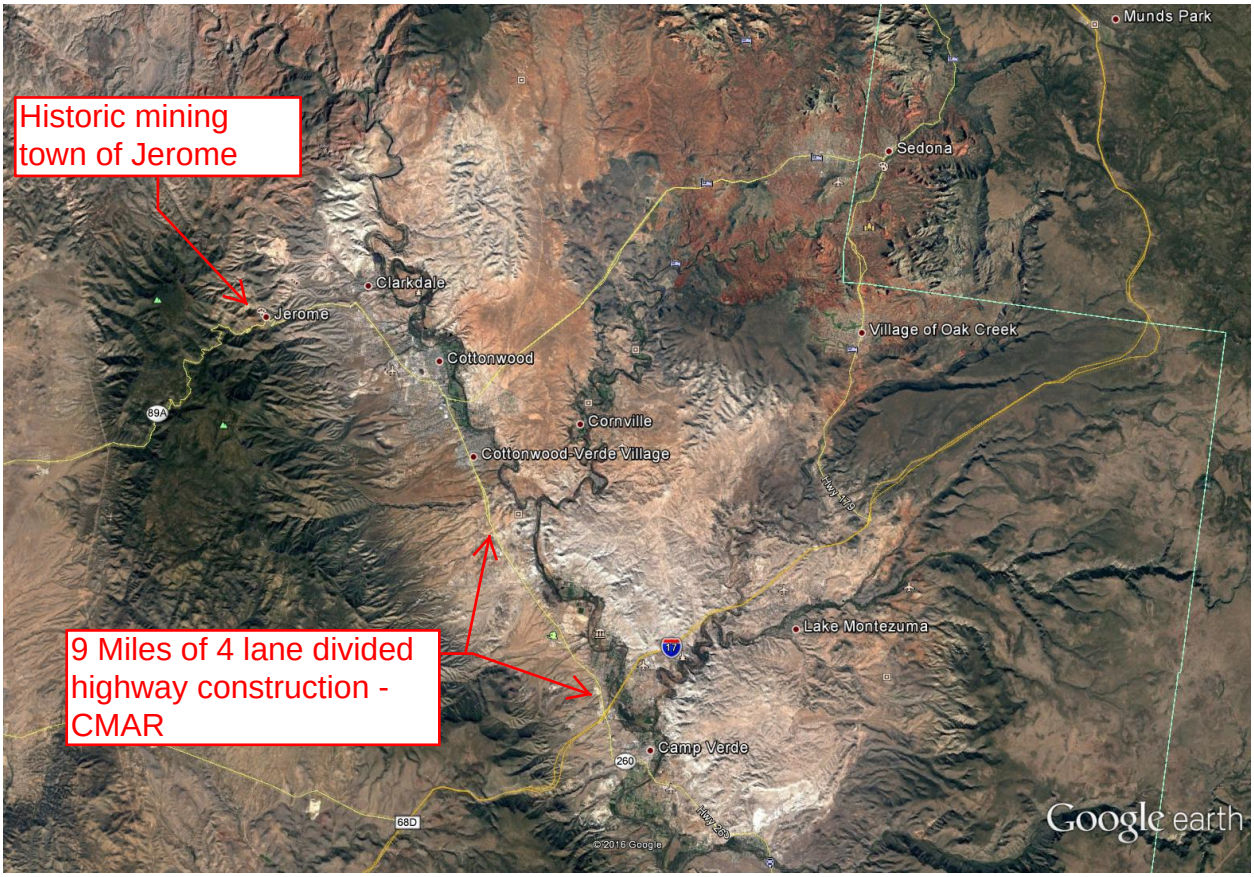
SOUTHWEST GEOTECHNICAL ENGINEERS CONFERENCE

MAY 4TH INNOVATIVE CONTRACTING FIELD TRIP

This years' project example is a $62 million dollar CMAR project in the Verde Valley to upgrade 9 miles of roadway to a 4 lane divided highway. The project is challenging due to the lakebed soils and heavy traffic. Through early involvement of the contractor in the CMAR process, planning for saturated fat clay subgrade and management of traffic was accounted for in the contract.

Innovations also include use of Geofoam blocks and Intelligent Compaction technology. Geofoam blocks were incorporated over an existing concrete box culvert to reduce overburden stresses. Intelligent Compaction technology is being utilized to improve quality of embankment, aggregate base and Asphaltic Concrete construction. Reductions in surveying and quality control testing expenses were also realized through incorporation of Intelligent Compaction technology.



The project field trip schedule is as follows:

Depart Hotel –	6:00 am
Arrive/review CMAR project –	8:30 am to 10:00 am
Tour historic mining town of Jerome –	10:30 to 1:00 pm
Arrive at hotel –	3:00 to 3:30 pm

For those interested in the geologic history of the Verde Valley:

REGIONAL GEOLOGIC SETTING:

The following excerpts are from an Open-File Report 93-16 from the Arizona Geological Survey titled "Surficial Geology of the Northern Verde Valley, Yavapai County, Arizona", authored by House, P.K. And Pearthree, P.A. in 1993:

"The Verde Valley is one of several roughly northwest-southeast trending basins in the Transition Zone geological province of Arizona. Structurally, it is a half-graben bounded on its southwest margin by the Verde Fault, a high angle normal fault along which the Black Hills have been uplifted. The Valley is bounded on the north and east by the Mogollon Rim, a prominent escarpment marking the southern edge ofthe Colorado Plateau."

