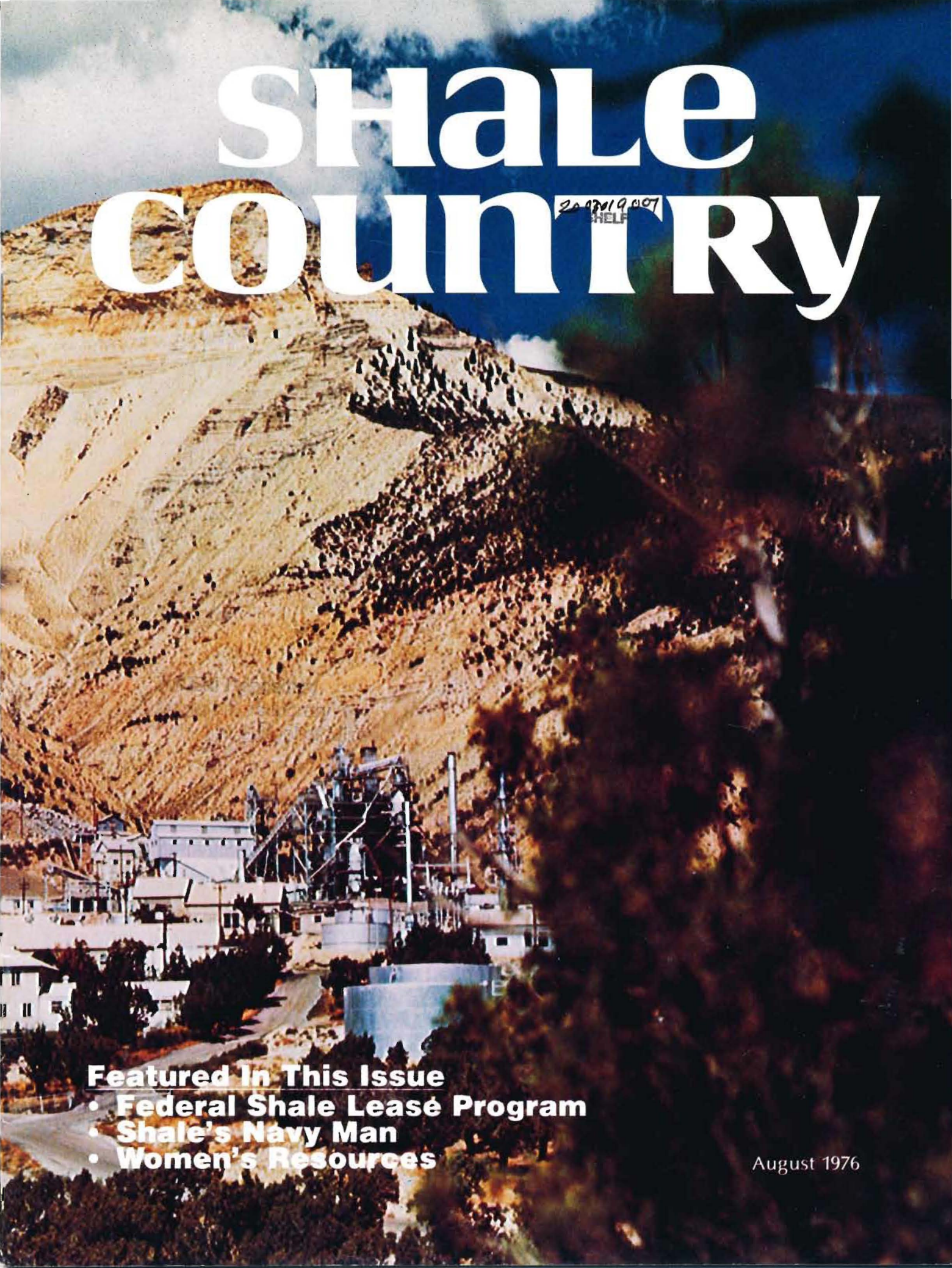
SHALE COUNTRY

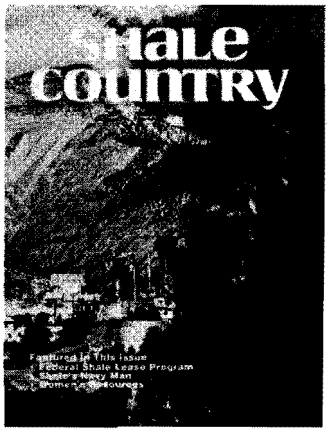


Featured In This Issue

- **Federal Shale Lease Program**
- **Shale's Navy Man**
- **Women's Resources**

August 1976

THIS ISSUE



On the cover: Summer at Anvil Points

Shale country experts take a look at the area's past (p. 9–10); and its future, via its women's resources (p. 11–13), the Navy (p. 14), and John Welles (p. 18–19).

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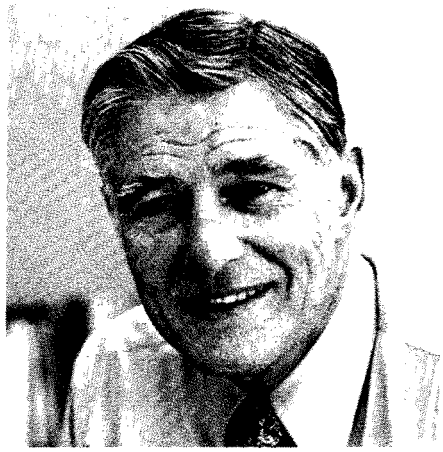


"I think we can provide a model—and that potential is exciting," says Tom Ten Eyck, Vice President of Community, Government and Public Affairs for the Rio Blanco Oil Shale Project.

Industry Interview

The Chance To Build A Benchmark

A fact of life that energy companies have faced is that energy development impacts communities. And that's why all the oil-shale ventures put much high-level management emphasis on community relations. One key example: the appointment of Tom Ten Eyck as Vice President of Community, Government and Public Affairs for the Rio Blanco Oil Shale Project (RBOSP). Ten Eyck, a civil engineer with years of experience in natural resources and government was asked recently to discuss his role and responsibilities with SHALE COUNTRY.

Shale Country: What does your job entail?

Ten Eyck: Basically, I serve as a facilitator and as a spokesman. That is, I try to keep the people who will be affected by our development of federal oil-shale tract C-a informed about our plans—and I try to find out what their concerns and ideas are so that we can respond to them. One way I do this is by spending a great deal of time talking with people in the town of Rangely and in Rio Blanco County, where our tract is located. I also spend time at the Colorado Legislature. I am registered as a lobbyist and in this case, I try to provide information to legislators, as well as to government officials at all levels. I also give speeches about RBOSP and about oil shale—whenever and wherever I'm asked.

S.C. How long have you been with RBOSP?

T.E. About 6 months. Previously I was with Cameron Engineers, Inc., which is Rio Blanco's management contractor, so I became very familiar with the project. As I did, I developed a high degree of respect for Walter Herget, RBOSP president. So when Rio Blanco needed someone to work with communities, and offered me the job, I readily accepted.

S.C. Do you feel you bring a special sensitivity to this job?

T.E. I have served on the Jefferson County School Board, on the first Colorado Board for Community Colleges and Occupational Education, on Denver's first Regional Council of Governments; I spent 10 years with the federal Bureau of Reclamation; I worked in Spain as a civil engineer designing irrigation systems; I spent 6 years as the Executive Director of the Colorado Dept. of Natural Resources. So I do feel I have an understanding of what it means to be both a government official and a citizen working with government.

S.C. Was this the prime reason for your taking this job?

T.E. The thing that interested me most about the project was the potential for being involved in the first really new industry that is paying appropriate attention to environmental and socioeconomic concerns—before development. In fact, I feel that Rio Blanco very possibly is going to have the distinction of making industry history. We have a magnificent opportunity to demonstrate that development can be economically profitable—and environmentally right. And the possibility of that opportunity is very attractive to me. I try very hard to focus my life toward that type of positive activity.

S.C. Where is oil shale going?

T.E. Our request for a suspension illustrates the obstacles still in the way of oil-shale development. I don't think the Congress and the general public understand that the energy problem is real. I am convinced there is a problem and there is a solution, of which oil shale must be a part. But there's such an array of obstacles, such as the contemplated new Clean Air Act amendments that would preclude most industrial development in this region.

S.C. Should the industry give up?

T.E. No, but I think we'll have to expect the situation to get worse before it gets better. We're kind of a pendulum society; we let environmental problems get almost completely out of hand before we did something—and then we overreacted. Now we have the same situation with energy. So I expect the energy problem to get very critical before we realize what's happening—and then, if we are not careful, we may enact crash programs that really impact the communities and the environment. So, I find some environmentalists' antidevelopment campaigns to be very intellectually disturbing exercises.

S.C. Where is RBOSP going?

T.E. We will have risked $150 million by the end of the year on this project. Should we spend $150 million more when there are other alternatives that have less risk? We may come to the conclusion that oil shale is not worth investigating further. But right now we happen to think America needs it and we think our development plans will work.

S.C. What do you think about shale development?

T.E. It's just got to come. We don't have any alternative other than to use every energy source we have. And we know the oil-shale resource is there and it's immense. *A.N.*

Industry Update

Paraho progresses

From the on-going Paraho Oil Shale Demonstration, near Rifle, Colo., come two items of major interest. One: Paraho completed the largest known shipment of crude shale oil to the West Coast last month. This shipment, totaling 3,668 barrels, went to southern California Edison's Highgrove electric-power generation facility near Los Angeles where it is now undergoing extensive combustion testing to determine the best and most economical method of using the synthetic unrefined fuel. The tests, which are being conducted in compliance with strict San Bernardino County anti-pollution regulations, indicate another potential use for shale oil, although this fuel is not yet commercially competitive.

