

CULTURAL, TECHNICAL AND ENVIRONMENTAL HURDLES OVERCOME: THE STORY OF CORTEZ PIPELINE BEFORE CONSTRUCTION

by Roger G. Ryman, SR/WA

Shell Pipe Line Corp., a subsidiary of Shell Oil Co., plans to begin construction of one of the largest pipelines in recent company history this summer. But the magnitude of the 30-inch line, which will span about 500 miles from southwestern Colorado to West Texas, isn't the only thing setting it apart from the company's other lines.

That's because it is not designed to carry oil or petrochemical products like the others. This line will transport carbon dioxide (CO₂)—a common gas used to make dry ice and carbonate soft drinks.

However, the carbon dioxide being pipelined from CO₂ source fields near Cortez, Colorado, to the Denver City, Texas, area will have another job. It will increase oil recovery from old oil fields in West Texas and New Mexico. The probable first large user of the CO₂ will be the Denver Unit of the Wason field. Shell Oil, as operator of the unit, expects that injection of the carbon dioxide will produce about 280 million barrels of crude oil that otherwise would not be recovered.

The development of this project, which could be operational by 1984, is expected to cost about \$1.9 billion in terms of 1982 dollars. About \$800 million is set aside for developing the carbon dioxide fields near Cortez and the field facilities for dehydrating and pressurizing the carbon dioxide (so it can enter the pipeline); approximately \$700 million for the 30-inch pipeline and associated compressor stations; and \$400 million for field facilities, a gas treating plant and other construction at the Denver Unit. Plans call for these costs to be shared between Shell Oil and partners in the project.

Development of the carbon dioxide source fields near Cortez, which will be conducted by Shell's Western Exploration and Production operations, will be a massive effort in itself as up to 200 carbon dioxide wells ultimately will be drilled. Exploration and Production also will construct several dehydration stations and many miles of pipeline from the wells to the dehydration facilities in Colorado and other facilities within the Denver Unit.

Besides constructing the 500-mile pipeline, Shell Pipe Line will construct a dry CO₂ gathering pipeline system near Cortez. The company will operate and maintain both the gathering system and main line when construction is completed.

Acquiring right of way and governmental clearances for a large project is always complex. However, Shell Pipe Line's Land and Environmental Department faced several unique challenges as project preparations began. The greatest of these challenges concerned the area around Cortez—where the proposed pipeline and carbon dioxide wells will be constructed in the midst of a wealth of historical artifacts left behind by the Anasazi Indians.

The Anasazi farmed the mesa tops of southwestern Colorado and northwestern New Mexico, growing beans, squash and corn before they abandoned the area about 700 years ago. They lived in pithouses or pueblos on the mesa tops in addition to cliff dwellings like those open to the public at what is now Mesa Verde National Park. These "ancient ones" left behind an abundance of pottery and other relics, vivid evidence of their society and lifestyle. Archaeo-



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Ryman holds B.S. and J.D. degrees from the University of Houston. A member of Gulf States Chapter 8, he has served as the group's National Director, President, Vice President and Secretary. He was the Chapter's "Right of Way Professional of the Year" in 1974. Also, he has been an active member of the IRWA Pipeline Committee for 10 years. Ryman serves on other industry committees including the Federal Affairs and the State Affairs and Legal Committee for the Association of Oil Pipe Lines.

logists suspect there may be as many as 100 buried Anasazi occupation sites per square mile in some places.

Because of this potential wealth of cultural antiquity, Shell representatives informed the Bureau of Land (see Cortez, pg. 18)

Cortez (cont. from pg. 17)

Management (BLM), a U.S. Department of the Interior agency, about the proposed construction during initial exploration efforts.

Working with the BLM and the Department of Anthropology at the University of Colorado, Shell and Woodward-Clyde, an independent environmental consulting firm from San Francisco, found a way to predict which areas around Cortez were likely to have archaeological sites—areas to avoid in planning pipeline and well sites. To do this, a predictive model was developed, showing known sites where the Anasazi lived, farmed and hunted, and keyed this data into the computer along with geographical factors such as distance to streams and direction faced by the site. This data was used to locate potential sites on a sophisticated color-coded map. Computer-produced maps also indicated what the probable impact of the project would be on wildlife and soil conditions, pinpointing which areas near Cortez would be affected the most and which would be affected the least.

