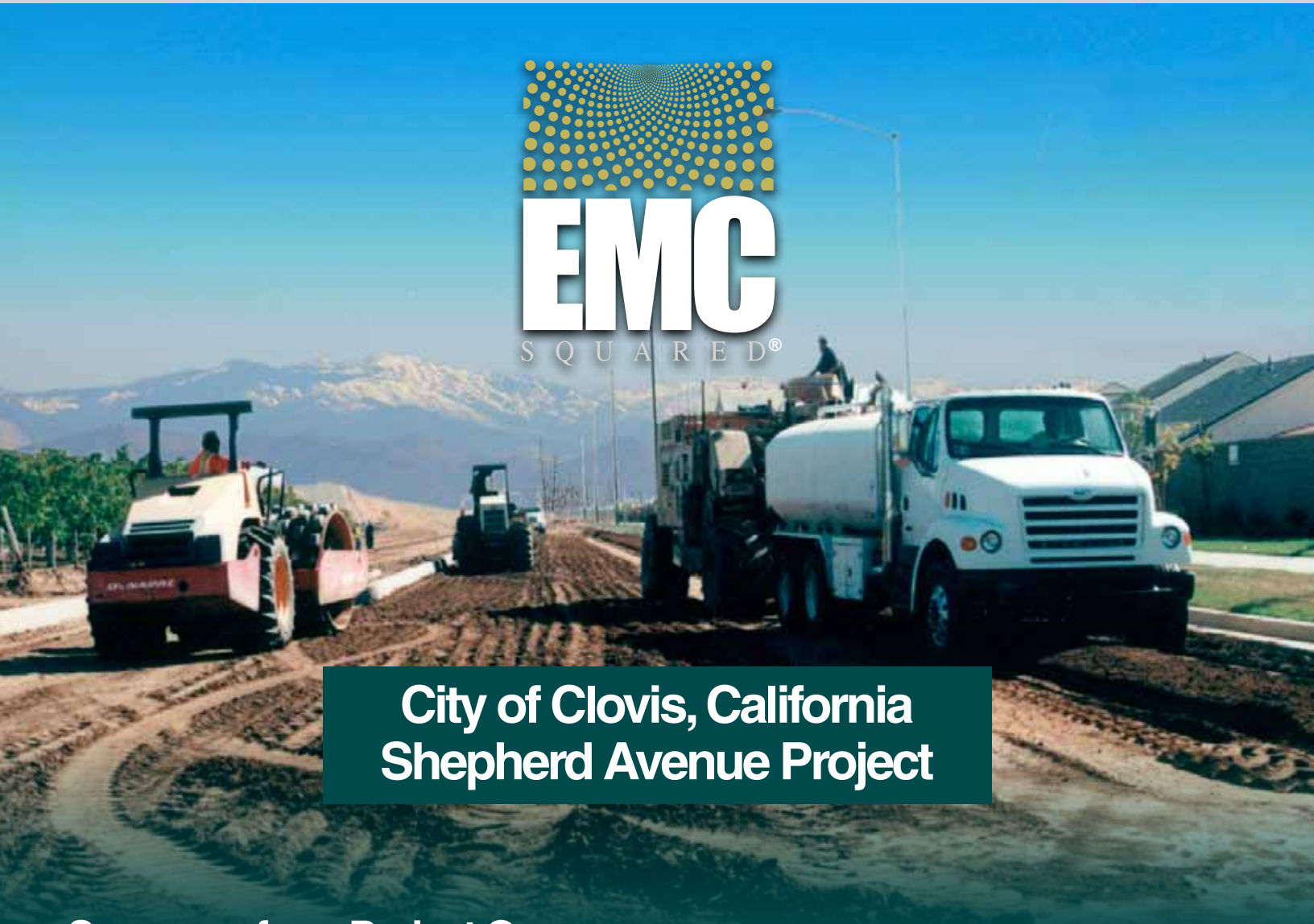
Advancements In Design And Product Technology Reduce Requirements For Road Materials