Second: as of press time, neither government nor Paraho officials could comment on their negotiations regarding the ERDA-Defense Dept. program to fund the production of 100,000 barrels of Paraho shale oil. But it looks like the program, which is to last 2 years, could officially begin quite soon. The program includes refining of the crude shale oil by others and testing of the products. The estimated total cost stated for the entire project is $12-$15 million.

Projects pass in review

C-b Shale Oil Project—This shale venture, the first to seek suspension from the federal lease terms, still hangs tight as of press time, waiting word on its request. Though suspension was *the* featured topic of discussion at the July Oil Shale Environmental Advisory Panel meeting in Vernal, Utah, a decision on any of the suspension requests was not announced by the Area Oil Shale Supervisor.

White River Shale Project—Vernal and Salt Lake City will be the sites this month for hearings on this project's Detailed Development Plan. White River, which has been concentrating its efforts on DDP and required environmental work for months, now continues to emphasize suspension and to encourage consideration of government-supported modular-sized plants as the next step in oil-shale development. White River officially sought suspension in July.

Rio Blanco Oil Shale Project—As detailed in this issue's article on the federal oil-shale lease program, because of air-quality and off-tract disposal problems that directly relate to conservation of the oil-shale resource, Gulf Oil Corp. and Standard Oil Co. of Indiana in July asked the federal government to allow them to suspend operations on their leased tract, C-a, for 24 months. The suspension would postpone tract development and delay the fourth and fifth lease bonus payments of $42 million each. In the request the companies also asked that they be permitted to complete the 2-year environmental baseline required before any development could begin in the future.

Walter Herget, president of Rio Blanco, emphasizes that this request does not mean that the companies have lost interest in oil shale. He reports that the venture will continue actively working on governmental and community affairs and on economic analyses. Also Rio Blanco will continue engineering and mining work in-house, although less contractor work is expected to be done during a suspension period.

FEA makes moot point for shale

The Federal Energy Administration recently ruled that price and allocation regulations on oil do not apply to synthetic fuels processed from oil shale, tar sands or coal. This point has been unclear since these price controls went into effect because the agency's mandate from Congress to control prices and allocation of crude oil did not define the term "crude oil." FEA has now concluded that the Congress did not intend these products to be regulated. But, since no commercial shale oil is presently being produced, the price control point, though indeed significant for shale, could be termed moot at the moment.

One name changes, one doesn't

The Oil Shale Corp., long known as TOSCO, is now officially the Tosco Corp. In late July, shareholders approved this change in the company's name. The firm's president, Morton M. Winston, says the name change reflects the growth and diversification of the company in several fields, in addition to its historic leadership role in oil-shale technology and development. However, he adds, "We are unchanged in our dedication to the development of synthetic fuels."

Grand Valley, Colo., is still Grand Valley. As our recent article on this well-known oil-shale community reported, some of its residents were trying to get the town's name changed to Parachute. Well, Parachute didn't fly. When this name change came up for a vote, a majority of the citizens voted for "no change."

A.N.

Senate aide tours shale area

Tom Laughlin, the aide who assists Sen. Floyd Haskell on energy matters related to the Interior and Insular Affairs Committee, recently toured Paraho Oil Shale Demonstration and Occidental Oil Shale's in-situ project. He also met with executives of the Rio Blanco Oil Shale Project, as well as local public officials. Laughlin told SHALE COUNTRY's regional editor that proposed changes in the use and distribution of bonus-bid monies from oil shale are likely to be enacted through measures in the coal leasing act (if Congress overrides the Presidential veto) and the Land and Water Conservation Fund bill. *C.E.*

Looking Ahead

Dial Ma Bell For Growth Information

The telephone, now 100 years old, makes far-away sights and sounds quickly and easily accessible. And in shale country, one way Mountain Bell continues to shrink our world is by keeping precise tabs on how and where the population is growing.

Because of the expense and intricacy of today's telephone system, Mountain Bell needs to look carefully ahead into telephone communication needs. The person looking into the future of the Western Slope is Nick Marquez, one of ten Colorado commercial forecasters. Marquez watches growth and employment trends in the Mountain Bell servicing area that covers Colorado west of Gunnison to the Utah border and from Rifle on the north as far south as Durango. He explains that a commercial forecaster "is part economist, part demographer and part employment specialist." His job: "Since a new switching office or a major addition to an existing one takes Mountain Bell 2 to 3 years to plan and construct, we need to predict demand well in advance."

To be exact, Marquez takes a computer look at the Western Slope 20 years from now by way of 5-year increments. Forecaster Marquez says, "We use the counties' population estimates, but as far as people are concerned, we need to know more than numbers. We need to learn what age groups will comprise the population, where the employable people will work, where they will live and in what kind of housing.

"Let's take a look at Grand Junction, for example. This city has experienced a fairly steady growth rate of about 2 percent per year since the late 1950s. Grand Junction's revenue dollars have traditionally come from tourism, agriculture, government employment and coal mining. Energy impacts will, of course, change this composition, and what this means to us is an increase in demand and a change in the sources of our revenue. But, since telephone service is a capital-intensive industry, we need to know some fairly precise facts and figures before we add to our servicing capacities."

And what do Marquez's predictions say about Grand Junction? To begin with, he sees a peak growth period in the area from about 1980 to 1985. This projection assumes that at least one commercial oil-shale plant will materialize during that time. Together with the energy industry, Marquez sees manufacturing and government employment playing a strong role in the growth of the Grand Junction exchange. He then translates this data into the number of new telephones required, which during the next 5 years—from now to year end 1980—will equal approximately 6,678.

Expensive supply to meet demand

To accommodate this demand, Mountain Bell has recently completed a $6-million addition to Grand Junction's central-switching facility. When one looks at the cost of this additional plant capacity and adds to it the yearly $3- to $5-million cost of outside plant expenditures in the Grand Junction district, (cable, poles, distribution boxes, for example), one begins to understand Ma Bell's pressing need for accurate market forecasts.

Marquez's predictions already indicate the need for another Grand Junction switching office expansion in 1979, but that addition should suffice until about 1982. He adds, though, that the most difficult-to-measure variables are the political and environmental questions surrounding Western Slope development. "A change in energy policy can significantly alter our predictions," says Marquez.

And what will this mean to shale-area residents? First, of course, it means that people living and working on the Western Slope will enjoy good telephone service in the years to come. And second, since Mountain Bell prefers to employ out of the local labor market, additional phone service will mean more jobs. Finally, Mountain Bell's market forecasts provide one more reliable source of information concerning the Western Slope. Because Ma Bell is willing to share information with other people who need to know the facts about growth, many in shale country can benefit from her—and Nick Marquez's—expertise. *R.M.R.*

Mountain Bell's new plant addition lights up Main Street in Grand Junction, Colo.

A Look At

What's the Status of the Federal Oil-Shale Leasing Program?

By Carol Edmonds

Amid Blackboards, DDPs, Flow Charts: the Mining Supervisor's Perspective

Five years ago, the President of the United States requested the Secretary of the U.S. Dept. of Interior to begin "a leasing program to develop our vast oil shale resources, provided that environmental questions can be satisfactorily resolved." The Interior Dept., proceeding on the basis of that charge, prepared a six-volume environmental-impact statement, (EIS), released in 1973. It examined a proposal for "two prototype oil shale leases in each of three states of Colorado, Utah and Wyoming," and the resulting environmental impacts of producing from these lands a total of some 250,000 barrels of shale oil a day.

On the basis of the EIS, leases were drawn up, and bids from private oil companies were accepted from January to June of 1974. Leases were awarded in Colorado and Utah, but industry submitted no bids for the Wyoming tracts.

Since the leasing, three other milestones have occurred in the federal government's prototype oil-shale leasing program. These are: 1. Collection of "environmental baseline" data, describing the environment before oil-shale development, has passed the 1-year mark for all the tracts. The second year of data collection, required before any commercial development can begin, is nearing completion. Many other data also have been collected, covering such factors as mine design, manpower needs, water requirements. . . 2. Each of the three projects has submitted a Detailed Development Plan, tracing the most probable path toward commercial development. Public hearings on the DDPs have been held. 3. One lessee, the C-b Shale Oil Project, has sought suspension of its lease terms, citing technical problems with rock mechanics and the uncertainties and obstacles facing the oil-shale industry as its reasons. Another lessee, White River Shale Project, is now considering suspension. And, the Rio Blanco Oil Shale Project has just requested suspension because of the confusing status of the federal Clean Air Act and its "no-

From Paper to Production—When?

With the federal prototype oil-shale program heading toward suspension of operations, it appears that getting from the paperwork stage into commercial production remains a big shale hurdle. But suspension hardly means extinction. As one of the lessees, White River Shale Project, put it, "While many difficulties are yet to be resolved, (White River) recognizes that good progress has been made and maintains its interest in pursuing the path of commercial production of oil from shale." Yet an interim period appears necessary. States Earl Ramsey, White River Shale Project program director, "We sense that the urgency of the oil crisis has passed. The general public has almost forgotten the (Mideast oil) embargo we had 3 years ago." This relaxed attitude about energy supplies has apparently been transmitted to Washington, D.C., Ramsey notes. So, White River sees a need to allow time for Congress to pass the legislation necessary for oil-shale development, and will request a 2-year suspension of lease terms (see Guest Column, pages 16–17).