This was only part of the planning effort needed to satisfy the requirements of applicable federal laws and regulations. Largely because the pipeline will extend across a large area and because about 40 percent of the line crosses federal and state lands, Shell furnished a large amount of data which was used to compile a two-volume environmental impact statement. Among other things, the information developed by the company and Woodward-Clyde indicated the probable effects of the pipeline and the CO₂ field on communities, farm lands, water, aesthetics, national forests, wilderness areas, air quality and other areas of environmental concern.

Planning for the environmental impact statement started in 1976, and it was finalized in 1980 following public hearings in Cortez; Albuquerque, N.M.; and Roswell, N.M. This cleared the way for the BLM to grant a pipeline easement for 129 miles of federal lands administered by the agency in Colorado and New Mexico.

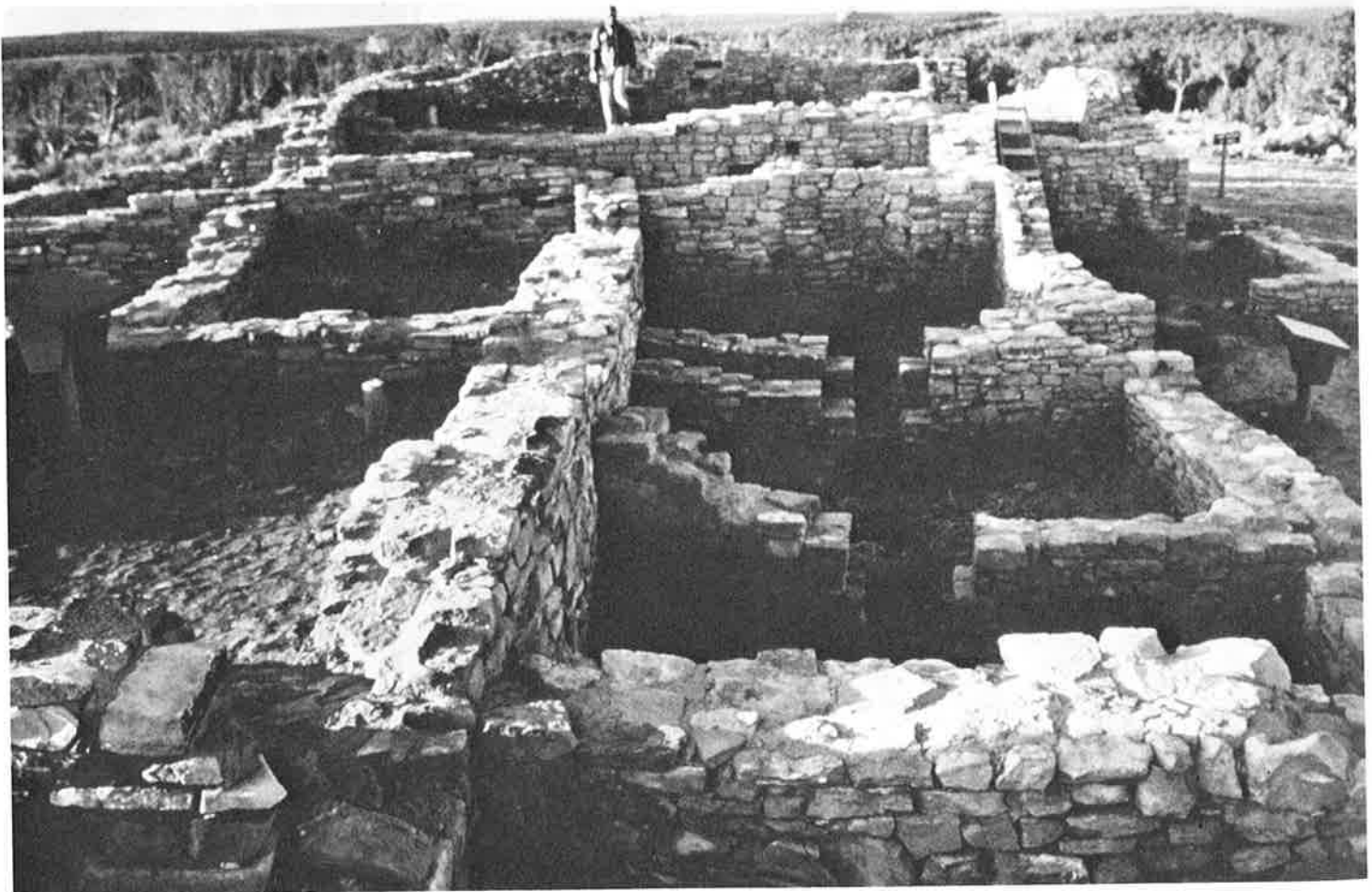
A particularly important part of preparing the environmental impact