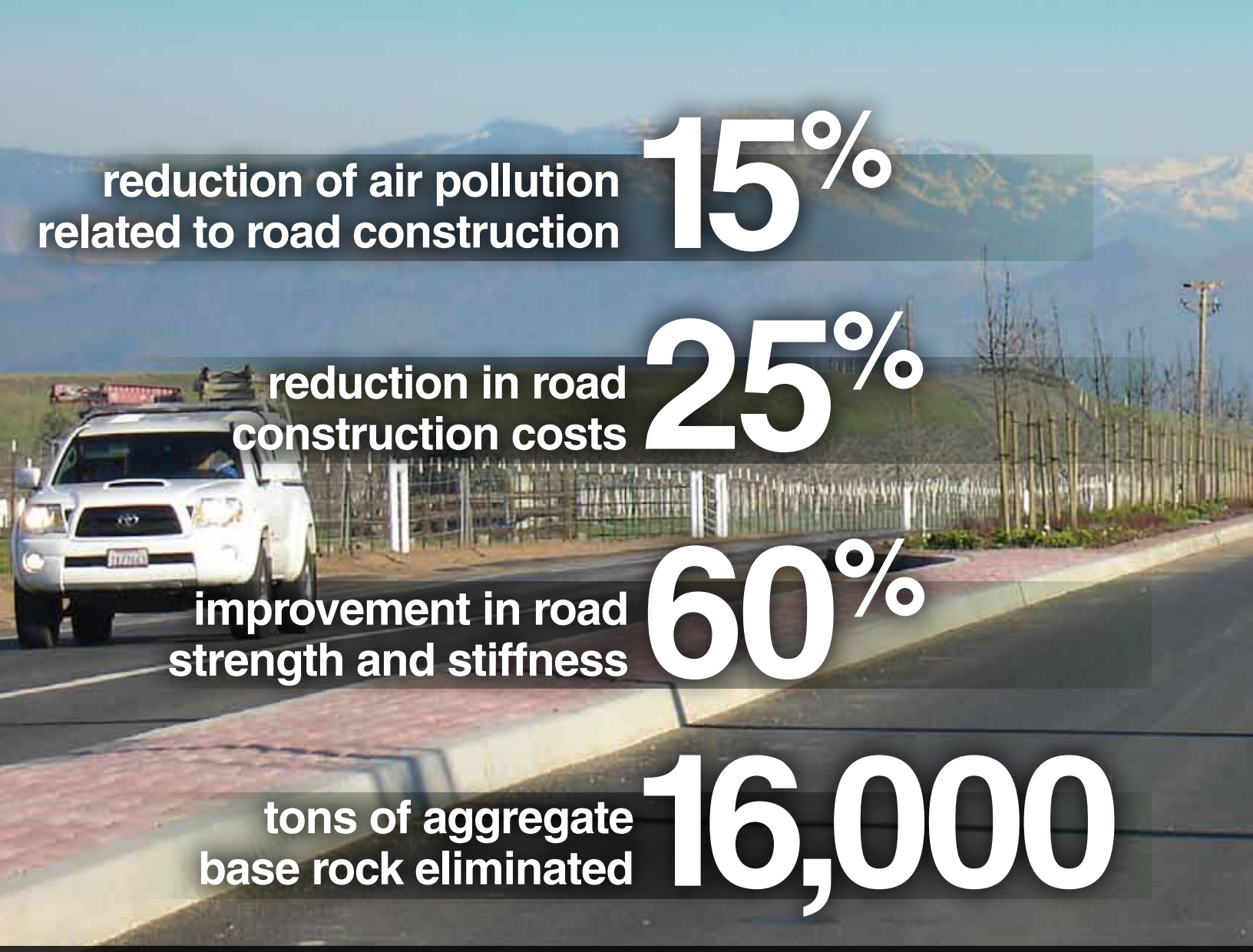
And Deliver Revolutionary Cost Savings On Expressway Rehabilitation Project



City of Clovis, California Shepherd Avenue Project

Summary from Project Owner:

"A one-mile roadway composed of 3 lane miles of expressway in the City of Clovis, California was constructed using non-conventional techniques. This first time project resulted in $250K cost savings, improved long term maintenance performance and reduced constructed related air pollution by 15%. Conventional methods typically include placement of asphalt surfacing over layered sections of imported/compacted aggregate base (AB) and compaction to 95% 2.5 feet below finish grade. Instead, the City pre-conditioned the Developer to employ a Mechanistic-Empirical (M-E) design approach using FHWA design criteria. The final design eliminated the traditional base course requiring 16,000 tons of Class 2 AB (640 truck loads) and replacing this section with a stabilized treatment of on-site subgrade soils and a stabilized 4-inch base layer comprised of recycled asphalt pavement (RAP) from the original roadway. This new approach to road design/construction allowed the City of Clovis to achieve increased quality features for the expressway when comparisons were made with Falling Weight Deflectometer (FWD) testing of the recently completed traditional constructed 1-mile pavement structural section of Shepherd Avenue adjacent to this project."