Examining resource recovery—Tract C-b formally submitted its request for an 18-month suspension on March 2, 1976. The application notes, "Exploratory operations to date have revealed technical uncertainties with respect to rock mechanics and their effect on attainable extraction ratios." Explains C-b's manager of leasehold development, Al Ireson, "We plan to review the present room and pillar mining plan (set forth in the DDP) to see if we can improve on extractive efficiency. It (improving resource recovery) may be as subtle as using pre-split blasting or a small reduction in some of the design factors for the pillar and roof span calculations." Only if C-b managers cannot see sufficient improvement in resource recoverability through revisions in current room-and-pillar design will the project research other mining methods, Ireson says.

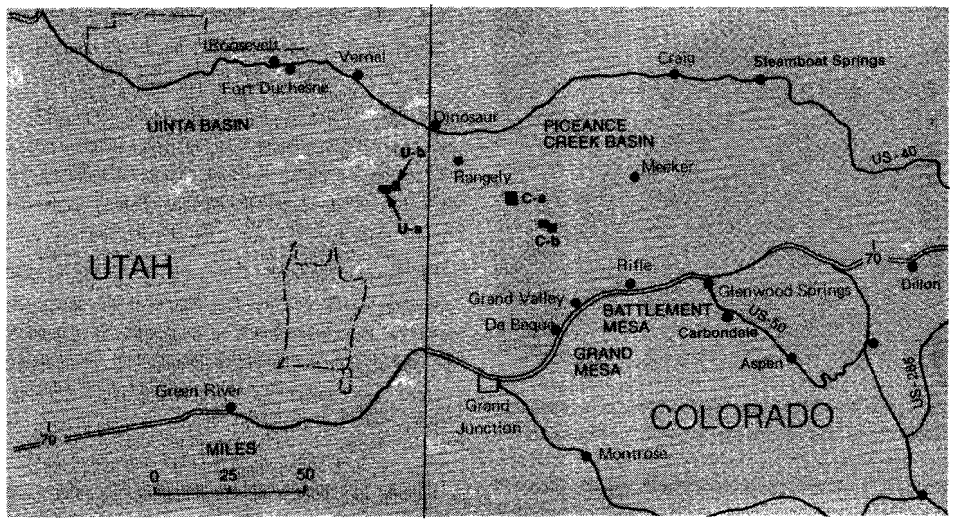
Two big question marks about suspension involve monitoring of the environment during suspension, and any revision or rewriting of the DDP following suspension. Ireson notes that the lease requires only 2 years of environmental baseline data collection and monitoring, to be completed by November 1976 for C-b. Anything after that point will require a "meeting of the minds" of the Mining Supervisor and lessee, he says. Much of the data collected show a cyclic pattern, Ireson notes, and the lessee would be inclined to let that information stand. On the other hand, data that show rapid fluctuations could lend itself to continued measurement, Ireson feels.

significant deterioration" regulations, plus unresolved problems connected with needed additional federal land for off-tract waste disposal and road and land needs for Rangely, Colo., the town where Rio Blanco expects most of its employees to live.

AOSS tackles DDPs

Suspension or not, the DDPs are being scrutinized. The DDPs epitomize the federal lease requirement for meticulous, careful analysis of proposed oil-shale projects on the public lands. The leases also require that each DDP must be approved by the Area Oil Shale Supervisor (AOSS) before the first shovelful of dirt can be turned to construct an oil-shale plant. AOSS Pete Rutledge has said he will rule on each DDP within 6 months after it is submitted. And he is scheduled to announce this month a decision on the first DDP submitted to his office—from project C-b. Rutledge has already said that although the options include rejection or blanket approval, his most likely action will be to "conditionally approve the DDPs"; that is, approval probably will be given based on the requirement that the lessees rewrite certain sections of the document.

In a recent interview, Rutledge reviewed for SHALE COUNTRY the aims of



the DDP, the status of the program, and the implications of suspension.

Shale Country: *What do the federal leases require in a DDP?*

Rutledge: The DDP should answer as many questions as possible (about plans for commercial oil-shale development). For each question, we ask, "Do we have an answer?" If we don't, then we ask, "Do we have a plan for getting an answer?" The DDP is a hybrid. We knew it could not be the engineering design for everything, since we'd be deciding certain things as we go along. It is sufficient for the DDP to trace a path so that we have a basic understanding of what is proposed.

It would, of course, be possible for the lessees to put together a DDP that would be very specific. But it would be fictitious. It's better to recognize the uncertainties.

S.C. *How has your office analyzed the public and government agency response to the DDPs?*

R. We've taken everybody's letters, the advice from the Oil Shale Environmental Advisory Panel and transcripts of the public hearings and compiled them in one book. Then we've looked at each comment, and translated all the salient points to index cards, which are coded according to subject matter and our filing system, and these are referred to

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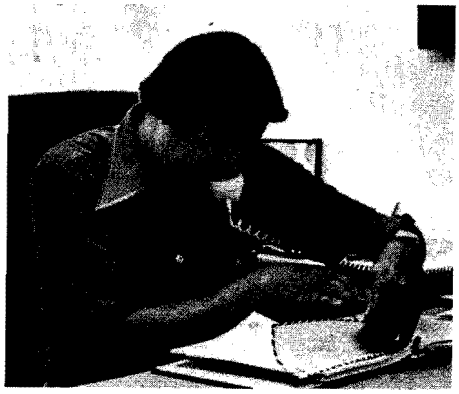
Along these same lines, C-b Project Manager Bob Loucks observed during public hearings on the DDP that the four companies which have been involved in the C-b project have spent some $12 million for work that led to the DDP. He said, "We are concerned that some well-meaning environmental specialists would have us continue to do over and over more detailed environmental studies. Obviously, there must be a reasonable limit—we believe that we are approaching the limit now."

As to any DDP rewriting after a suspension period, Ireson says that if the mining plan required only minor adjustments, "We would (then) expect little or no rewriting, perhaps one or two attachments."

Wait for Action—Suspension has been requested by the Rio Blanco Oil Shale Project. The application pointed out that Gulf and Standard will be unable to proceed with development until the status of the Clean Air Act, its standards and the "no-significant deterioration" regulations is determined. The application also stated that lack of action at the Congressional level to pass bills which would allow the Interior Dept. to lease additional land to the lessees for non-mining uses, such as processed shale disposal, could result in waste of the oil-shale resource. On-tract disposal would require underground room-and-pillar mining which would result in the recovery of only one-fourth to one-fifth of the amount which could be obtained by open-pit surface mining and off-tract disposal. The application also noted continuing needs for a new road from tract C-a to Rangely and additional federal land for Rangely to facilitate orderly population growth.

In the letter to Pete Rutledge, Area Oil Shale Supervisor, Gulf and Standard also noted a need for utilities and pipeline rights-of-way and an unavoidable delay in a Colorado water court trial to review Rio Blanco's request for groundwater on tract C-a. The letter specifically requested a 24-month suspension of operations; the suspension would postpone the fourth and fifth payments of $42 million each for the time of the suspension, while allowing the companies to hold the lease.

However, though suspension may be in the offing for all three projects, each DDP positively states the long-term goal is commercial development. As spelled out by Rio Blanco Oil Shale Project, "Our ultimate goal (on tract C-a) is to engage in commercial production of shale oil and associated by-products at as high a production rate as is feasible, consistent with environmental, technical and economic constraints that now prevail or may exist in the future."



Not all doom and gloom—Mining Supervisor Pete Rutledge sees promise in the federal oil-shale leasing program, and also observes that, if the leases are suspended, "I think it would be extremely wasteful to throw out 2 years of experience."

some expert in our office for a response. (See related story, this page.) From all this, I don't believe there's anything insurmountable in the DDP (submitted by C-b). We may require that it be expanded by imposing certain conditions or by asking the lessees to rewrite certain portions, such as the monitoring program. But we aren't talking about major revisions.

We view the DDP as a dynamic document—just as the prototype program is dynamic.

S.C. *When will the program have accomplished its goals, which include developing a mining and retorting technology for commercial oil-shale production?*

R. Let me answer that in terms of a specific tract, taking C-a. Obviously, there is a law of diminishing returns involved here. The initial phases answer more questions than later phases—in terms of quantity of questions, not importance. For the C-a project, it appears all of the questions will not be answered until the open pit starts moving—so that they are moving in front, reclaiming in back. (Current C-a plans call for backfilling to start after some 30 years of production at 55,800 barrels a day.) As a mining engineer, I give a lot of weight to the question of the ability to be able to move the open pit and reclaim it as you move. I do not believe any mining company would ever be justified in commencing an open-pit operation in this area, whether it was totally on their own capital or whether it was a combination of the public's and private, without the option of continuing that pit.

S.C. *However, the program could prove unfeasible before that 30-year point. Is that right?*

R. Yes. But, as soon as we go through operation of full-size retorts, we should get some answers to the economic questions. Up until now, however, we haven't proven much of anything. Our paper studies indicate the basic problem is one of economics, and there are so many things that affect that.

S.C. *When would you make a decision on the suspension requests, and on what basis would you decide?*

R. There is a provision in the Mineral Leasing Act, allowing suspension for "conservation of the resource," which is very broadly defined. We would also have to consider the oil-shale leases. The decision logically would come before the fourth bonus payments, which are due in March, April and June of 1977. (At that point, the lessees are required to make the fourth bonus payments or to offset them with development costs. If the leases were suspended, there would be no bonus bid payments during the suspension.) Suspension should be granted some 6 months before the fourth bonus payments are due, to allow for the vagaries of bureaucracy.

When making a suspension decision, we would be asking two questions: What should be done under the suspension to maintain the integrity of the environmental baseline? Are there some things that both the lessees and government would like to continue monitoring to learn more about certain questions, such as air quality?