statement was surveying the effects of the main pipeline on cultural resources—historic artifacts and ruins left by the Anasazi and other early civilizations. This work was separate from the computer mapping of the Anasazi sites near Cortez and concerned long sections of the proposed pipeline route in New Mexico and Colorado where cultural resources are abundant.

Shell conducted extensive on-the-ground cultural resource inventories to insure that potential sites were located, reported and avoided during pipeline construction. Regarding such surveys, the BLM stipulated in the easement on BLM lands that Shell was required to perform cultural inventories on all lands, including private and other non-federal tracts, along the route, as a

(see Cultural, pg. 19)

Ruins of Anasazi houses like these dot much of the landscape near Cortez, Colo.,—where Shell Pipe Line is beginning construction of a carbon dioxide line which will stretch about 500 miles to West Texas. The pipeline is being routed far away from such visible historical landmarks.



Cultural (cont. from pg. 18)

condition of the grant. The BLM took the position that such action was required by the National Historic Preservation Act and associated regulations. Shell appealed this decision to the Department of Interior Board of Land Appeals on grounds that inventories on non-federal lands is not mandated by law as a requirement for issuing an easement on federal lands. Before a decision was made, the Secretary of the Interior assumed jurisdiction of the case, which is still pending at this writing. This apparently reflects Interior's concern with conflicting BLM action and uncertainty about this issue in recent years. The appeal also involves issues related to requirements under the Endangered Species Act.

After the initial route survey, Shell and BLM agreed upon rerouting about 17 miles of the line in various northern New Mexico locations to reduce adverse environmental impacts and to avoid lands determined to have surface coal mining potential. The impact of the carbon dioxide line on the environment also is expected to be lessened by placement of about 90 percent of the pipeline route parallel to other existing rights of way.

As a further step to protect historically valuable sites, archaeologists will be on hand during pipeline construction to investigate any discoveries of artifacts. Steps will also be taken to protect against erosion and restore fragile vegetation—steps which will be examined by federal inspectors.

During the development of the environmental statement, the concept of "third-party contracts" for this purpose originated. This approach enabled Woodward-Clyde, as Shell's consultant, to prepare the environmental statement while being closely supervised by a team comprised of different disciplines within the BLM. The new approach was beneficial because it reduced the lead time required for preparing the statement, saved money and cut the workload and BLM staffers. This procedure has since become widely accepted throughout the federal government.

While environmental studies were under way, little right of way for the line

was actually acquired, although preliminary surveying and title work took place to provide information needed in route selection. Until 1980, right of way was acquired only at crucial areas such as river crossings. (In addition to smaller streams, the line will cross four major rivers in New Mexico, the Animas, the San Juan, the Rio Grande and the Pecos).