reduction of air pollution related to road construction **15%**

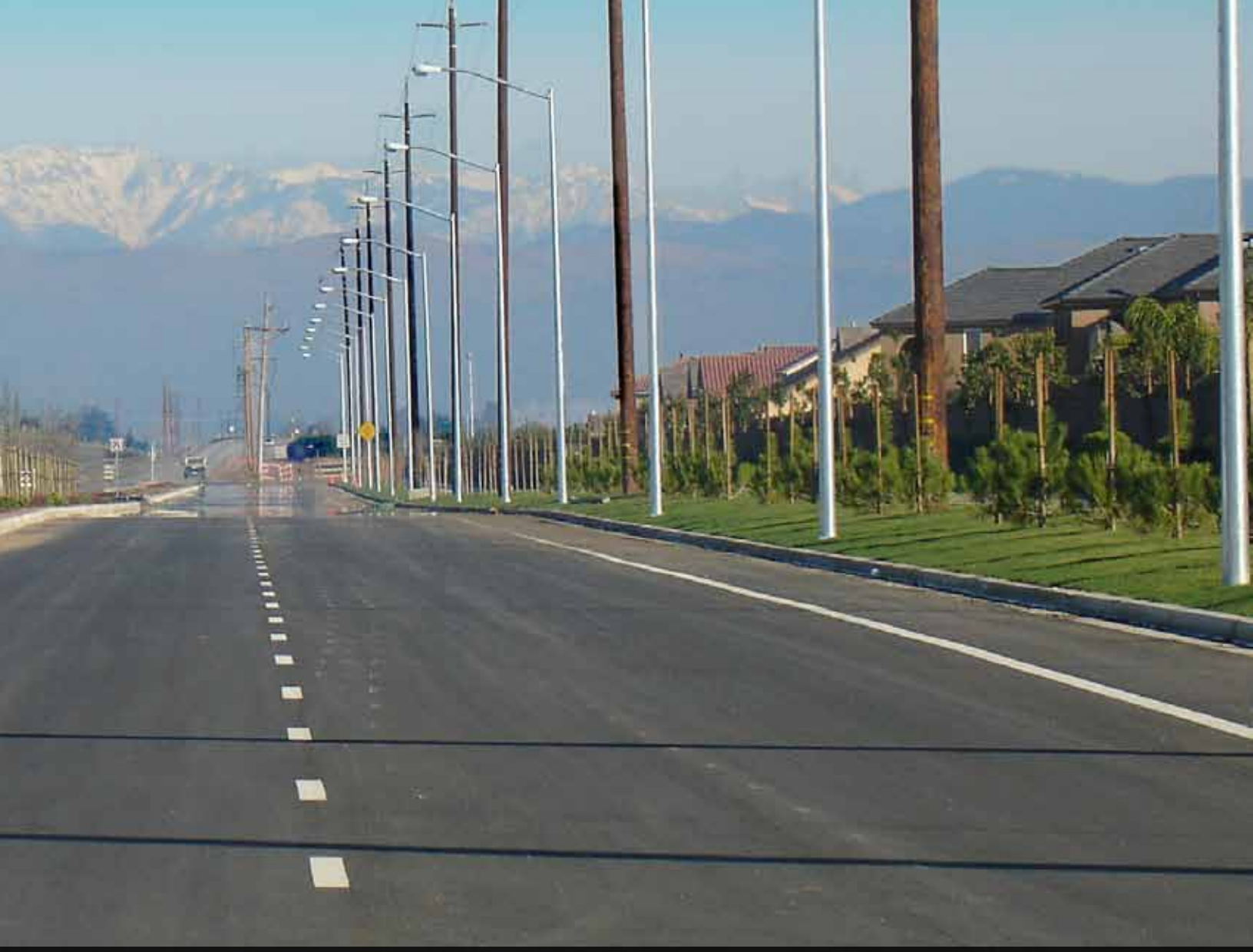
reduction in road construction costs **25%**