As to what is likely to happen, I have

Fathoming a DDP

Mission: to decide what is needed to make the voluminous Detailed Development Plan pass muster. In other words, the DDP, which spells out plans for commercial development of oil shale on a federal tract, must meet the standards in the federal leases. The leases require, among other things, "a detailed description . . . of the procedures to be followed to assure that . . . the lease operations . . . will meet and conform to the environmental criteria and controls incorporated in the lease. . ."

Given public testimony and reams of advice from organizations and government agencies, how is all this information sifted? That is the task of the Mining Supervisor, Pete Rutledge, and his staff, who are part of the U.S. Geological Survey, and who are located in the Area Oil Shale Supervisor's Office, in Grand Junction.

To illustrate the review process, the Mining Supervisor's C-b Tract Coordinator Eric Hoffman describes some of the procedures used to evaluate C-b's plan: "Each staff person was assigned a major area of analysis, such as mining development, ore handling, air-quality control and erosion control. Each of these subject areas fits into one of four major areas: monitoring; development and operations; environmental protection and environmental baseline.

"From comments, written and oral, submitted to the Mining Supervisor, more than 200 index cards were prepared—listing the essence of each comment. For example, one card noted that Morey Wulfson, of Environmental Action of Colorado, had stated that there is documented evidence that synthetic fuels will cause cancer of the lungs, skin and scrotum. That comment was referred to a staff expert in the Mining Supervisor's office. The response: a reference to the May 1976 meeting of the Oil Shale Environmental Advisory Panel, when Dr. Merril Coomes, a scientist who works with C-b's carcinogenic research, presented findings that indicate processed shale does not pose a carcinogenic hazard."

For each such comment on the DDP, the Mining Supervisor's staff writes a suggestion for disposition. If they find the comment is significant, they may suggest that a condition of approval be attached to the lease. The result: what Hoffman calls a "composite bottom line," spelling out conditions of approval, which Rutledge himself must finally agree should or should not be required of the lessee.

sent the Interior Dept. a plan of action on the C-b request for suspension of operations. C-b claimed the formation was structurally weaker than anticipated. The plan of action suggests that we need to verify that claim. It also suggests that the suspension be limited to a specific time frame or event, and that some maintenance of the leasehold be required.

If that plan is approved, I think that Interior would draw up its own agreement for a suspension of operations (rather than simply signing the agreement proposed by the lessees). C-b requested an 18-month suspension, and 18 months is probably within the time frame we would consider.

S.C. *Would a new or revised DDP be required, following suspension?*

R. We've been diligently planning for 2 years. I think it would be extremely wasteful to throw out 2 years of experience and go back to square one. Of course, if there were major changes during a suspension, we would review them with the panel and go back to the public.

S.C. *Meanwhile, what happens to your office during suspension?*

R. We would most likely continue operating at the same staff level for the next year. You know, the lessees have spent millions for the work done so far; the government has invested innumerable dollars, and something ought to come out of all this. For example, we're working with the Environmental Protection Agency on a feasibility study to computerize all the environmental data gathered on the tracts, so that it can be used for other purposes (in addition to oil-shale development). Overall, we're trying to blend together the environmental data and other information. Right now, it's hard to see the light at the end of the tunnel of oil-shale development. But, who knows? Oil shale has had a varied history. I'm not all doom and gloom. With that kind of resource sitting out there, there's got to be some light somewhere.

And the light, from Rutledge's vantage point, may be fueled by shale oil.

Ten Oil-Shale Commandments? Hardly!

"The Bibles" of fundamental oil-shale law wouldn't even fill one bookshelf, and they don't begin to compare to the libraries of law books and regulations governing other energy minerals such as oil, gas and coal. The basic oil-shale legal references are the Mineral Leasing Act of 1920 and the oil-shale leases (published in the Federal Register, Vol. 38, No. 230 on Nov. 30, 1973). Providing background is the six-volume Final Environmental Statement for the Prototype Oil Shale Leasing Program (issued by the Dept. of Interior in 1973).

Interpreting these laws and advising the Mining Supervisor on their implementation is the job of the U.S. Office of the Solicitor, whose regional office is located in the Denver Federal Center. From that office attorney Lowell Madsen advises government agencies from the U.S. Geological Survey to the U.S. Fish & Wildlife about oil shale, coal and other leasable minerals on lands managed by the Interior Dept. He explains, "My function is to represent all these people (in the various Interior Dept. agencies). We try very hard not to take an advocate's position between two or more agencies. I'm more of a referee." And since oil shale does not have extensive regulations governing extraction or a large body of case history (court decisions) for guidance, "We're really plowing new ground," Madsen notes.

Defining 'prototype'—Among the more hotly debated issues in the oil-shale prototype leasing program is the meaning of the word "prototype." Part of the concept is defined in the Final Environmental Statement (Vol. III, pp. 1, 2) that describes the objectives of the program:

—To provide a new source of energy to the nation by stimulating development of commercial oil-shale technology by private industry.

—To insure environmental integrity of affected areas and to develop environmental safeguards and restoration techniques that can be reasonably incorporated into the planning of a mature shale industry.

—To permit an equitable return to all parties in the development of this public resource.

—To develop management expertise in the leasing and supervision of oil-shale resource development, to provide the basis for future administrative procedures.

Within this overall framework, the environmental statement examines impact of two prototype oil-shale leases in each of three states. While the statement refers to "prototype development on public lands which, when combined, could support a production potential of about 250,000 barrels per day," Madsen says that number represents "the best estimate, given current technology, of output." The statement wasn't limiting the number of barrels that could be produced from the lease plans, Madsen says. The sole limit to production was imposed by the number of leases issued and by the difficulties of complying with restrictions in the lease itself. One of the key lease requirements: "The lessee shall conduct all operations in compliance with all applicable Federal, State, and local water pollution, control, water quality, air pollution control, air quality, noise control, and land reclamation statutes, regulations and standards."

The attached stipulations provide that "continued compliance with changing pollution control laws is required." In other words, the regulations provide for commercial development of oil shale without undue environmental damage.

In addition to compliance with all pollution control laws, the lessees are also subject to applicable state and local laws. There is some potential conflict over jurisdiction. For example, Rio Blanco County Commissioners in Colorado have insisted that the lessees of the federal oil-shale tracts must apply to the county for permits to change the zoning on those lands from agricultural to industrial. Lawyers for both the county and federal government had tentatively agreed to cooperate to avoid litigation. However, a suit filed recently by the State of Wyoming may determine the issue of federal-state control of leased lands; Wyoming is challenging the Secretary of the Interior's coal leasing regulations.

In short, the word to describe oil-shale law today is "evolving." From the morass of regulations, statutes and court decisions, federal policy on oil shale is shaped daily. And, in the absence of specific regulations governing extraction, it appears that oil-shale law will never be reduced to a simple set of "commandments."

Referee—Solicitor Lowell Madsen explains that "prototype" development is limited by the number of tracts the government leased, not by any ceiling on production.

Situation Report

Shale in the Sky— An Alternate Fuel

When the administrator of the National Aeronautics and Space Administration asked a non-profit national research group to study alternatives to oil as a source of aircraft fuel, the group looked at oil shale from the very beginning. The beginning was 2 years ago when an ad-hoc committee was formed under the Aeronautics and Space Engineering Board; the Board is part of the National Research Council, which in turn is an investigative and study arm of the National Academy of Science and National Academy of Engineering.

Spurred by the Mideast oil embargo, the group was formed at NASA's request to investigate alternate fuels for military and civilian aircraft. The ad-hoc committee consists of some 15 representatives or retired executives from the major airlines, aircraft building and aircraft engine industries, the military, NASA, and various government agencies. Their investigation has included an on-site inspection in June 1976 of a private shale-oil venture, the Paraho Oil Shale Demonstration at Anvil Points, near Rifle, Colo.

Following the inspection, the chairman of the committee, Dr. Abe Silverstein, discussed with SHALE COUNTRY shale oil's potential as an aircraft fuel. He said: "The fuel you make from shale oil is akin to kerosene (presently used as a fuel product); it has paraffinic characteristics." The paraffinic nature of the shale oil relates to its simple straight-chain hydrocarbon chemistry, as contrasted to the aromatic, ring-compound characteristics of some fuels, such as coal. Aromatic fuels such as naphthene are more difficult to burn and may sacrifice combustion characteristics—meaning less efficient use of energy. Incomplete combustion may cause smoking engine exhausts and higher temperature combustion systems. In contrast, the haze factor is reduced when shale oil is used as a jet fuel.

Notes John Jones, inventor of the Paraho oil-shale retorting process, "Research is needed to better understand why shale oil is burning more efficiently in jet engines." In the meantime, Silverstein's group is interested in shale oil's combustion efficiency, since part of the committee's task is to study fuel conservation. Silverstein explains, "We're looking at higher efficiency for aircraft, as well as a backup for current aircraft fuels in the event of an oil embargo."

Such considerations received heavy play during the tour last June of Paraho. Committee chairman Silverstein said that his group concluded, "Shale oil is an important fuel. An effort should be made to push ahead more rapidly on manufacturing and testing."

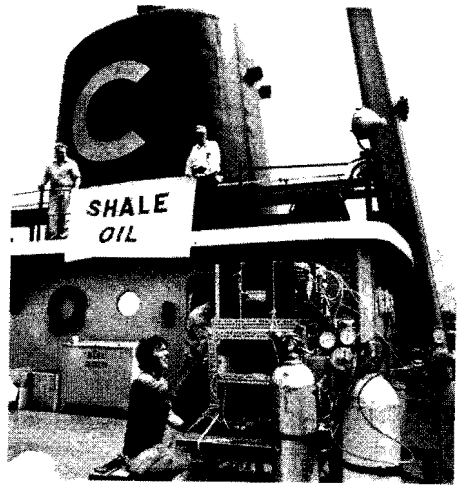
Link between aircraft, ship fuel?

