# Asphalt Value Proposition:

# Perpetual Pavement

## Benefits of Partnering to Design Long-Life Pavements

**Collaborative partnerships between industry, academia and government agencies provide fiscally responsible pavement structures that yield dividends for taxpayers for decades.** A Perpetual Asphalt Pavement, properly designed and constructed, lasts longer than 50 years without requiring major structural rehabilitation or reconstruction, and needs only periodic surface renewal in response to distresses confined to the top of the pavement (Newcomb, 2002). In addition, many pavements that were not originally designed as perpetual can become Perpetual Pavements by adding structure — 1 inch of asphalt at a time. California employs these philosophies in its roadway network when building Perpetual Pavements.

The Sacramento I-5 Capital Corridor enhancement project, led by the California Department of Transportation (Caltrans), utilizes a Perpetual Pavement, or Long-Life Pavement, design approach developed by the University of California Pavement Research Center (UCPRC), Caltrans and the asphalt pavement industry. The project rehabilitates approximately 67-lane miles on a heavily traveled section of I-5 using asphalt overlays. The project, awarded on March 20, 2019 to a joint venture, posted a winning bid of $275 million. Representatives Tony Limas with Granite Construction Co. and Dana Davis with Teichert Aggregates note they are appreciative of the opportunity to work with Caltrans and the University of California Pavement Research Center on these innovative Perpetual Pavement projects.

Construction on I-5 began in the Fall of 2019 and was scheduled to run through the Fall of 2021. The project utilizes approximately 350,000 tons of base materials in three types of engineered asphalt mixtures and an additional 195,300 tons of dense-graded Superpave mix, plus a rubberized open-graded friction course for the asphalt surface.

A life-cycle cost analysis for the new and existing lanes indicates that using a Perpetual Pavement design methodology saves Caltrans approximately $40 million in undiscounted direct asphalt paving costs over the next 60 years when compared to conventional rehabilitation strategies. The Perpetual Pavement design approach has a 4 percent higher initial cost, but no rehabilitation costs over the analysis period. The pavement maintenance schedule includes a 2.4-inch upper-structural layer every 20 years instead of every 10 to 15 years required with traditional pavement designs. Perpetual Pavement design results in undiscounted overall savings of approximately 40 percent. John Harvey, Ph.D, P.E. of the UCPRC stated, “Long-Life Pavement designs provide a high likelihood of reduced life-cycle cost, as well as environmental benefits, by requiring less material over the design life and fewer rehabilitation and maintenance construction events. Caltrans’ first Long-Life Pavement project on the most heavily trafficked stretch of state highway [SR-710] is 17 years old and only the open-graded surface has been repaved. The last deflection testing indicated no structural damage.”

Not included in California's life-cycle cost analysis calculations are the reduced road user costs due to less frequent maintenance resulting in approximately 65 percent fewer paving construction shifts over the 60-year period when calculated by UCPRC using the life cycles and construction productivity estimates from Caltrans' life cycle cost analysis manual. Research also shows that asphalt pavements are resurfaced in "fair" condition (Robbins & Tran, 2018), allowing agencies to save on rehabilitation costs and improve motorist satisfaction. In fact, the Federal Highway Administration has determined that pavement smoothness is a key factor to ensuring satisfaction for road users (FHWA, 2002).

The use of Perpetual Pavement design in California is part of Caltrans' careful process of implementing research-based innovation and desire to implement a data-driven processes. Caltrans uses performance-related specifications to integrate mixture design with mechanistic-empirical structural design (Wu, Harvey, Buscheck, & Mateos, 2018). Lessons learned working with the asphalt pavement industry and the UCPRC are applied to future projects, resulting in higher quality asphalt pavements being designed and constructed for California motorists. Thomas Pyle, Chief of the Caltrans' Office of Asphalt Pavement stated, "Long-Life Pavements are important to Caltrans because they not only make sense environmentally but also economically. Rehabilitation strategies that last for decades eliminate future construction lane closures to the public. This reduces GHG [greenhouse gas] emissions due to no traffic slowdowns in a construction zone, as well as better use of existing resources. While these strategies may cost more now, economically they allow for more roadway repair funding flexibility in the future as demand for the same dollars is lessened."

True Perpetual Pavement design harnesses the material properties within each pavement layer to optimize pavement performance and increase pavement life. The asphalt industry has a free, third-party verified pavement design tool, PAVEXpress (www.PAVEXpress.com), which has the ability to design Perpetual Pavements. State agencies can leverage this philosophy to reduce the overall life-cycle costs of pavements within their current management system while reducing maintenance needs and user delays from construction events. To learn more about Perpetual Pavements and their design advantages, read NAPA's free publication "*Perpetual Pavement: A Manual of Practice.*"

**Recommendations:**

1. Utilize the NAPA publication "Perpetual Pavement: A Manual of Practice" to design new Long-Life Pavements.
2. Explore the use of PaveXpress (www.PAVEXpress.com) and its Perpetual Pavement design tool.

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