"In the late Miocene the ancestral drainage from the Verde Valley was blocked, probably by a combination of structural subsidence and volcanic activity at the southern margin of the valley (Bressler and Butler, 1978; McKee and Elston, 1980). The absence of consistent external drainage resulted in the deposition of the Verde Formation, an extensive and varied sedimentary unit composed primarily of lacustrine, fluvial, and volcaniclastic sediments and interbedded lava flows. Concurrent with the accumulation of sediments in the middle of the basin, thick deposits of gravel were laid down as alluvial fans by streams entering the basin from the surrounding highlands. Deposition of the rocks in the Verde Formation lasted from approximately 8.5 to 2.5 Ma (Bressler and Butler, 1978; Nations et aI., 1981, McKee and Elston, 1980). Interbedded basalt flows in the Verde Formation have yielded dates of 4.5 Ma, 5.5 Ma, (McKee and Anderson, 1971) and 8.3 Ma (McKee and Elston, 1980). The geomorphic evolution of the Verde Valley changed dramatically in the latest Pliocene. Major stream down-cutting and basin dissection was initiated when the through-going Verde River drainage began to breach the natural volcanic/structural dam at the southeastern end of the Verde Valley. This transformation occurred

sometime in the latest Pliocene (Bressler and Butler, 1978; Nations et al., 1981). Subsequently, the geomorphology of the valley has been shaped primarily by the long-term down-cutting of the Verde River and large-scale climatic variations during the Quaternary period."

"Quaternary deposits and associated landforms mapped in this study record the recent geologic evolution of the northern Verde Valley. Quaternary deposits consist of extensive, usually thin, alluvial fans and eroded alluvial fan remnants along the flanks ofthe surrounding highlands and sediments deposited by the Verde River and Oak Creek. Each Quaternary deposit has an associated geomorphic surface existing in some degree of preservation ranging from pristine to de-graded."

"A fluvial geomorphic surface is a distinct landform resulting from the attainment and subsequent abandonment of an equilibrium level of aggradation or degradation. The term equilibrium refers to the condition in which a balance exists between the rate of delivery of sediment to a stream system and the rate of removal of sediment from the system (Bull, 1991). A disruption in the balance may lead to either aggradation or degradation by the affected stream. The attainment of equilibrium results in the formation of a relatively uniform, planar surface (alluvial fan, pediment, or stream terrace) composed of, or capped by, alluvium. Abandonment of a fluvial geomorphic surface is usually associated with incision by streams in response to changes in the sediment and/or water discharge characteristics of their tributary drainage basins; however, abandonment may simply occur in response to major lateral changes in stream channel positions."

"The first mechanism involves a departure from equilibrium conditions and can have the most lasting effect on the landscape through isolation of surfaces from major episodes of erosion for thousands to hundreds of thousands of years. The stimulus for this type of change can come from climatic change, tectonic processes, or some combination of the two. In the Verde Valley, climatic change and the long-term tendency for stream down-cutting have dominated the area's geomorphic evolution over the past 2 million years. Once a surface is abandoned, it is subject to erosion only from hillslope processes, small, superposed drainage networks, and lateral erosion by major streams and tributaries. The long-term preservation of a fluvial geomorphic surface depends on the resistance of its constituent alluvial materials to erosion, the original extent of the surface, its position relative to major streams, and, to some degree, chance. Over time, an undisturbed surface undergoes weathering and soil formation. These processes continue indefinitely unless the surface is obliterated by erosion or buried by renewed aggradation from major streams. Under ideal conditions of surface preservation, the degree of soil development reflects the time that has elapsed since the surface was isolated from major fluvial activity. Specific soil characteristics, such as maximum clay and calcium carbonate contents, change progressively with time. These characteristics can be evaluated and related to dated soils formed under generally similar climatic conditions to estimate the surface age (Gile et al., 1981; Bull, 1991)."

"The Verde River and Oak Creek are the fundamental controls on the development of alluvial landforms in the Verde Valley because all tributaries are graded to them. The long-term tendency of these major streams has been to down-cut, possibly because of regional uplift of the Transition Zone during the Pliocene and Quaternary (pewe, 1978; Menges and Pearthree, 1989). The pattern of geomorphic change along these major streams must be reflected in the assemblage of landforms in the piedmont areas.

Seven distinct levels of Verde River and Oak Creek terraces were identified in this mapping project. These terraces and terrace remnants range in age from recent (the modern channel and floodplain) to early Pleistocene. Seven roughly correlative levels of piedmont alluvial surfaces were also identified, but correlation between terrace remnants and piedmont alluvial surfaces is uncertain in most cases. Only in a few instances do fans clearly grade into terraces. It is likely that geomorphic processes in major streams and tributary piedmont drainage systems operate on different time scales, and thus their response times vary considerably."

"During the Quaternary the Verde River and Oak Creek have down-cut at least 300 m (1000 ft) into the basin fill deposits (Verde Formation) of the Verde Valley. Down-cutting apparently has been episodic, however, with river terraces representing intervals of stability or minor aggradation. Piedmont landforms indicate that the period of net down-cutting has included at least one period of major aggradation during the middle Pleistocene and several periods of base-level stability. At the present time, both the Verde River and Oak Creek appear to be in a down-cutting phase because of the presence of bedrock at or very near their beds in many reaches."