

# PRESERVATION STRATEGIES FOR THE CONCRETE PAVEMENT NETWORK OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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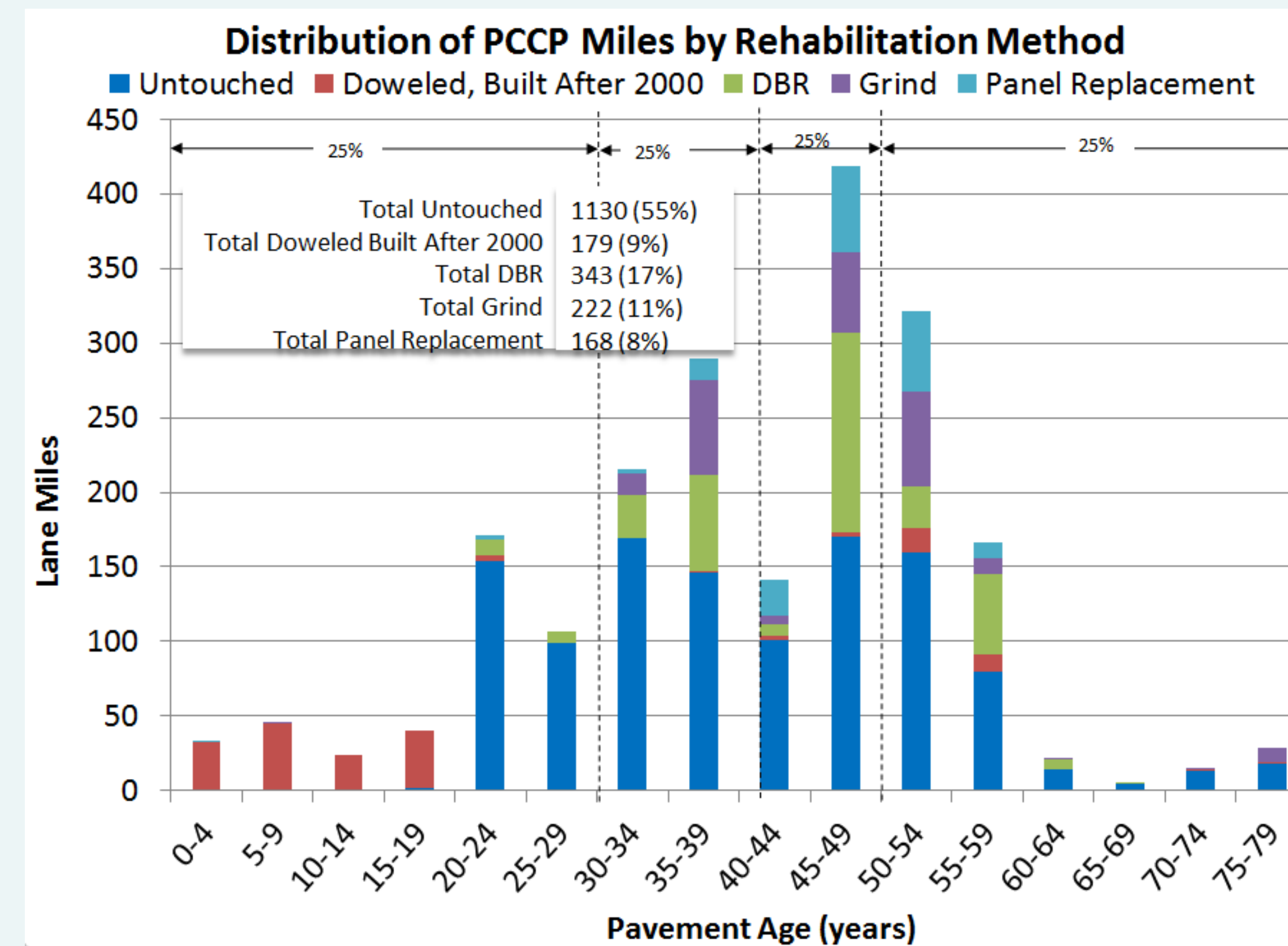


