GUIDEBOOK SERIES
Volume 8

INDUSTRIAL MINERAL RESOURCES
OF THE
DELAWARE BASIN, TEXAS AND NEW MEXICO

Edited by J. Richard Kyle

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Field Conference — 24 – 27 October 1990

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SOCIETY OF ECONOMIC GEOLOGISTS
INTRODUCTION

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This field trip of the Society of Economic Geologists, held in conjunction with the 1990 annual meeting of the Geological Society of America in Dallas, Texas, provides the opportunity to examine the geologic setting and mineral resources of the Delaware Basin of west Texas and southeastern New Mexico. The Delaware Basin is best known for its petroleum production, particularly from Permian reservoirs, but also hosts some of North America’s major industrial mineral resources.

The Trans-Pecos area of west Texas and contiguous southeastern New Mexico has had significant and varied non-fuels mineral resource production. Historic minerals production in the region is dominated by silver and lead from the Shafter district, silver and copper from the Van Horn district, mercury from the Terlingua district, sulfur from Culberson and Pecos Counties, talc from the Allamooore district, potash from the Carlsbad district, and fluorspar from the Christmas and Eagle Mountains. Some of these deposits are genetically related to Tertiary magmatic activity in the southern Trans-Pecos region to the south of the area traversed on this field trip. Other districts and commodities have potential for future development. Recent exploration has defined additional silver-lead-zinc reserves in the Shafter district and major beryllium resources in the Sierra Blanca district.

The first day of the field trip traverses the region from El Paso, Texas, to Carlsbad, New Mexico. This traverse spans the transition from Basin and Range topographic and structural regime to the Great Plains. The first part of the trip travels over uplifted ranges dominantly of Paleozoic and Mesozoic sedimentary strata separated by gravel-filled bolsons with local playas. Enroute to Carlsbad the route skirts the northwestern margin of the Delaware Basin, including the spectacularly exposed Permian reefal carbonate strata in the canyons of the Guadalupe Mountains. These strata host the world-renowned Carlsbad Caverns, as well as other recently discovered and undeveloped major cave systems. An early afternoon tour of the operations of the International Minerals and Chemical Corp. No. 5 shaft provides the opportunity to examine late Permian (Ochoan) evaporite strata of the Carlsbad district, the source of the largest domestic potash production and reserves. A late afternoon visit to Carlsbad Caverns offers a view of a major karst system developed in Permian shelf margin carbonates. In addition to the opportunity to visit a popular tourist attraction, this stop is significant in that the hydrologic and geochemical system that created the Delaware Basin margin karst systems is believed also to be related to the development of the elemental sulfur concentrations within the Delaware Basin.

The field trip travels south from Carlsbad on the second day to examine the geologic setting of the industrial mineral resources of the central part of the Delaware Basin enroute to Van Horn, Texas. Surface geology, cores from production wells, and Frasch sulfur extraction operation at Pennzoil's
Culberson mine in the Rustler Hills will be examined during the morning. The Culberson deposit is one of the largest commercial sulfur concentrations in the world and appears to be localized along a northeast-trending normal fault zone. This structural configuration provided the proper environment for the bacterial reduction of evaporite-sourced sulfate, utilizing petroleum as the energy source, to produce hydrogen sulfide and carbon dioxide as metabolic products. Subsequent reactions produced the bacterogenic calcite host rock and the elemental sulfur concentrations. The group will travel to the southwest over the "Gypsum Plain" and will examine the Castile Formation in the inactive Rock House gypsum quarry. The route continues toward the southwestern margin of the Delaware Basin represented by reefal carbonate strata exposed in the Delaware Mountains and the Apache Mountains. Stratabound barite deposits in the basal Castile Formation at Seven Heart Gap in the southwestern margin of the Delaware Basin are generally similar to those at the Culberson sulfur deposit. However, geologic and geochemical evidence suggest that they have distinctly different origins.

The field trip group will examine other important industrial mineral deposits of northern Trans-Pecos Texas that occur within the Diablo Platform southwest of the Delaware Basin on the third day before traveling on to El Paso. The talc deposits of the Allamoore district occur within complexly deformed and metamorphosed carbonate strata of the late Proterozoic Allamoore Formation north and northwest of Van Horn. These talc deposits generally rank second in annual domestic production. The group will examine the talc mining operation of Milwhite, Inc. at Tumbledown Mountain and the Pioneer-Apache talc processing operation at Allamoore. The Texas Architectural Aggregate Company produces decorative marble from the contact aureole of the Tertiary Marble Canyon stock north of Van Horn. This area also contains copper-silver deposits along Basin and Range faults and the Cave Peak porphyry molybdenum prospect associated with a Tertiary breccia pipe complex. Traveling west from Van Horn, the group will again cross the Basin and Range of Trans-Pecos Texas; the major caldera-sourced felsic volcanics of the southern Trans-Pecos Tertiary magmatic province occur to the south and southeast. Enroute to El Paso, a stop will be made at Sierra Blanca for an overview of the geologic setting and recent exploration activity for major beryllium silicate deposits associated with fluorite replacement bodies in Cretaceous limestones adjacent to a Tertiary rhyolitic laccolith.