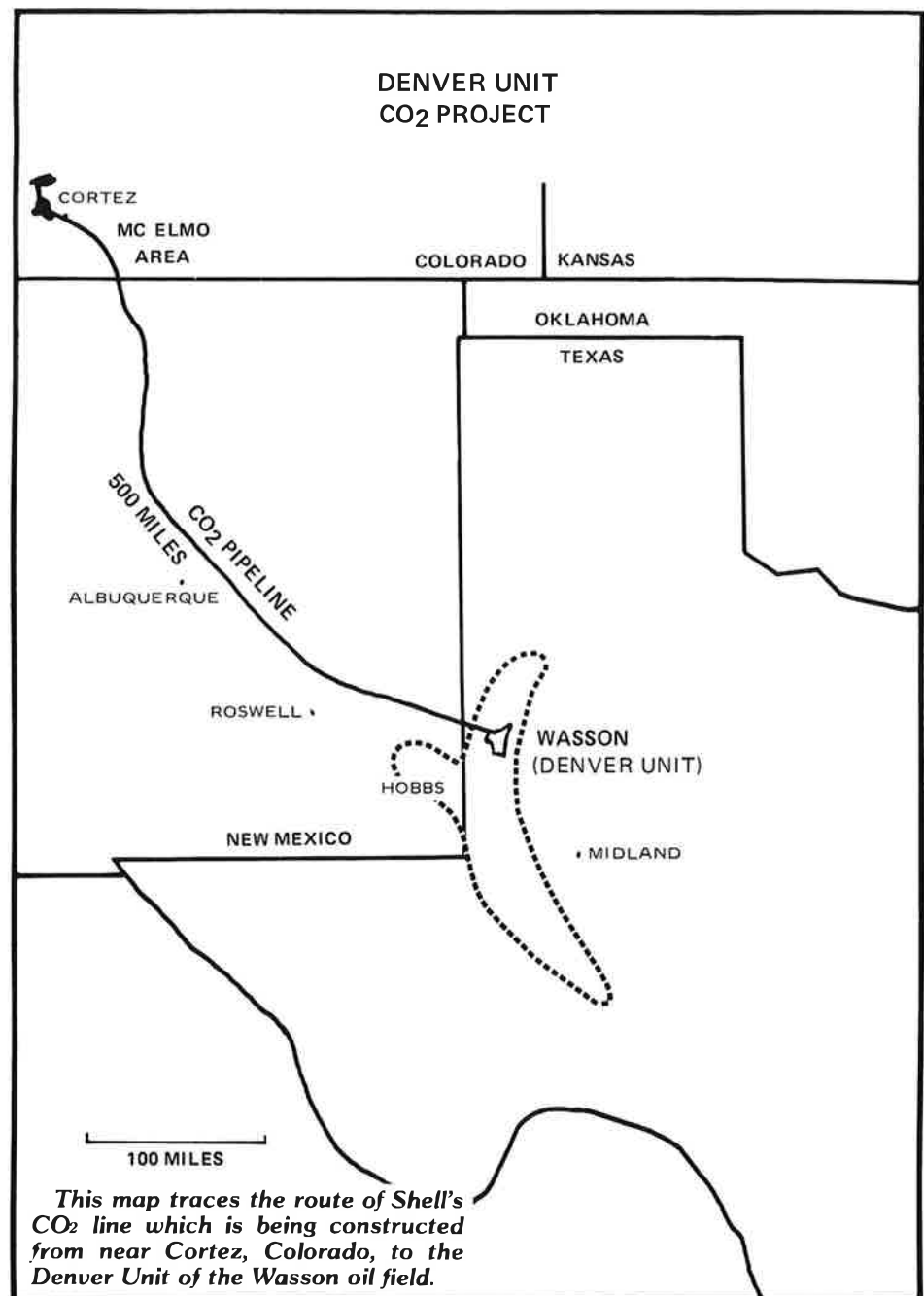
Right of way acquisition quickly gained speed after the final environmental statement for the pipeline and well field was published. As a result, over 98 percent of right of way across

about 225 miles of federal, state and Indian lands and about 277 miles of private tracts were acquired by February 1, 1982.

The project also involved permits to cross 37 major federal and state highways, as well as franchises covering roads and other property under county jurisdiction in each of the 14 counties along the pipeline route in Colorado, New Mexico and Texas.

The company negotiated at length with tribal councils to acquire right of way across tribal Indian lands

(see *Tribal*, pg. 20)



Tribal (cont. from pg. 19)

northwest of Albuquerque. Fifteen miles were needed on the Santa Ana Pueblo Reservation, while 12 miles were required on the Zia Indian Reservation.

Th prolonged negotiations involved the Indian tribes' insistence on granting easements for a term of no more than 10 years. Shell believed that long-term grants were essential for its project. Since the right of eminent domain was not available, Shell was prepared to lay the pipeline on a longer route to bypass reservations and indeed purchased right of way "option" (deferred payment) agreements for such a reroute. Acceptable agreements ultimately were negotiated with the Zia and Santa Ana, but the easement term issue could not be satisfactorily resolved on another Indian reservation in southern Colorado and about five miles of pipeline have been added to bypass that area.