## ABSTRACT

The Washington State Department of Transportation (WSDOT) has about 2,400 lane miles of concrete pavements. The pavements have far exceeded their original design lives and carried several times the estimated traffic loading. WSDOT is facing an accelerating rehabilitation backlog and enormous rehabilitation need due to the continuously reduced preservation funds in the past. However, like most State Departments of Transportation, WSDOT's roadway preservation budget has been reduced. The ability to maintain a good performance level with reduced funding comes from using innovative techniques and picking the best investment alternatives wherever possible. This paper describes the development of preservation strategies for WSDOT concrete pavement network. The strategy accounts for the current pavement conditions, predicted future conditions and agency financial constraints.

## BACKGROUND

- ❖ **WSDOT's 2,400 lane-miles concrete pavements**
  - Vary in age between 1 and 75 years.
  - The majority were built in the 1950s and 1960s (Jointed Plain Concrete Pavements without dowels), and the original design life was 20 years.
  - 50% have never been maintained, and the average age is 40 years.
- ❖ **WSDOT's budget constrains**
  - Growing backlogs of concrete pavement rehabilitation needs throughout the state.
  - Development of preventive strategies to delay or avoid capital construction spending.



WSDOT concrete pavement lane-miles in 2016

## MONITORING PAVEMENT PERFORMANCE

- ❖ **The Washington State Pavement System** monitors the performance of each 0.1 lane-mile pavement section
  - Cracking, Spalling and Patching
  - Faulting
  - Roughness and Rutting
- ❖ **Concrete pavement rehabilitation methods**
  - Grinding
  - Dowel Bar Retrofit (DBR)
  - Reconstruction
- ❖ **Pavement rehabilitation trigger values**

### Reconstruction/CSOL:

- >15% panels having multiple cracking, or
- >60% of slabs having single cracking, or
- The combination of other distresses causing the same damage.

### DBR for undoweled sections:

- >10% of slabs having 0.5" or higher faulting, or >25% of slabs having 0.25" to 0.5" of faulting, or > 50% having 0.125" to 0.25" of faulting, or the combination causing same damage; and
- Pavement age less than 50 years; and
- All type of cracking and high patching <10%.

### Grinding:

- >25% of slabs have faulting, or
- Rutting > 0.5", or
- IRI > 220 in/mi.