improvement in road strength and stiffness **60%**

tons of aggregate base rock eliminated **16,000**

Project Report from City of Clovis

Because of a development and construction boom in Fresno County, California, resources for road construction were costly and in short supply. The City of Clovis conditioned the developer of the adjacent Master Planned Community to reconstruct and upgrade a one mile length of Shepherd Avenue, one of the expressways running east – west through the community. City officials were interested in using a more innovative design method for determining the pavement structural section (PSS). The City's pavement design consultant utilized a more sophisticated Mechanistic-Emperical (M-E) design approach promoted by the Federal Highway Administration (FHWA) in lieu of the dated Empirical design approach used by the California Department of Transportation (Caltrans) in the interest of designing a PSS that would be both stronger and less costly than the conventional design. The M-E design procedure used input from resilient modulus testing conducted prior to design and construction. Based upon the resilient modulus test results, the pavement design consultant selected an EMC SQUARED System stabilizer product to treat both the existing subgrade soils and the recycled asphalt pavement (RAP) materials that were reclaimed from the previous pavement surfacing. The PSS design developed according to the M-E design methodology eliminated a requirement for 16,000 tons of crushed aggregate base material by instead strengthening the subgrade soils and the RAP materials with the EMC SQUARED System stabilizer treatment. The EMC SQUARED System products are Concentrated Liquid Stabilizers (CLS) that are added to the compaction water during conventional road construction procedures. Specimens of the stabilized soils and stabilized RAP materials were sampled on a daily basis during construction and subjected to Resilient Modulus Testing in a pavement materials laboratory to confirm that the stabilized subgade and base course constructed in the field were meeting or exceeding the modulus values that were used in the PSS design. Falling Weight Deflectometer (FWD) testing, a Non-Destructive Test (NDT) method, was also conducted on the completed pavement structural section following construction. As reported by the City, the FWD test results showed that the section of expressway constructed with the EMC SQUARED System stabilized materials provided a 60% improvement in strength and stiffness over the attached section of Shepherd Avenue that had been constructed according to the conventional Caltrans design that required a thicker layer of asphalt pavement and twelve inches of crushed aggregate base material.



Benefits to the City of Clovis and Lessons Learned

Utilized Resilient Modulus testing (dynamic method) versus R-Value testing (static method) to assess the strength qualities of the subgrade soils: Resilient Modulus testing identified the subgrade soils with poor engineering qualities, where R-Value testing identified the subgrade soils with strength qualities of an aggregate subbase material. Additional laboratory classification testing confirmed poorer quality characteristics of the subgrade soils than had been predicted by R-Value testing.

- Design pavement layer utilized Caltrans Specification ¾" Type 'B' max medium w 15% recycled aggregate pavement, Asphalt Cement – AR8000 in lieu of the traditional ½" Type 'B', Asphalt Cement – AR4000, resulting in strength improvement of 13% in the pavement layer.
- Properly stabilized in-situ materials removed the need to transport 640 truck and trailer rigs with base rock to the project site, which thereby reduced traffic congestion, wear and tear on the city streets, and improved air quality during construction phase, plus did not diminish scarce aggregate resources.
- Road sections that employed QC/QA testing/inspection procedures versus Method specification met or exceeded design requirements.

Benefits of the EMC SQUARED® System

The net savings reduced overall construction costs for the one mile long expressway project by approximately $250,000.00. Like many other areas throughout California and the nation, aggregate materials in the project area are mined from quarries and riverbed deposits that are rapidly being exhausted in the nearby area. Since the construction of this project, round trip hauls for aggregate have gone from 20 to 30 miles out to 125 to 175 miles per load, so the savings today would be closer to $400,000.00. The cost advantages of EMC SQUARED System treatment become even more attractive. Then factor in the savings in the road wear by eliminating 640 truck trips averaging 150 miles per trip to build just one mile of new roadway.

City, county and state taxpayers have subsidized the construction of new roads by providing the paved road network being destroyed by lengthy aggregate hauls, a terrible waste of public resources. As the transportation costs, the air pollution and road wear associated with these long hauls mount up, the built-in demand for proven stabilization treatement becomes apparent. This project was constructed in the San Joaquin Valley, an air basin with extreme air pollution problems. The city reported that the replacement of imported aggregate base rock materials by in-place stabilization of asphalt millings and native soils reduced project related air pollution by fifteen percent.

