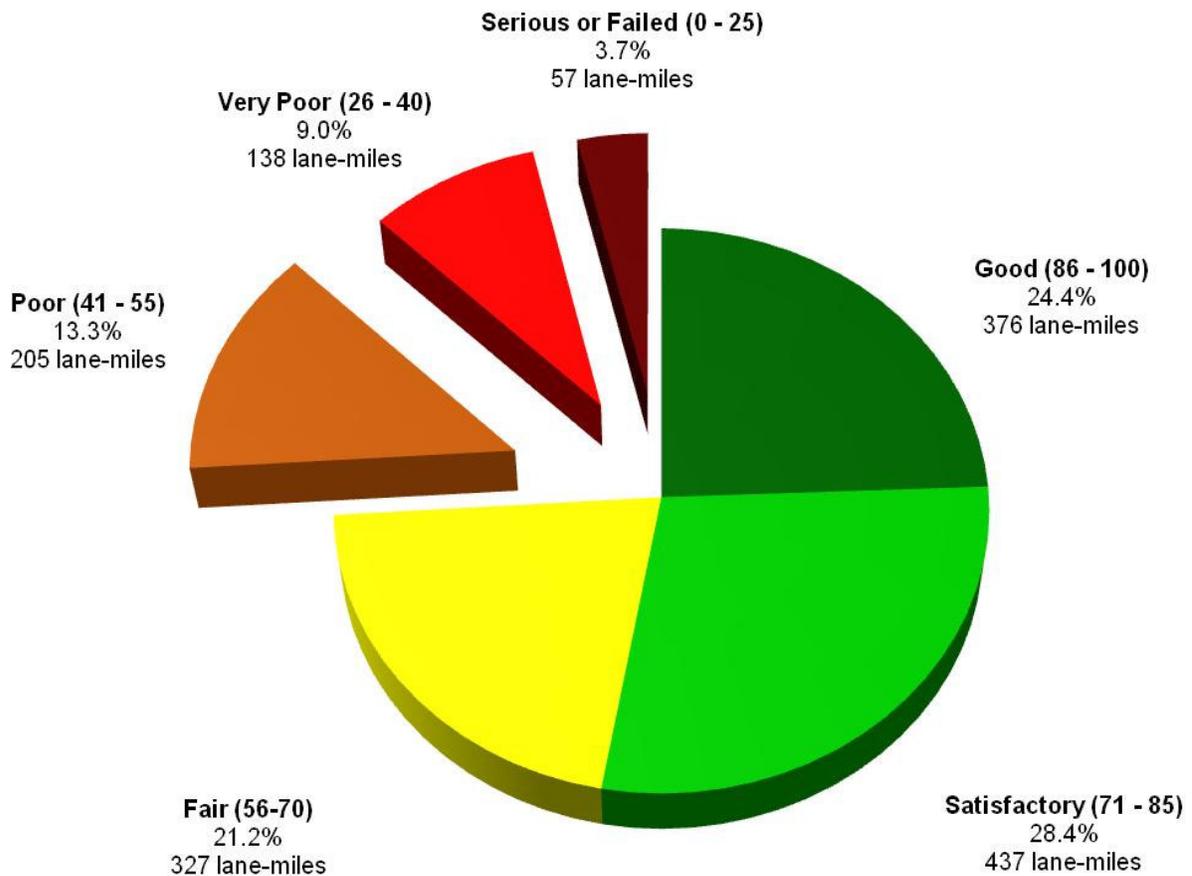
Streets in "Fair" condition or above generally require only routine or preventive maintenance. When pavements reach a condition level of "Poor", they show notable deterioration and are candidates for major maintenance or preservation work such as an asphalt overlay, select

concrete panel replacement, or diamond grinding. Streets in “Very Poor” condition or below have typically deteriorated to the point where potholes and other structural distress are widespread, and the pavement needs to be completely reconstructed.

Arterial Pavement Condition

SDOT evaluates arterial pavement condition every three years. The results of the 2010 pavement condition survey, by PCR, are shown below in Figure 1.