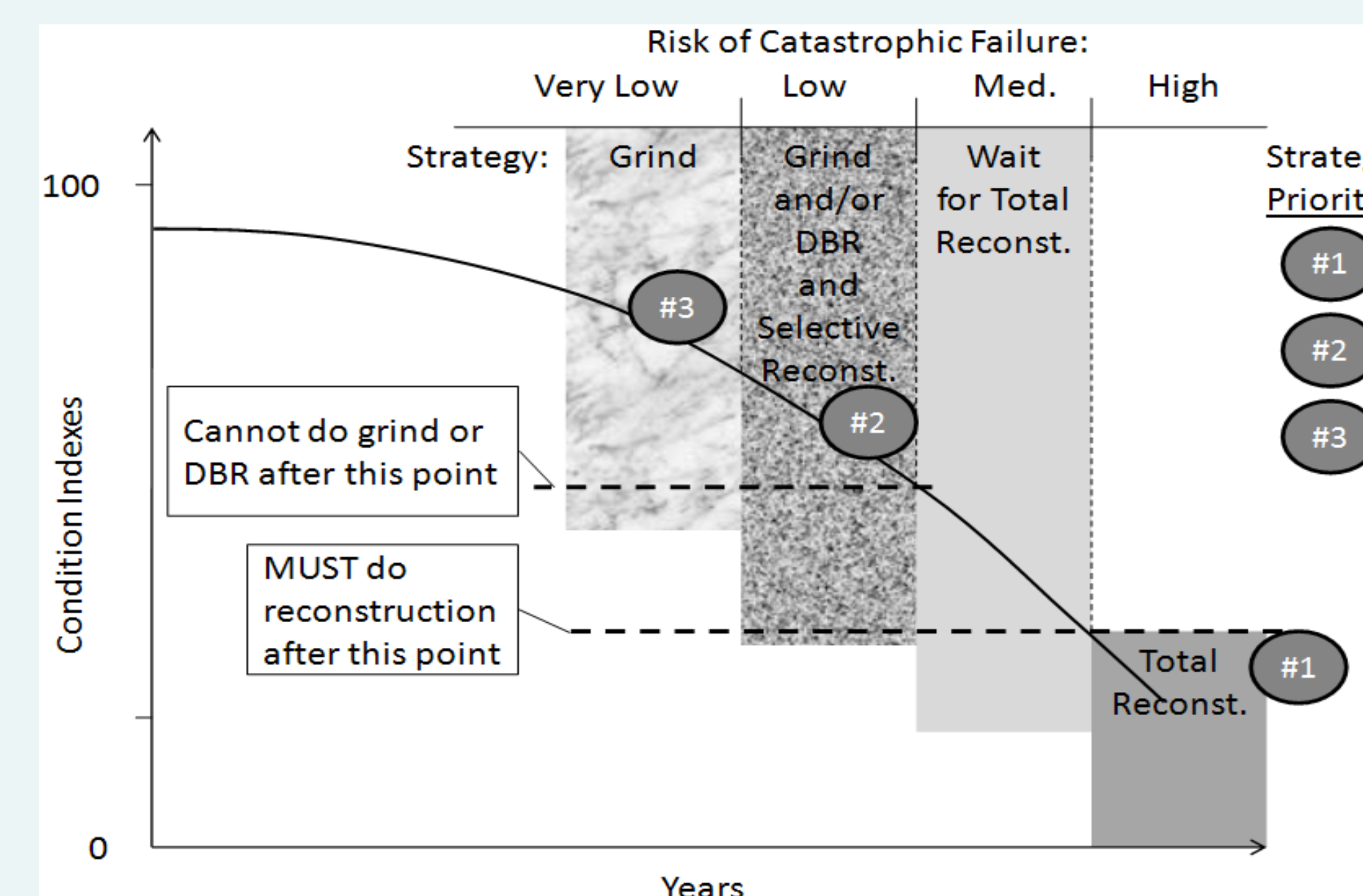
## ❖ WSDOT concrete pavement rehabilitation needs in 30 years (fiscal year 2016-45)

- Rehabilitation alternatives at the lowest life-cycle cost are selected.
- A detailed list of proposed projects for the 2016-25 periods was developed and defined as the rehabilitation needs assuming no budget constraint occurs.
- The plan for 2025 - 2045 is naturally less detailed and more subjective, given the lack of certainty in estimating future road conditions and needs over a 30-year period.
- Comparing to concrete reconstruction, CSOL saves \$1.6 million dollars and 90 closure-hours per lane-mile. Over the next 30 years, there will be 600 lane-miles of WSDOT concrete pavements converted to flexible pavements by CSOL.

	Triage		Reconstruction/CSOL*		Total Cost (\$million)
	Lane-mile	Cost (\$million)	Lane-mile	Cost (\$million)	
<b>2016-25</b>	366	156	515	611	767
<b>2026-35</b>	567	198	174	268	466
<b>2036-45</b>	417	146	504	776	922
<b>Total</b>	1,350	500	1,193	1,655	2,155
<b>Annual Average</b>	45	17	40	55	72

## PAVEMENT REHABILITATION NEEDS

- ❖ **Reconstruction and risk of catastrophic failure**
- ❖ **Priorities for concrete pavement expenditures**
  - #1: High risk that requires reconstruction/CSOL.
  - #2: DBR and/or grinding to postpone reconstruction.
  - #3: Grinding.



Concrete pavement performance and rehabilitation alternatives

## CONCLUSIONS AND RECOMMENDATIONS

- WSDOT is facing an accelerating rehabilitation backlog of the concrete pavements due to the continuously reduced preservation funds.
- The analysis of WSDOT concrete pavement performance data provides a quantitative understanding of the concrete pavement network.
- The newly updated concrete pavement condition indices are able to reflect the pavement structure conditions and rehabilitation methods properly.
- Maintaining sections that are currently due for rehabilitation.
- Integrating preventive activities with rehabilitation strategies.