The whole research area related to using shale oil for transportation needs "will require complete performance tests," Jones states. And he notes the intriguing possibility of parallels between the applicability of using shale oil as a fuel for aircraft and for shipping vessels. For instance, tests made last year using Paraho shale oil to fuel an iron ore vessel on the Great Lakes indicate that certain similarities may emerge between the use of shale oil for aircraft and ships, he says.

According to Jones and Silverstein, an immediate research need is to continue such transportation-fuels testing on large quantities of refined shale oil. Jones explains that one reason for long-term research is the possibility that undesirable residue from shale oil might accumulate in jet engines.

While Silverstein's committee has performed on-site evaluation of shale oil, its mission is far from finished. In addition to its investigation of shale oil, the group also is examining other alternative sources for aircraft fuel. The task may seem complex and oil-shale production itself may seem distant. But the ad-hoc committee members are accustomed to working with the difficult. For example, Silverstein, now a consultant for Republic Steel Corp. of Cleveland, at one time headed NASA's Lewis Research Center in Cleveland and directed some of the first manned space flights. Today, he agrees that a pioneering spirit is common in both the space industry and in this nation's efforts to tap oil shale for such uses as aircraft fuel. *C.E.*

Investigating shale oil, Dr. Abe Silverstein, one-time director of NASA's Lewis Research Center in Cleveland, sees shale oil as having potential as an aircraft fuel because of supply and efficiency reasons.



To sea with shale? Use of shale oil for another transportation need, shipping, was tested last year aboard the S/S EDWARD B. GREENE, flagship of the Cleveland-Cliffs Iron Co. Great Lakes fleet.

Environment

Archaeologists Preserve Shale Country's Past— for the Future

By Teddy Orr

What do today's shale-country inhabitants have in common with Spanish explorers, gold-rush miners and nomadic Indians that roamed northwestern Colorado hundreds of years ago? Quite a bit, says Dr. Bruce Rippeteau, State Archaeologist for Colorado. He explains: "Many of those who used to live in the northwestern portion of the state were motivated in ways similar to today's residents. For example, the Indians and the early Euro-American pioneers dwelt there to farm and hunt. Those same factors motivate many of the families that live or move there today. Others in the past came on a temporary basis, often just to extract particular economic resources. And, this is also true today. But instead of flint or turquoise, today's temporary residents are seeking oil, gas, oil shale and coal. Thus, it's very likely that hundreds of years from now, an archaeologist will find the remnants of our modern energy extraction; and he will be able to draw conclusions about what our life must have been like in shale country in the late 1900s, just as we are now doing with cultures that inhabited that region as long ago as 15,000 B.C."

According to Dr. Rippeteau, most of what is known about shale country's past has been learned from the cultural resources that archaeologists thus far have found in Colorado's Piceance Basin and its neighboring areas. But, "We've only begun to explore the surface," he says. "Right now we're not sure just what the total range of cultural resources are in the shale-country area. It is wise that our legislation requires us to find out before losing them because of our other priorities."

But, what is known about shale country's past is fascinating. According to Dr. Rippeteau, the earliest evidence of human beings in that area dates back to between 15,000 to 10,000 B.C. "These earliest inhabitants belonged to the Paleoindian Culture or the Desert Culture. Later, we see a cycle into the Plano Culture, whose people hunted bison from the plains as late as 6,000 B.C.," he says. Next came the Archaic period. "During this period, it appears that the people did not rely on any one food source but rather foraged among an extensive selection of plant and animal food resources." Then, Dr. Rippeteau says, in the first centuries A.D., cultigens came to shale country. "These Fremont Culture people developed large agricultural villages, usually located near water, and became tribal-level cultures based upon that immense new energy of seasonal farming. Finally, the Euro-American explorers appeared in strength about 200 years ago, and, of course, after them, the pioneers and precious metal-seekers. Today, the population of shale country is relatively large and is predicated upon the modern cultural behavior of needing energy elsewhere but being able to afford an exploitative economy by outside support."

Archaeology is . . .

Such knowledge of former shale-country inhabitants is possible through the science of archaeology. Archaeology, Dr. Rippeteau explains, "is a tool that helps us recreate the days and worlds of yesterday's humans. For example, archaeologists find artifacts and features

Cultural resources managers and development firms are getting together early in the planning phase to see that cultural resources are adequately considered along with the rest of the development. Here, Dr. Calvin Jenning, Director of the Laboratory of Public Archaeology at Colorado State University (far left), Dr. Bruce Rippeteau, State Archaeologist for Colorado, and Dr. Bruce Lutz, Director of the Archaeology Laboratory at the University of Northern Colorado, study maps after a field inspection of a prehistoric site.

(artifacts that are difficult to remove, such as house walls or stone fire pits) and interpret their relationships within the site, between sites, and across space and time. Archaeology uses the surviving material culture to reconstruct social culture, and in rare cases, mental culture. And, it's the only way we have of knowing about Pre-history, which covers the period of time before people wrote or were written about." Archaeology is a social science, Dr. Rippeteau explains, and thus is different from paleontology, which deals with animal fossils usually from a much older time period.

A recent challenge developed in the field of archaeology is that of cultural resource management, according to Dr. Rippeteau. "Cultural resources include examples of past human behavior, as represented by cultural information, that can be inferred from the surviving archaeological evidence. Some cultural resources should be preserved and studied since they are often unique and always non-renewable. Once they are gone, there is no way to get them back unless we make assumptions about what it is we want to know," he says. Dr. Rippeteau explains that the concept of cultural resources as deserving management started only as recently as the 1960s and is just now hitting its stride. Prior to this time, Dr. Rippeteau says, "We archaeologists and cultural resource professionals had to work primarily on a salvage basis—often just ahead of the bulldozer. Now, we have a whole set of laws that gives us a proprietary interest in most state and federal (or governmentally-related) land-use developments. And, these laws are so strong and representative of deeply held national values that courts consistently rule in our favor. We don't have many battles to fight anymore to get compliance with the procedures that regulate cultural resources," he says.

Legal links to shale

"So, these laws are the reason the State Archaeologist is involved in oil-shale development—to see that these non-renewable cultural resources are adequately considered along with the rest of the development," says Dr. Rippeteau. He adds that while the State of Colorado has laws that deal with cultural resources, most laws actually affecting shale development are federal because of its vast land ownership. However, these laws largely require consultation and the concurrence of the State Archaeologist. "And, the federal oil-shale leases themselves may even have provisions for specific cultural resource preservation."

Dr. Rippeteau's office has sponsored compliance workshops, such as this one held last June at the State Museum in Denver.

Dr. Rippeteau notes that under the interlocking 1966 National Historical Preservation Act, the 1969 National Environmental Policy Act, the 1971 Executive Order, and the 1974 Archaeological Conservation Act, archaeologists may survey to locate and then evaluate any discovered cultural resources to determine their significance to the public. "If the evidence merits it, we have the authority to mitigate the impact of development on those cultural resources. If the evidence does not merit the National Historic Register, which is considered first, management of the resource may well be accomplished through methods such as avoidance procedures that are stipulated in the leases. The first choice is preservation, perhaps through earth burial, but in many cases this is not possible. Then, we require a state-of-the-art excavation complete with laboratory study and the very best publication of data possible."

Pulling it together

Dr. Rippeteau feels there have been problems coordinating the various energy-related developments in Colorado's northwestern area—coal and shale, for example. And, it seems that energy developers have often been confused or uninformed regarding the legal compliance procedures relating to archaeology. Thus, Dr. Rippeteau feels one of his primary roles as State Archaeologist is to help energy companies comply with the laws and to coordinate the archaeological aspects of the energy-related projects that impact cultural resources in Colorado. Therefore, he says, "Since becoming State Archaeologist, I have made an effort to always be available via telephone to answer questions. Also, to help energy-development firms know what their responsibilities are under the law, we have sponsored compliance workshops and an oil-shale archaeology symposium. We also will be distributing guidelines on what constitutes good archaeological and cultural resource management reports and what those reports must include. And, we are working on major proposals for expansion in the State Archaeology office so that we can better serve energy-related agencies and companies in the whole area of compliance."

Are there any reasons besides the legal aspects why people should be concerned with preserving cultural resources? Says Dr. Rippeteau, "Knowledge and wisdom are the justification and the reward for our present labors to preserve as many unaltered samples of the past as still happen to remain. To illustrate, let me quote the French explorer La Rouchefoucault Liancourt, who in A.D. 1800 wrote (while camped directly upon one of the very sites which would later create our awareness of the largest single prehistoric phase of American prehistory): *'Fancy must live in future ages, to find occupation in this infant country; past ages can exist here only for generations not yet born.'* I can only add to that thought by saying that much of the future is now."

No price tag—"We're all going to have to be more concerned with each other. That's the kind of thing you can't put a price tag on," said Mesa County Commissioner Maxine Albers.

Reaching the 'non-brazen'—"The very people you're trying to reach are the least able to project themselves. When you move into a new town, just brazen people like me go to clubs or meetings," said Dorothy Minkle of the Area Council on Aging.

Community Profile

Case History: Coping with Growth-Related Ills

By Carol Edmonds

The human needs of persons living in rapidly-growing towns should not be shoved aside in the rush to build sewers and trailer courts—and they are definitely under scrutiny in shale country. For example, the special needs of women in boom towns and ways to meet them were considered at a day-long brainstorming session of 15 women leaders, which was held in Grand Junction, Colo. in June 1976.