Stabilization Products LLC

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Canadian Sales: Road Milieu Technologies, Ltd. (780) 875-9159

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"TRANNY Award Nomination"

Category

Project
Shepherd Avenue Reconstruction
Highway Rehabilitation - Expressway

Program
Design/Environmental

Nomination
Shepherd Avenue Reconstruction
City of Clovis

Nominator
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Summary

A one-mile roadway composed of 3 lane miles of expressway in the City of Clovis, California was constructed using non-conventional techniques. This first time project resulted in $250K cost savings, improved long term maintenance performance and reduced constructed related air pollution by 15%. Conventional methods typically include placement of asphalt surfacing over layered sections of imported/compacted aggregate base (AB) and compaction to 95% 2.5 feet below finish grade. Instead, the City pre-conditioned the Developer to employ a Mechanistic-Empirical (M-E) design approach using FHWA design criteria. The final design eliminated the traditional base course requiring 16,000 tons of Class 2 AB (640 truck loads) and replacing this section with a stabilized treatment of on-site subgrade soils and a stabilized 4-inch base layer comprised of recycled asphalt pavement (RAP) from the original roadway. This new approach to road design/construction allowed the City of Clovis to achieve increased quality features for the expressway when comparisons were made with Falling Weight Deflectometer (FWD) testing of the recently completed traditional constructed 1-mile pavement structural section of Shepherd Avenue adjacent to this project.

Contributors

Lloyd Crask, GE
City of Clovis

Joey Araiza, Senior Inspector
City of Clovis

Bob Randolph, President
Soil Stabilization Products Company

Bob Oliver
TriCounty Grading & Paving

Kevin Castanos
Wathen Castanos Developer

Leo Wilson
Wilson Homes Developer

Gary Meadows
Garret Construction

"TRANNY Award Nomination"

Project
Highway Rehabilitation – Expressway
Nomination
Shepherd Avenue Reconstruction

Program
Highway Design/Environmental
Nominator
Steven White, P.E., City Engineer

Description

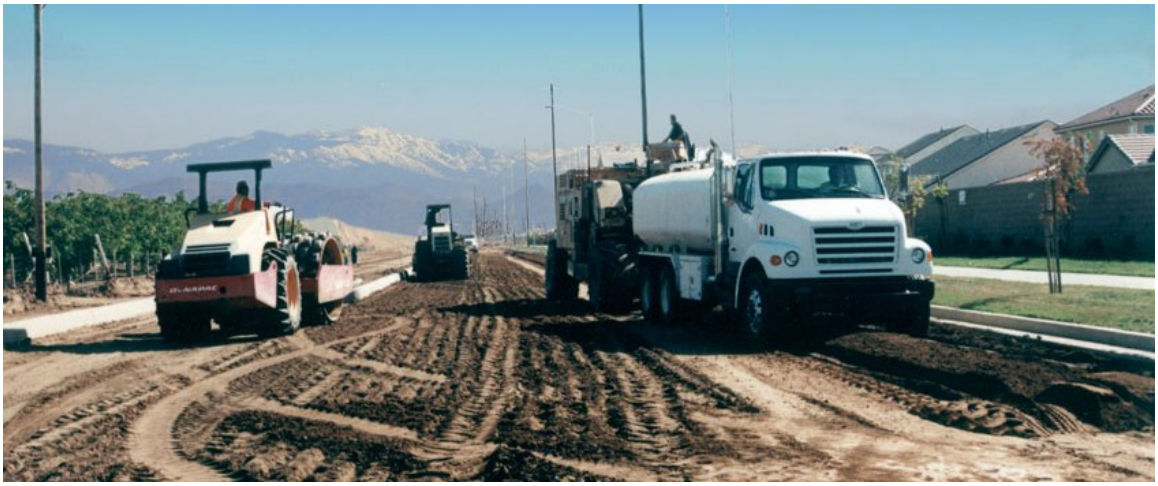
Because of a development and construction boom experienced in Fresno County, California, resources for road construction were in short supply during the Summer and Fall of 2005. The City of Clovis conditioned the developer of adjacent property to reconstruct of Shepherd Avenue (Expressway) from Temperance Avenue to DeWolf Avenue (1-mile in length). During late Spring 2005, City of Clovis officials were inquiring about a non-traditional approach to design methods for highway pavement structural sections (PSS). Through discussions with Lloyd Crask, G.E., a city consultant, proposed the use of a Mechanistic-Emperical (M-E) design approach by FHWA in lieu of the Emperical design approach by Caltrans. The M-E procedures incorporated resilient modulus testing of the soils in lieu of R-Value testing procedures. The final PSS design eliminated 16,000 tons of Class 2 aggregate base material by using instead the environmentally safe EMC Squared stabilization method of treating the subgrade soils and recycled pavement from the original surfacing for this project. The new PSS design would require Quality Control/Quality Assurance (QC/QA) procedures during the construction operations. The QC/QA procedures employed testing by the average area method for sublots of daily construction operations. The reconstruction of Shepherd Avenue project from Temperance Avenue to DeWolf Avenue was completed in November, 2005.

