

Background

Walnut Bend Lane is a 40-foot two-way undivided roadway. Currently, more than 50% of the concrete pavement on Walnut Bend Lane is in very poor condition and is cracked. The shoulder joint has deteriorated and is now open. Water will enter this joint and continue to cause the erosion of the layers supporting the concrete.

Maintenance Scenario

One way to maintain the function of the roadway is to conduct a full depth repair of joint concrete where needed.

Full depth repair reinstates the structural integrity of the shoulder and fixes the localized structural problems. However, the expected life extension for full depth repair maintenance is between 5 to 15 years. Therefore, at this repair will need to be completed at least twice in order to ensure a minimum 20 year useful maintenance period.

Maintenance Cost

Walnut Bend from Westheimer Road to Westpark Drive is 1.06 miles long. The width of the concrete pavement is about 40 feet. According to *TxDOT 2014 Average Low Bid Unit Prices* (<http://www.txdot.gov/business/letting-bids/average-low-bid-unit-prices.html>), the cost for full depth repair of joint concrete pavement is \$210/yd².

Assume that 50% of the existing concrete pavement needs full depth repair and would have to be done twice within next 20 years, the total cost for full depth repair would be:

$$\begin{aligned} \text{Cost}_{\text{Full Depth Repair}} &= L \times W \times 0.11111 \times P \times F \times C \\ &= 5,597 \times 40 \times 0.11111 \times \$210 \times 2 \times 50\% \\ &= \$5,223,2679.95 \end{aligned}$$

Where *L* is the project length 5,597feet (1.06 miles)

W is the width of concrete pavement 40 feet

P is the unit price of full depth repair of joint concrete pavement

F is the full depth repair frequency, which is 2 times during the next 20 years

C is the percentage of cracked concrete

Reconstruction Scenario

Another way to maintain the function of the roadway is to reconstruction the roadway, which the proposed project intends to do. The total estimated cost of reconstruction of both the back-of-curb and roadway of Walnut Bend Lane from Westheimer to Westpark Drive is \$9,134,868. A reconstructed roadway can be expected to last for 40 years.

Benefit Cost Analysis

In summary, the projected maintenance cost of the current roadway conditions can be estimated at \$5,223,679.95, which is more than half of the reconstruction cost. In addition, the remaining 50% of pavement (the portion in “fair” condition now) will need maintenance within an additional 10 years. Therefore, the total cost of maintenance within the next ~30 years will be higher than the reconstruction cost. Compared with maintenance, reconstruction of Walnut Bend from Westheimer to Westpark is the preferred alternative economically.