Long negotiations were also required to get 18 miles of right of way on Navajo "allotted lands" (where the federal government holds the land in trust for individual Indians), with more than 1,700 signatures finally being obtained. There, Shell applied for a perpetual easement, but the Bureau of Indian Affairs (another Department of Interior agency) granted a 20-year right of way. This action has also been appealed to Interior.

In initiating private right of way acquisitions, field offices were established in Cortez and Albuquerque, and staffed with Shell supervisors and contract right of way personnel, who handled title work and document preparation. These offices were shared with Shell Oil's General Engineering Department people who performed survey, mapping and drafting duties. Also, legal firms were retained in both Colorado and New Mexico to assist in handling local and state matters.

A wide range of property values and land use were encountered along the 500-mile route—a diversity that was mirrored by the concerns of more than 700 individual owners of private tracts. Landowners' concerns were especially sensitive in Colorado's La Plata and Montezuma counties where much of the pipeline route followed two existing pipelines.

Feeling the pressure of this landowner interest, the Montezuma County Planning Commission was reluctant to recommend issuance of a permit for this alignment. Extensive on-site studies were conducted and many public meetings held before an alternate alignment paralleling an existing electric transmission line was agreed upon and a permit granted.

Even with the alignment issue settled, negotiations proved difficult because the landowners reconstituted a previously formed landowners' association represented by Denver counsel, while landowners in adjacent La Plata county formed a similar group. Several months of serious negotiations took place before agreement was reached on acceptable easement language and a payment which is based on the appraised value of each tract.

Property values were calculated based on individual appraisals by professional non-Shell appraisers as well as data from other area pipeline and utility companies. In most cases, offers were made on an acreage basis rather than a lineal distance formula.

The time spent in properly appraising right of way values and determining fair offering prices paid off in Shell's purchasing easements during the first few contacts from a majority of the landowners. Ultimately, it was necessary to file only 12 condemnation suits, all in New Mexico, and compromise agreements were reached in half of those before trial.

Only one of the condemnations was seriously challenged. There, the landowner, represented by extremely competent counsel, questioned the public purpose of the pipeline as well as its location. The issue was hotly contested during three days of trial, with substantial testimony being heard regarding the public benefit of the pipeline for New Mexico as well as for the residents of other states. The court ruled for Shell and the decision was not appealed.

Members of the International Right of Way Association with Shell who worked on the project were Dave Daupert, Perry Huntoon, Joe Jackson, Ed Paul, Todd Simons and Bill Cooper (retired). Also involved were C. B. Williams with Aries Land Co., Inc.; Mike Allen, Ken Claggett, Dale Cotner,

Carl Davis, Bill Dodson, Ben Lynch, George McCammon, Pat Mitchell, Charles Pittman and Harry Speaker III with Coates Field Services, Inc.; Bill Buckner and Jim Livingston with Continental Field Service Corp.; Charles Alford with Diversified Energy Services, Inc.; Clyde Palmer with Tech Staff, Inc.; and Otey Deare with Universal Field Services, Inc.

The use of carbon dioxide represents a relatively new technological step that offers widespread potential in recovering oil from declining fields. But its use at the Denver Unit is not the first time a major effort has been made to boost production in the Wasson field, which was discovered in 1936.

In 1964, Shell Oil, the largest interest owner in the Denver Unit (with 31.6 percent interest) and other property owners pooled interests to form the 28,000-acre unit, allowing production of more oil through waterflooding techniques. Other large interest owners in the unit include Conoco, Texaco, Exxon, Arco and Getty.

The field has since evolved into one of the largest waterflooding projects in the U.S., pushing out oil that primary producing methods leave behind. But waterflood production from the unit peaked at 151,000 barrels per day in 1975 and has now declined to about 90,000 barrels per day.

Carbon dioxide injection techniques were first investigated in the early 1970s for possible use at the Denver Unit. Shell Oil has determined that waterflooding would recover less than half the oil in the unit. That is because water cannot free residual oil trapped in the pores of rock since it cannot mix totally with oil. On the other hand, carbon dioxide appeared attractive because it does mix well with oil (when injected at high pressures—a trait which allows it to enter rock and move some of the trapped crude).