Grand Junction is near Paraho Oil Shale Demonstration, Occidental Oil Shale, Inc., and Rio Blanco Oil Shale Project; all three have offices in Mesa County. Grand Junction, a city of some 28,000 persons, including oil-shale employees, is the county seat. In the midst of traffic from Interstate-70 and Western Colorado's major airport, the town is absorbing growth from government, tourism and other energy developments such as uranium; Grand Junction seems likely to continue its rapid growth, with or without oil-shale development. So these women, not wanting growth to overwhelm their town, set out to marshal it. The following describes their plan of attack, and approach that other communities might find useful. A resource person who assisted the women was Gulf Mineral Resources's Donna C. Davidson.

Start with a blackboard full of lists of needs that a fast-growing town is experiencing, and where do you go from there? When the room is full of the community leaders who listed those needs, the answer may be that you jump immediately to practical solutions, and then you develop programs to carry them out. That was the approach adopted by 15 women leaders in Grand Junction recently during a seminar held to identify the priority needs of women in shale country's high-growth communities and to find ways to meet those needs. Organizing the 1-day workshop was the Virginia Neal Blue Women's Resource Center, based in Grand Junction, and community development planner, Donna C. Davidson of Gulf Mineral Resources Co.

Opening the meeting, Davidson predicted it would be "practical and action-oriented," aimed at attacking problems women face in a rapidly-growing community. She quickly sketched a theoretical way of looking at the needs of the individual in a community. Davidson began by listing three general needs of the individual:

Community—Having a sense of belonging, participating, sharing. Having people to talk to and to do things with; having friends you can turn to for help; feeling that you are accepted as an individual. All this is difficult in a boom town where long-term residents may snub newcomers.

Identity—The individual as she sees herself, and as others see her, in various roles within the family and the community. When a newcomer arrives in town, she must rebuild her identity within that community.

Variety—of roles, activities, recreation. In a boom town there are not enough outlets for creative energy; typically, variety is another new bar or gas pump in town.

Looking at these needs, Davidson said that people having different lifestyles try to meet them in different ways. Example:

A person's way of earning a living will strongly influence when they have free time and how they spend it. A rancher with a seasonal round of activities is likely to have different recreational needs and desires than a shift worker with a daily round of activities. Another factor: family. Persons in a boom town may be geographically separated from their family so newcomers must search within the community to meet needs previously answered by their family. Where grandparents or a sister might have taken the kids for a weekend so the parents could get away from it all, now a new friend or a babysitter must be found.

Answers? Self-reliance, not the feds

The most cost-effective way in the long run to meet these new needs in a boom town is through development of the community's own local resources, rather than relying on federal programs or waiting for outside intervention, Davidson observed. Therefore, the planner urged the group to "focus on what we can do from this room."

The women Davidson addressed are, as she described them, "activists, executives, leaders," among them a county commissioner, city council member, mental health worker and director of a program for the mentally retarded. Thus, there was hardly a pause before the women started enumerating women's needs in the community. Observed Dot Hoskin, a woman active in a nationwide effort, Women in Government: "Household violence is one concern. I've talked with some mothers (at a continuing-education class); at least a half-dozen there had been beaten by their husbands or their mothers had been beaten by their husbands. They need some place to go."

Responded Maxine Albers, a county commissioner, "That brings to mind child abuse, something I've been terribly conscious of. It points up the need for child care to help these mothers." Margaret Moorehead, from the State Department of Social Services, observed that child-care homes are subject to state regulations, permitting the operator to charge no more than $3 per child per day. The paltry fee hardly allows the operator to meet expenses—thus creating a shortage in child-care homes. The women agreed.

County Commissioner Albers continued, "Our educational systems are failing to work at helping students learn to live with each other." Said Virginia Pipe, a volunteer with the Women's Resource Center, "Yes, we need a preventive thing rather than a mop-up." Referring to preventive measures, Albers observed that isolation, lack of personal relationships, is a cause of many boom town problems. She suggested that a feeling of unity is often achieved in a neighborhood. "We need to encourage the neighborhood concept," she said.

Alcoholism and public rest rooms

Selecting from the list of specific community problems, each woman in the group described what she thought was a top priority problem the group ought to address. Among the top problems: alcoholism and other drug abuse; a need to educate the public about growth-related human need problems; a sanctuary for battered wives, rape victims and others; and communications among service organizations.

Asked to describe their second priority concerns, the women's answers varied: development of neighborhood and other groups that encourage personal relationships and group feelings of unity; educating the power structure to the needs of women and educating women to participate in the power structure; public rest rooms.

The women then discussed what problem areas would be the most fruitful to attack, taking into account the resources that would be available to start with. Three distinct areas emerged: encouraging women to involve themselves in the power structure; creating "neighborhoods"; establishing sanctuaries for female victims of violence.

During the next hour of the session, three small working groups developed strategies for:

—Developing a pilot project in cooperation with the school board to use a public elementary school as a neighborhood community center and as a focal point from which to develop neighborhood activities. A community director would be hired to identify needs, match them with existing resources and set up programs.

—Working through a voter registration campaign, League of Women Voters, and Women in Government to identify and encourage women to become active in public affairs and civic organizations; the Women's Resource Center can provide workshops in public affairs and leadership training for women.

—Getting quantitative data on the number of battered wives and violence victims in the area; estimating the needs that a sanctuary house would have to fulfill; and contacting other sanctuary programs to gain further knowledge of how to develop one.

Members of the group took individual responsibility for doing the first round of jobs that had to be done in order to get the projects started. For each of the groups, one of the first orders of priority was to get more people involved in the project. The Women's Resource Center will serve as a focal point for reporting progress and the workshop will meet again in 2 months. Davidson commended the group's approach, noting that they had come up with "systematic, multipurpose projects" that would answer many of the needs they had listed earlier.

What can other towns learn from the Grand Junction experience? Davidson says that merely listing the problems is not enough. "If you want to solve them you have to organize. You have to develop the human resources, the physical resources and the financial resources to meet the problems—and that's hard work." She said the most important thing about the process at the Grand Junction workshop was that the women assessed the strengths and the resource base they had to start with; then chose a limited number of objectives that could be achieved, starting with what was available. Each implementing strategies included a plan to increase the resource base—to pull itself up by its own boot-

straps. "The significant achievement of the workshop," Davidson said, "is that each of the proposed programs is a 'seed' program; one that can grow from a small beginning and when fully developed will meet more than one of the needs originally listed."

Summing up her role, Davidson said, "It involves giving people the encouragement and faith in themselves and some extra knowledge and skills to do things they're perfectly capable of doing if they want to. . . . It's an attitude: If you're willing to work, you bloody-well can fight City Hall!"

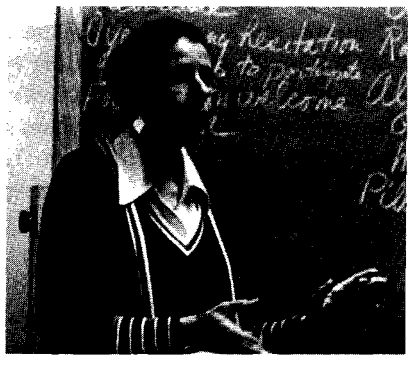
'Enormous Strength' At the Grassroots

"You've come a long way, baby," is an idea that might apply to companies in boom towns and the persons who work for those companies. It also applies to Donna Davidson, a community development planner who has worked since January of 1975 for Gulf Mineral Resources Co. Davidson assists towns experiencing impacts from energy-company development. For example, she recently worked with the New Mexico State University Grants College to organize a 3-day workshop, "Developing Local Responsibility for Growth Management," in Grants, N.M. Gulf Mineral Resources is developing a uranium mine near Grants. In addition to organizing seminars and workshops, Davidson works within Gulf as a consumer advocate, calling attention to problems that will affect Gulf employees living in boom towns. She sums up her job as a communication link between the company and the community.

Working out of Gulf's Denver offices, Davidson, who is single, has come a "long way" from her native New York City and from Pittsburgh, Pa., where she worked as an administrative assistant to the vice president for academic affairs at Carnegie-Mellon University. She later worked in Pittsburgh as a management consultant. Eventually she decided that it was time to consider a new career. So "I decided to go for broke," she says, then jokes, "I went broke." She returned to school and struggled on a slender budget while she earned a master's degree in public works administration at the University of Pittsburgh. After she had completed the academic requirements for a doctoral degree in economic and social development at the same university, she was employed in a new job Gulf Mineral Resources had created. The company was moving from exploration into development activities and needed a person who could work with communities dealing with social and economic impact problems. Davidson is now doing her doctoral dissertation research on a subject that she feels will be helpful to both communities and industry: "Increasing the Response Capacity of Human Service Systems in Boom Towns." As she talks about human services and human resources, it is clear that the idea of the company's role in an impacted town has come a long way. Referring to herself and to Gulf Mineral Resources, Davidson says, "Our attitude is that town development should be a joint effort between the citizens of the community, industry and state government."

Where does Davidson fit into all this? Never as a dictator. "It is not my job to tell somebody else how they should live in their town. That would be presumptuous," the planner says. Instead, she may inform citizens in fast-growing towns about how other persons are handling similar problems. She explains, "One of the most important things I do is to put people in contact with each other. Just trading phone numbers can be a significant act."

Davidson assumes a different role when she helps local citizens to recognize their own abilities. She explains, "I see an enormous strength and capacity among people who live in the West and new people who are coming in. It's a question of organizing all this energy and talent to get it tackling those boom-town problems; that's an art in itself." The aim, she states, is to help a town set its own priorities and resource allocations as rapid growth causes sudden demands for increases in government services and disrupts human service systems. But the people must guide their own planning, so that they develop what Davidson calls "a sense of town," the feeling about their town that, "We like it because we made it that way."