Benefits to the City of Clovis and Lessons Learned to be incorporated in CIP Program

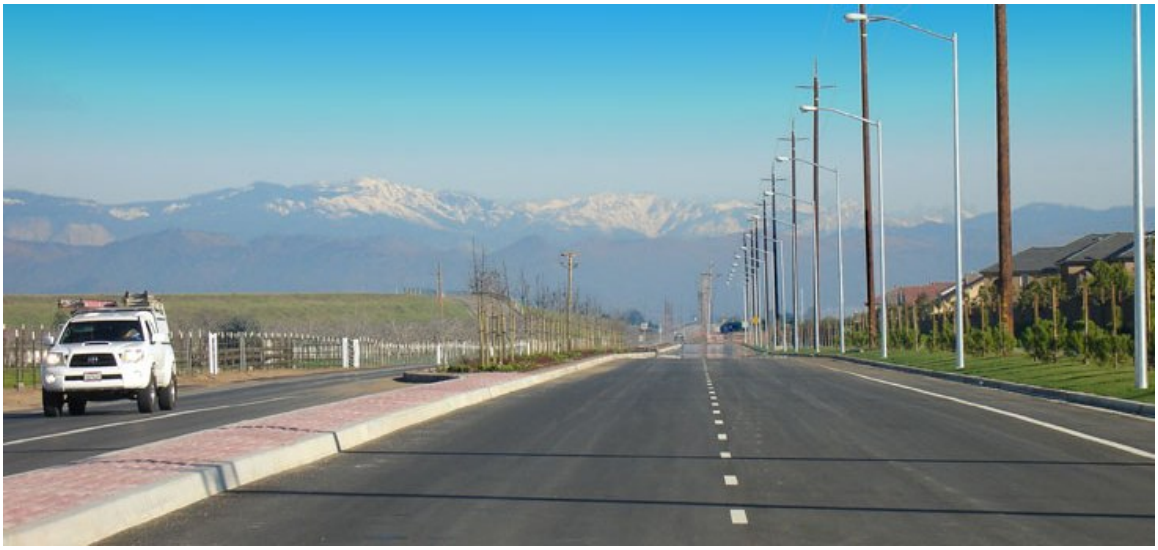
- Utilized resilient modulus testing (dynamic method) v. R-Value testing (static method) to assess the strength qualities of the subgrade soils: Resilient Modulus testing identified the subgrade soils with poor engineering qualities, where R-Value testing identified the subgrade soils with strength qualities of an aggregate subbase material. Additional laboratory classification testing confirmed poorer quality characteristics of the subgrade soils;
- Design pavement layer utilized Caltrans Specification ¾" Type 'B' max medium w 15% recycled aggregate pavement, Asphalt Cement – AR8000 in lieu of the traditional ½" Type 'B', Asphalt Cement – AR4000: Resulting in strength improvement of 13% in the pavement layer;
- By using on-site materials, removed the need for using 640 truck and trailer rigs from traveling to the project site: not using a diminishing resource of aggregate base, reducing traffic congestion, wear and tear on the city streets, improving air quality during construction phase;
- Employed QC/QA testing/inspection procedures v. Method specification: road sections met or exceeded design parameters; Method specification introduced variability in the design parameters from +3% to -17%;
- Stabilization methods during construction of the entire PSS: The environmentally safe process recorded an average of 59% in strength property gains of both subgrade soils and recycled asphalt pavement materials when compared to a street section using conventional untreated aggregate base and untreated subgrade soils: Improved longevity, decreased maintenance dollars, decreased life cycle cost;
- Measured deflection data along the stabilized section of Shepherd Avenue using the FWD was reduced by an average of 60% when compared to the unstabilized section of Shepherd Avenue – City initiating Pavement Management Survey (PMS) baseline data for future development of infrastructure;
- Construction cost savings to the City of Clovis for construction of the stabilized section v. the conventional street section was $250,000 of future maintenance cost savings.

SHEPHERD AVENUE RECONSTRUCTION

Mixing of 12-inch layer of subgrade soil using pulverizer and water truck with EMC SQUARED treated water.



Compaction of stabilized subgrade soils with vibratory sheepfoot.



Completed Shepherd Avenue open to traffic in November 2005