In conjunction with research and testing to determine if this recovery technique could be used economically, Shell then set out to find a carbon dioxide source with sufficient reserves to improve production at the Denver Unit. The company began exploratory drilling at the McElmo Dome and Doe Canyon fields near Cortez, confirming that more than enough CO₂ existed to

(see CO₂, pg. 24)

Northern (cont. from pg. 26)

bureaucratic delays. It essentially squelches the entrepreneurial instincts of all but the most well-financed and adventuresome project proponents. The U.S. needs these new investments to maintain economic health. We must find effective ways to build major projects while still protecting the public interest in its broadest sense.

It is time to recognize that we have available all of the technical and financial resources necessary to solve the ongoing crude oil transportation system problems. Northern Tier involves state-of-the-art pipeline technology. We have none of the unique difficulties, such as permafrost, faced by the Trans-Alaska pipeline or any other arctic pipeline in crossing essentially unpopulated, arctic terrain. Northern Tier will build its pipeline in the same area and under similar environmental conditions where hundreds of other pipelines have already been successfully built. There are no unique technical or environmental problems to solve to end

the nation's crude oil transportation problems. Instead, it is the current public/political/regulatory system which stands in the way of proceeding to satisfy this vital national need.

Contest (cont. from pg. 4)

- to the use of his or her name, addresses, photograph, etc. in any IRWA publicity.
8. By entering the contest each contestant agrees to abide by all the contest rules and decisions of the judges, which shall be final. Contest rules are subject to change by the International Membership and Public Relations Committee. All entries become the property of IRWA.
 9. No responsibility is taken by IRWA for entries lost, misdirected, or delayed by mail.
 10. The contest is subject to all Federal, provincial, state and local laws.
 11. The name of the winner will be available upon request by writing IRWA within six months after the drawing.

CO₂ (cont. from pg. 20)

supply the 1.2 trillion cubic feet needed for the proposed Denver Unit project. In addition to Shell Oil, Mobil Oil also is expected to produce substantial quantities of carbon dioxide from the region.

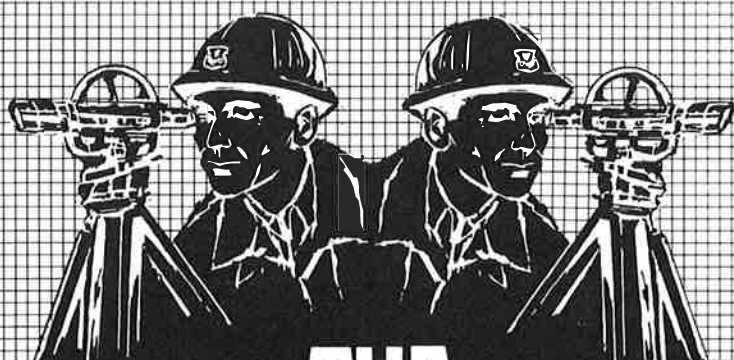
The McElmo Dome, which covers more than 200,000 acres, is one of the largest known natural accumulations of CO₂ in the U.S. About 65 million or so years ago, hot, molten rock rising up to form the Sleeping Ute Mountains near Cortez, pushed up through carbonate sedimentary rock, driving carbon dioxide out of it. This substance was then trapped and accumulated in the underground reservoir.

Before finally committing to the enhanced recovery project, Shell completed a \$5 million, 3½ year field test to confirm that this technology could recover large volumes of oil in the Denver Unit. That test was instrumental in clearing the way for a Shell Oil decision in 1980 to develop the final design of the recovery project.

While the line from Cortez to the Denver Unit will be the first major CO₂ line to be constructed by Shell Pipe Line, it won't be the company's last. Studies are already underway to determine the feasibility of constructing such a line in order to boost production at declining oil fields in southern Mississippi and Louisiana.



Ken Clagett reports that the Chapter 53 Four Corners Affiliate is growing every meeting. A strong speakers program is one reason. At the March meeting, Daniel Deschinney, Director, Navajo Land Development addressed the affiliate. Deschinney spoke on the procedures for obtaining rights of way across Navajo Tribal lands.



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