Figure 1. 2010 Arterial Pavement Condition

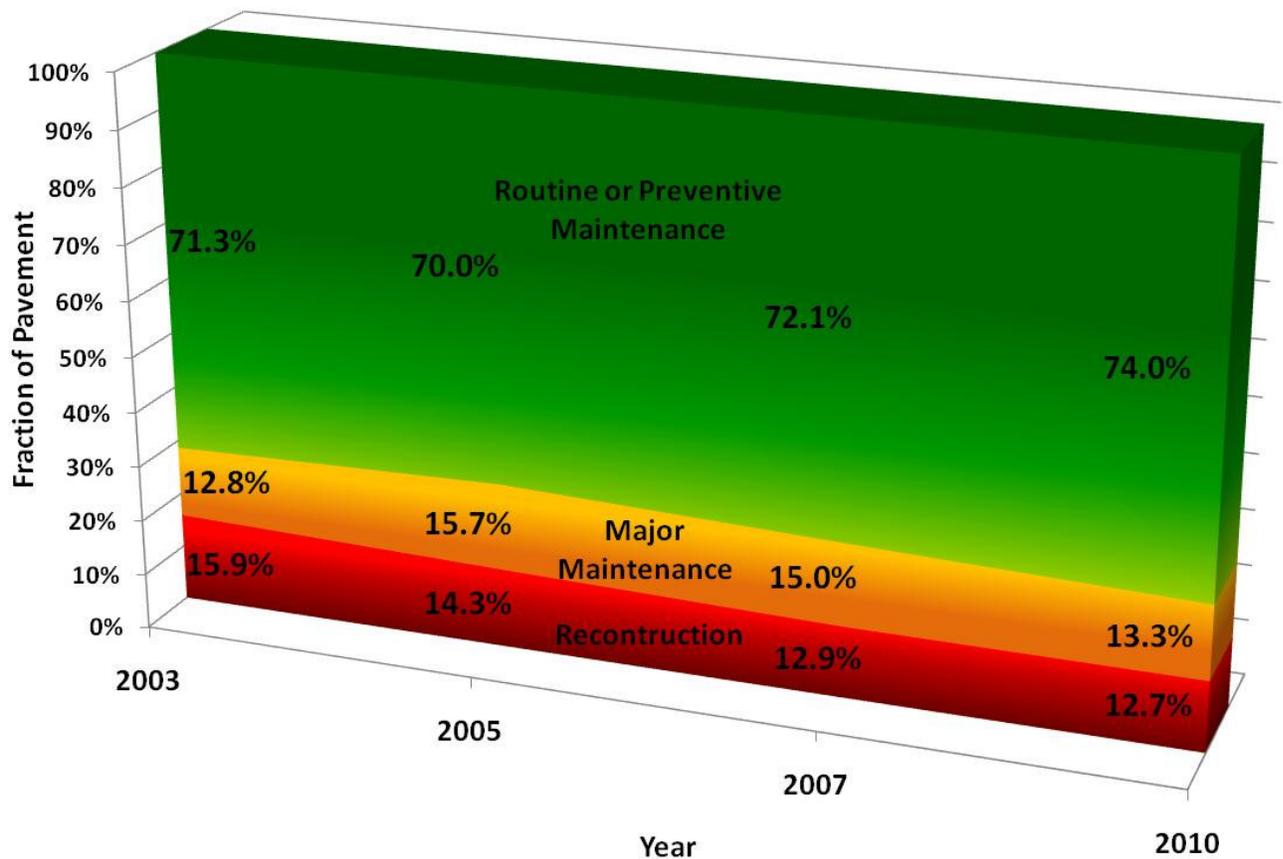


A large fraction (74%) of Seattle’s arterial pavement system is in serviceable condition (“Fair” or better) and requires only routine or preventive maintenance at this time. However, approximately a quarter of the network (26%, “Poor” or below) presently shows a pavement rehabilitation need, major maintenance or reconstruction. This is a significant backlog, representing a total of 400 lane-miles.

Arterial Paving Needs

Since the Bridging the Gap (BTG) transportation levy was approved in 2007, there has been slight progress reducing the number of streets in need of major maintenance and reconstruction. Figure 2 shows the paving needs as estimated following the 2003, 2005, 2007 and 2010 arterial pavement condition surveys.

Figure 2. Arterial Network Maintenance Needs by PCI, 2003 through 2010



A significant deferred maintenance backlog persists, and street rehabilitation has been closely paced by deterioration. Despite the additional BTG funds and the acceleration of the AAC paving program, one out of every four arterial blocks is, on average, still in need of major maintenance or reconstruction.

SDOT's pavement management system models pavement performance using pavement type, age, condition, and paving budget/costs. Based on those factors, it is estimated:

- At the close of 2010, there are 205 lane-miles of arterials (13.3% of the network) at a condition level of "Poor". This is the point at which they show notable deterioration and would be candidates for major maintenance such as an asphalt overlay or select concrete panel replacement. Another 195 lane-miles (12.7% of the network) are in "Very Poor" condition or below. Streets in this category have generally deteriorated to

the point where potholes and other structural distress are widespread, and they will need to be completely reconstructed.