Self-reliance is the key—"It is not my job to tell somebody else how they should live in their town," says Donna Davidson, Gulf Mineral Resources community development planner who helped organize women's needs workshop in Grand Junction, Colo.

In planning for growth, Davidson advises townspeople that there is no "one right way" to grow. "Where a town starts from determines what its own inner strengths are and where it's going to move," she says. "You start with the strengths you have and build on that." While she may refer citizens to "certain processes that have worked in a number of communities and are likely to work here," she encourages the citizenry to rely on the town's history and character. Davidson says she is especially impressed with the independent attitude of rapid-growth communities in the West. She finds they are still untainted by the "Let-George-Do-It" attitude. Townspeople and the companies in the towns need to press the federal government for more local control, Davidson states. But at the same time, local people must acquire skills and capability to exercise that control responsibly.

In fact, she sees the rapid-growth Western communities as a fulcrum point for "moving from an overgrowth of federal bureaucracy to a better balance." One of her key hopes: these towns must set examples of "restoring power and capability to local government and to the ordinary citizen."

(Donna Davidson may be reached at Gulf Mineral Resources Co., 1720 S. Bellaire, Denver, Colo. 80222 (303) 758-1700.)

Vignette

The Navy's Man in Shale Country

"We are now activating quite a program for our oil-shale reserves," reports Commander Rick Wilson, Officer in Charge of the Naval Petroleum and Oil Shale Reserves in Colorado, Utah and Wyoming.

"When I walk down the street in my uniform, most people think I'm a fireman," says Commander E. R. Wilson. Well, when the place is Casper, Wyo., who would imagine that the uniform is Naval and the wearer is the Officer in Charge of the Naval Petroleum and Oil Shale Reserves in Colorado, Utah and Wyoming?

Actually, even though Commander "Rick" Wilson, who usually wears street clothes, has only been in Casper for about a year, the Navy has been part of the shale area's local scene for years—indeed, since 1915. Wilson reviews the story: "Back in the early 1900s, when the Navy converted from coal-burning to oil-burning ships, it knew it would always need petroleum reserves. So, thousands of acres of petroleum and oil-shale were set aside for the Navy as a future source of fossil fuels. Many of these lands were in shale country and that's why the Casper office was established, and it's been open almost all of the time ever since, though on a relatively quiet basis."

But right now, says Wilson, "The office is in a period of change—and rapid, tremendous expansion." The main reason: The recently-signed Naval Reserve Production Act that opened up these petroleum reserves for full-scale development. For example, "On the Wyoming Naval Reserves," says Wilson, "we now have 150 oil wells producing about 3,000 barrels a day. In addition, we are activating a development program that will add 400 to 500 more wells over the next 5 years, with a production peak of about 20,000 barrels a day."

Wilson adds, "I also manage the Navy's oil-shale lands, which are all in this region. Until recently, there has not been much activity related to these reserves. But that will soon change. The Navy has decided to initiate an extensive, 6-year engineering and environmental predevelopment program on its shale reserves. We'll begin in Colorado this summer by drilling core holes; by fall we expect to select an operator: and by 1978 we anticipate opening an office, probably in Grand Junction, with a staff of 50–100 to handle this program. The goal: to provide Congress with enough data so it can decide if it wants to develop these oil-shale reserves. We have 56,000 acres of oil-shale lands in Colorado and 89,000 acres in Utah, but we are concentrating on Colorado first. We will, though, be evaluating our Utah shale reserves soon."

Why is the Navy activating such a major oil-shale program when other shale ventures are slowing down? Wilson replies: "Originally we meant to monitor the programs of others'—but everyone else is waiting. So we decided we'd better go ahead with our own research—but we will not duplicate what others have already done."

Asked how he pulled such an assignment—a 3-year tour—Wilson answered: "I'm in the Naval Civil Engineer Corps, which is responsible for doing basic construction for the Navy and Marines and for handling the petroleum reserves. As for my qualifications for this job, I have a civil engineering degree and a master's degree in petroleum engineering. In addition, through a Navy-industry program, I spent 10 months with an oil company, training as a petroleum engineer."

On the job, Wilson says, "In a typical week, I travel about 30 percent of the time—visiting consultants, operators, other officers in Washington, D.C., and the oil and oil-shale reserves. When I'm in the office, I get involved in contractual procedures, but basically I do most of the necessary planning. For example, a lot of my effort went into planning for the addition of 500 wells. Presently we have a small staff, just one other officer and one secretary. By September, we'll have four Naval officers and 14 civilian staff members because of our expanded oil and oil-shale programs."

Before oil and shale came into his life, Wilson served as director of construction at the U.S. Embassy in Cambodia, in public works in Hawaii, and as a company commander (Seabees) during the Vietnam war—after being recalled from civilian life where he had his own construction business. Today, Wilson says, "I like my assignment, and my wife and three children and I love Casper."

What does Wilson feel about the future of oil shale? "Of course I have no idea what Congress will choose to do about the Naval oil-shale reserves," he says. "But I am sure that someone, someday, will develop oil shale, probably under a joint government-industry program so that the risks can be shared. There are too many BTU's of energy locked in oil shale for it never to be developed, even if more exotic fuels become available."

A.N.

Real Estate Corner

Boom Town Financing and Housing

Political / environmental / economic question marks surrounding energy development make the Western Slope a high-risk area as far as housing financiers and developers are concerned. There are also doubts as to the area's soundness regarding investment in local government bonds on a large scale. For these and other reasons, the housing issue is one of the most persistent problems facing those who must find answers to energy-development questions.

One of these people is Ross Bolt, coordinator of the Boom Town Financing Study; a 1-year grant from the U.S. Economic Development Administration to the Colorado Dept. of Local Affairs finances this project. In order to get a balanced input of information, this study has pooled the resources of people with diverse backgrounds: government personnel, bankers, accountants—and an oil-shale representative. And this group agreed that its task involved more than housing—related population increases and prospective requirements for public facilities, for example.

"The projection of housing needs is an incredibly complex task," says Bolt. "For example, it is obvious that most people will live where amenities are—in cities and towns with the best public services and facilities. So before deciphering housing needs, we decided to take a careful look at public-sector financial needs in six sample areas of the Western Slope."

The task of gathering and summarizing data went to a private consultant team, Bickert, Browne, Coddington & Assoc. (BBC), of Denver, headed by Dean Coddington. "What we do is accumulate socioeconomic data, assess impacts and translate them into human and physical needs," Coddington explains.

BBC's report to the Boom Town Financing Study takes the form of tables and graphs depicting such factors as population projections, revenues, expenditures and capital facilities required in five counties, six cities and related school districts on the Western Slope. The communities studied were Craig, Rangely, Grand Junction, De Beque, Paonia and the proposed new town of Battlement Mesa. The study measures needs according to low, medium and high population projections as they relate to the type of energy-related projects that may materialize. To summarize, the results of the study to date suggest that city governments in almost every instance will be hard-pressed to meet the demands for services and capital finances likely to be imposed on them. On the other hand, counties and school districts will find their positions enhanced through the location of commercial facilities with high tax valuations.

Money: not the only matter

Coddington, however, is quick to add that there are other than dollar terms involved. One of these factors concerns whether or not people will bond themselves to the highest possible extent for services for something that will be exported out of the state. For example, will they pay for a sewer system for new employees of a coal plant when the coal will be shipped to Chicago? Severance taxes, whereby corporations in effect pay for part of the capital improvements, are one solution to this problem. Coddington cites another, a situation in which a corporation puts up some of the capital-improvement dollars (as the oil-shale industry has in the Rifle-Meeker area).

Both Coddington and Bolt feel an efficient legal mechanism for sharing state and county revenues with growing-pained municipalities is needed, because, according to Coddington, "it is the municipality rather than the county that must offer capital-intensive services like water and sewer."

Also one method for sharing federal revenues with municipalities—the 75-percent EPA funding for required water and sewage treatment plants—needs to be streamlined, says Coddington. He adds, "Since there is a 3-year time lag between the application for such funding and its receipt, if we were advising a community on financing water and sewer, we would advise them to finance these services on their own." Finally, Coddington emphasizes that his firm's work for the study was limited to requirements imposed by Bolt's staff.

The final report of the Boom Town Financing Study is expected to be distributed in late November. Persons interested in a copy of this report may write to: Colorado Dept. of Local Affairs, Boom Town Financing Study, State Centennial Bldg., 1313 Sherman St., Room 518, Denver, Colo. 80203. *R.M.R.*

Services Impacted by Growth

The community services most directly impacted by growth were considered in the Boom Town Financing Study in terms of related capital-improvement items. Total projected expenditures were considered in terms of the cost of capital improvements plus operating costs.

—Fire protection
—Police services
—Water
—Sewage treatment
—Solid-waste collection/disposal
—Hospital facilities and services
—Detention facilities
—Juvenile treatment and custody facilities and services
—County and municipal courts
—Standard academic educational programs in the grade, junior high and high schools
—Public housing
—Libraries
—Recreational facilities
—Administrative space

Guest Column

A Position on Oil-Shale Development

By the White River Shale Project

The White River Shale Project recently submitted its Detailed Development Plan, which is being reviewed at public hearings this month and by the Area Oil Shale Supervisor's Office for about 6 months. When the DDP was submitted, White River also released a position paper that discusses some of the problems the venture's developers perceive in regard to oil-shale development. The statement is presented below.