A few notes are appropriate, particularly for those who may follow this guidebook at later times. Virtually all land in west Texas and adjacent New Mexico is privately owned, and prior permission for entry must be obtained from the landowner. After permission is obtained, particular care should be taken to maintain reasonable and respectful activities on the working ranches and mining properties. Also, in planning for travel, note that the trip traverses the irregular boundary between the Mountain and Central time zones. This boundary trends north along the Hudspeth-Culberson county line about 5 miles west of Van Horn, turns east along the southern boundary of the Guadalupe Mountains National Park, then north to the New Mexico border, following the Texas-New Mexico boundary eastward. Thus, El Paso and Carlsbad observe Mountain time, but the Central Time zone applies to Van Horn and most of the rural areas of Texas covered by this guidebook.
ACKNOWLEDGMENTS

We are grateful to many individuals and companies for their generous contributions to the success of this field trip. The New Mexico Geological Society and the El Paso Geological Society provided free use of the text and diagrams from previous road logs (Dickerson and Hoffer, 1980; Powers and James, 1987). The managements of the following companies provided permission to visit their mining properties: International Minerals and Chemical Corp., Pennzoil Sulphur Corp., Standard Gypsum Co., Milwhite Inc., and Texas Architectural Aggregate Associates. Judge Lee Green gave permission to visit the Seven Heart Gap area on the Foster Ranch. We appreciate the special arrangements for visiting Carlsbad Caverns National Park provided by Wallace B. Elms (Director) and the Department of Cave Resources.

We appreciate support during the production of the road log by Pamela Hart (typing) and Patricia Clark (photography), as well as a valuable review by Noel McAnulty. Walt Ayres, Pat Dickerson, Howard Harlan, Tucker Hentz, Dave Norman, Harry Posey, and Steve Seni served as independent reviewers of guidebook articles. Betty Kurtz (typing), David Stephens (photography), Jeff Horowitz (drafting), and Dan Gonzalez (layout) provided valuable assistance in the production of the guidebook. We are grateful to Martha Brown, Carmen Goytia, and Graciela Negrete of the Economic Geology Publishing Co. for registration, accounting, and logistical support concerning the arrangements for the trip.
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ITINERARY

Wednesday, October 24

7:00 pm ------ Registration
Overnight stay: Holiday Inn, Airport, El Paso, TX (Tel: 915-778-6411)

Thursday, October 25 (Day 1)

6:00 am ------ Breakfast
7:00 am ------ Begin road log: El Paso to Carlsbad
11:30 am ------ Lunch
1:00 pm ------ Underground tour: IMC No. 5 Shaft
3:00 pm ------ Resume road log: IMC to Carlsbad Caverns
5:00 pm ------ Underground at Carlsbad Caverns
7:00 pm ------ End Day 1 excursion
7:30 pm ------ Dinner: Sirloin Stockade
8:30 pm ------ Dr. Dennis W. Powers: "Recent Studies of Evaporites at the Waste Isolation Pilot Plant (WIPP Site)".
Overnight stay: Carlsbad Inn, Carlsbad, NM (Tel: 505-887-3541)

Friday, October 26 (Day 2)

6:00 am ------ Breakfast
7:00 am ------ Begin road log: Carlsbad to Pennzoil Sulphur Co.
9:30 am ------ Pennzoil Sulphur Co. Culberson Mine
12:30 pm ------ Lunch
1:30 pm ------ Resume road log: Pennzoil Sulphur Co. to Rock House quarry
3:00 pm ------ Rock House gypsum quarry and Elcor plant
3:45 pm ------ Resume road log: Rock House quarry to Seven Heart Gap barite
4:30 pm ------ Seven Heart Gap barite
6:00 pm ------ Resume log: Seven Heart Gap barite to Van Horn
7:00 pm ------ Van Horn
7:30 pm ------ Dinner and Overnight Stay: Days Inn, Van Horn, TX (Tel: 915-283-2401)

Saturday, October 27 (Day 3)

6:00 am ------ Breakfast
7:00 am ------ Begin road log: Van Horn to Tumbledown Mountain
8:00 am ------ Milwhite Tumbledown Mountain talc property
9:00 am ------ Resume road log: Tumbledown Mountain to Marble Canyon
10:00 am ------ Marble Canyon Texas Architectural Aggregate property
11:30 am ------ Lunch
12:00 pm ------ Resume road log: Marble Canyon to Allamoore
1:30 pm ------ Pioneer talc plant
2:30 pm ------ Sierra Blanca: discussion of Round Top beryllium prospect
3:30 pm ------ Resume road log: Sierra Blanca to El Paso
5:00 pm ------ El Paso International Airport

*NOTE - The field trip traverses the boundary between the Mountain and Central time zones; all listed times are local which may cause apparent discrepancies in travel times between some stops.