- Seattle's backlog of arterial deferred maintenance stands at approximately \$578 million.
- An average annual investment of \$37 million is required to maintain Seattle's arterial street network at its current condition level (an average PCI around 65), with deferred maintenance stable in the \$600 million range. Over the next twenty years, the funds must deliver a yearly average of 21 lane-miles of major maintenance and 9 lane-miles of reconstructed pavement.
- An annual investment of \$65 million is required to improve the condition of the arterials (to an average PCI of approximately 79) and eliminate deferred maintenance by the year 2030. Over the next twenty years, the funds must deliver a yearly average of 24 lane-miles of major maintenance and 19 lane-miles of reconstructed pavement.
- Over the remaining life of the BTG initiative, 2011 to 2015, the City's main arterial paving fund source (Arterial Asphalt and Concrete Program, TC365440) averages approximately \$20.3 million per year. (Note: Over the 9-year life of BTG, spending will average approximately \$21M annually.) This indicates that the condition of Seattle's arterials will continue to decline overall and deferred maintenance will grow.

Although the existing BTG funds are not proving sufficient to eliminate the backlog of deferred arterial street maintenance, they have allowed progress rehabilitating some of Seattle's most important streets such as 2nd Ave , 4th Ave and Stewart St downtown, Elliot Ave W and 15th Ave W through Interbay, 1st Ave S in SODO, and 15th Ave NE in the University District. The acceleration of the Arterial Asphalt and Concrete Program has stabilized arterial condition.

The basic criteria SDOT uses to establish arterial paving priorities are: street condition, cost and cost effectiveness of treatment (weighing preservation opportunities against full street reconstruction), traffic volume and the types of traffic the street serves (e.g. transit, freight, pedestrian and bicycle), grants and other leveraged funding opportunities, utility coordination, citizen complaints and claims, and geographic balance across the city. All paving projects include installation curb ramps at intersections, bringing street crossings into compliance with current American Disabilities Act (ADA) standards. Projects also incorporate funded Complete Streets elements and drainage infrastructure upgrades to comply with the City's Stormwater Code.

Map of Arterial Paving Needs in 2010 and Paving Projects 2007 to 2015

Attached to this document is a map showing 2010 arterial paving needs compared with projects completed or planned paving projects from 2007 through 2015. Completed and planned projects, shown by the **BLUE** lines, include those funded by Bridging the Gap funded and other sources (e.g. Sound Transit paving on Martin Luther King Jr Way S). SDOT expects to pave on average 20 to 25 lane-miles per year over the life of BTG depending on costs. Since the paving program was accelerated, SDOT has delivered 130+ lane miles.

Arterial paving needs, as identified during the 2010 pavement condition rating project (PCI of 55 or lower), are shown by **RED** lines on the map. Approximately 400 lane miles are rated as poor/very poor/risk of failure. This map demonstrates the current level of need (which will grow over time with pavement deterioration) contrasted with funded paving work.

Non-arterial Pavement Condition and Needs

Estimating maintenance needs on Seattle’s 2,412 lane-miles of non-arterial streets is challenging because condition information is not available. An alternate estimating approach is to use maintenance cycles typical of different pavement types and compare those to the current rate of renewal. Table 2 shows the life cycle of the different pavement types in Seattle’s non-arterial inventory and the current maintenance practice. A proposed maintenance schedule is shown at left, based on what might be realistic from a budget standpoint.

Table 2. Non-arterial Pavement Maintenance Comparative Scenarios

Pavement Type	Current			Proposed		
	Pavement Area (12-foot lane-miles)	Typical Design Life (Years)	Current Seattle Maintenance Cycle (Years)	Maintenance Cycle (Years)	Non-Arterial Paving Cost (\$Million per lane-mile)	Annualized Maintenance Cost (\$Millions)
Concrete Surfaced Streets (PCC)	1,279	40-60	>5,000	160	\$1.6	\$12.8
Asphalt Surfaced Streets (AC, AC/AC, AC/PCC)	583	20-30	> 500	25	\$0.493	\$11.5
Chip Seal (BST)	549	7 – 10	> 30	10	\$0.025	\$1.4
TOTAL						\$25.7

The non-arterial major maintenance proposal above is based on overlays of asphalt streets on a 25-year cycle, replacement of half the concrete street network over the next eighty years and ongoing chip seal efforts. Since little non-arterial paving is currently done, the paving costs are rough estimates. The proposal does not take into account asphalt surfaced pavements that have already failed or will fail because of inadequate maintenance. Those streets will require reconstruction, at an additional cost beyond the yearly budget estimate. Moreover, the 160-year concrete replacement cycle used in this analysis is extremely optimistic.

Current annual budgets for non-arterial street rehabilitation and seal coating, around \$865,000 in total, are far below the \$25.7 million per year estimate of what would constitute a reasonable non-arterial paving budget. Within the current budget limits, SDOT primarily focuses on residential chip sealing and repairing busy non-arterials used by transit buses, bicyclists and industry, or around hospitals and other locations with heavy pedestrian traffic crossing the street. The small non-arterial paving projects include curb ramp installation at intersections, bringing street crossings into compliance with current American Disabilities Act (ADA) standards.