The White River Shale Project was formed in June 1974 by Phillips Petroleum Co. and Sunoco Energy Development Co., the owners of federal oil-shale lease Ua, and Sohio Petroleum Co., the owner of federal oil-shale lease Ub. The project was formed for the express purpose of establishing a plan for joint development of the leases.

In the ensuing time period, as the White River project team proceeded with carrying out its charge, some very significant external events occurred, and some internal conclusions were reached, which impact seriously on the development of an oil-shale industry. Some of the most significant problems currently associated with the commercialization of oil shale are:

1. In the past 2 years, a period of devastating inflation, the estimated cost to construct a 100,000-barrels-per-day shale-oil plant has escalated from the $600 million range to more than $1.5 billion. The latter cost has been verified in a detailed study carried out for White River Shale by one of the country's leading contractors.

2. As a consequence of the sharp increase in capital requirements (caused by inflation), the projected price of shale oil required to yield a 15-percent return on investment (1975 dollars) exceeds $20 per barrel on a 100-percent equity investment basis.

3. The present stage of retort technology is not adequate to allow for proceeding directly into commercial development.

4. A commercial oil-shale installation will consist of very large and complex units of mining, retorting, and upgrading, all close-coupled and interdependent. A high operational risk is involved since each operating unit must have a high availability, or "on stream" factor, to maintain the desired production levels. Failure to achieve this availability has a disastrous effect on project economic viability.

5. There is a great deal of uncertainty and risk relative to environmental issues and political issues. The measures and costs associated with providing an environmentally-acceptable oil-shale facility are difficult to predict in the present stage of development. On the political side, one area of greatest concern is the situation where product prices could be subject to some form of control while ever-increasing expenses are not. Also, there is no assurance that the political actions needed to make oil-shale development commercially attractive will occur by the time the technological uncertainties have been eliminated.

Not withstanding all of the aforementioned problems, the White River Shale Project firmly believes that from our national-interest viewpoint, a program for oil-shale development should be carried to the point that the major technical and economic uncertainties are resolved. Thus, we are recommending the following programs for the development of oil shale:

Demonstration Modules Should be Built: As a first step, a program should be created that insures demonstration of a wide range of technologies for shale processing. A carefully considered number of modules should be built. These modules would allow for demonstration and evaluation of the technology using full commercial-scale equipment. The module would most probably be a single retort coupled with attendant mining and other required supportive facilities. The demonstration phase will provide a sound base for predicting capital, envi-

ronmental, and operational costs for an expanded commercial facility.

Modules will Require Joint Government-Industry Funding: Our studies indicate that construction and operation of a module will cost in the $100–$200 million range and will be unprofitable. In light of the technical and economic uncertainties, this cost level precludes the possibility of demonstrating a wide range of technologies sponsored entirely by private industry. We believe the most realistic approach would be joint government-industry funding through the technology development phase. A basis for industry to acquire the government's interest in the plant should exist. If the technology is successfully demonstrated and if economic conditions permit, the plant could then become the core for an expanded commercial venture.

Subsequent Commercialization May Require Government Support: Synthetic fuels cannot be competitive in today's price-regulated market (or at today's world market prices), and there is no assurance whether or when free-market pricing conditions will again exist. In addition, it is likely that some form of government support may be required to make shale commercialization financeable and competitive in the energy market. Until the modular demonstration phase is completed and a firm evaluation of the economics can be made in the light of the economic environment at that time, we (White River) are unwilling to speculate now on either the nature or magnitude of government support which might be required.

Financial Assistance for Communities: When conditions for commercialization do occur, it is essential that government assistance should also be available for the communities that will be impacted by the construction of the commercial oil-shale plants.

In summary, we (of White River) are willing to continue our efforts to develop oil shale to meet the country's future energy demand. We are willing to demonstrate jointly with the government what this will require in terms of technology and money. Thus, the White River Shale Project intends to submit a proposal to the government for joint industry-government development through the modular stage.

A very poor utilization of the resource would be to proceed directly to construction of a commercial facility which, based on the present state of knowledge, might well be environmentally, technically and economically unacceptable. Information gained from the modular approach can be expected to suggest modifications to mining, retorting and environmental protection techniques which would increase the ultimate recovery of shale oil from the ore and thereby contribute to the overall conservation of the resource.

White River Shale Project intends to request a suspension of the lease terms in order to allow time for establishment of a joint industry-government program for the module stage. As is the case in most research and development programs, the modular developmental operation costs will exceed the generated revenue. Therefore, the funding for this stage should not require loan pay-back but rather incorporate a mechanism for future buy-back of government interests on an agreed basis from subsequent commercial plant profits.

In addition, the White River Shale Project must have assurance from the government prior to payment of the discretionary fourth and fifth bonus payments that ownership of the federal tracts can be retained by the lessees until such time that economic and political conditions will permit prudent development of the tracts to commercial capacity, or until the initial term of the leases has expired.

WHITE RIVER SHALE PROJECT

Estimate of Capital & Operating Costs*
(Millions of 1975 Dollars)

	Capital Costs MM$	Operating Costs MM$/Yr.	Shale Oil BPCD Produced
Pre-Phase I	87.5	--	0
Phase I--Mine Opening	4.0	0.5	0
Phase II--Single Retort Operation	136.3	12.4	± 5,000
Phase III & IV--Commercial Operation	1,382.4	122.6	100,000
Total Capital Cost	1,610.2		

Estimate of
Sales Price of Upgraded Shale Oil

$20.00/Barrel

Based on:

- 100% equity financing
- 15% return on equity
- 1975 dollars--no escalation
- FOB Casper, Wyoming
- No community financing
- 20-year commercial life @ 100,000 barrels per day

*Capital estimates based on conceptual design of the "Most Probable Plan" of oil-shale development as described in the Detailed Development Plan for Federal Tracts U-a and U-b.

Voice of the People

Many-Faceted View of Oil Shale

John Welles, Vice President for Institutional Planning and Development for the Colorado School of Mines, offers some thoughts on oil shale from a rare and unique perspective.

He serves on Colorado Governor Dick Lamm's Energy Policy Council. He is Vice President for Institutional Planning and Development for the Colorado School of Mines. He directed the Industrial Economics Div. of the University of Denver Research Institute for 18 years. He holds a B.E. from Yale and an M.B.A. from Wharton; his major fields of interest are technology transfer, industrial location, industrial market research, and economics of research and development. He helped prepare the U.N. Conference on the Human Environment and he believes that business prosperity *without* population growth *is* possible. He also feels that Colorado has a responsibility to the nation to develop—and share—its energy and mineral resources, including oil shale. He is John Welles; and this many-faceted individual was recently interviewed by SHALE COUNTRY to get his unique perspective on oil shale.

Shale Country: What is your role on the Energy Policy Council?

Welles: The Council consists of seven members—the Directors of the Departments of Natural Resources, Local Affairs and Agriculture; the Assistant Director of the Department of Health; two members of the Governor's staff; and me. We consider issues that come before the Council at the Governor's request or at our initiative.

My role is to function as one of the seven and to consider these issues from my particular perspective on Colorado and energy development. I have no special role, but I do try in particular—when I can—to bring to bear what the academic community can offer. That is, I make suggestions about how Colorado's academic institutions can support energy-related activities. Also, to the extent that I have had experience in dealing with industry and government on energy matters, I try to bring the perspective of these two groups into the discussion. In short, I try to make sure that the people on the council realize how the academic, government and industry communities think and how they probably will react to state energy policy initiatives.

We are a policy-advising group in that we assist the Governor in formulating the state's position on energy matters. Thus, for example, the Council has addressed the issue of federal incentives for oil-shale development. We've also looked at the question of offsite disposal land for oil-shale developers. The Council also often considers the socioeconomic impacts of oil-shale growth and how these may be ameliorated through state policy and cooperation with industry and the federal government. In brief, we try to consider all major interrelated Colorado energy policy issues and give our thoughts to the Governor. Our function is really three-fold. One: we give him specific recommendations on issues as he requests. Two: we alert him to issues coming up. Three: we try to look downstream and foresee what state government should do in the future.

I feel the Energy Policy Council functions reasonably well, and I suspect it will continue to operate, though there may be a better arrangement on the horizon. But, one of the greatest problems with such a group is the sense of insufficient time to explore all the issues, and all the facets of each issue. To do so would take a full-time Council with a full-time staff and I don't think that's in the cards yet. Actually, the Council is trying to make up lost ground. Colorado should have started such planning 6–8 years ago, but no one, on the state or national level, had such foresight.

S.C. What is your role at the Colorado School of Mines and how does it relate to energy development?

J.W. Generally, I help the School of Mines make long-range plans and develop its financial resources. I also handle legislative and public affairs. More specifically, the School is in a period of critical change. So I view my major role as strengthening its program in two key areas. First, the state seems to have decided that it does not want to fund the School at a level the School feels it needs to provide quality education. So I am dealing with the question of how to develop financial sources to augment the School's budget.

Second, the world has changed a great deal in the past 30 years. Mining companies are going from small to multina-

tional size. And, their scope has broadened; mining has become a high-technology industry. No longer is it a pick-and-shovel industry; now it depends on sophisticated sciences and instrumentation. And the whole area of minerals and energy policy has become very complex. Therefore, the School of Mines has to expand its scope to match the needs of the world.

For example, in terms of oil shale, there are several ways that the Colorado School of Mines can continue to work with this industry. First, we should be very sensitive to the needs of the industry for mining engineers and minerals economists. We want to be sure that our undergraduates and graduates are being targeted to meet the needs of the industry, as well as the needs of the state and federal governments, consulting-engineering firms and research institutes. These are the markets for our graduates and we want to be sure we are turning out enough people—and the right kinds.

For example, we need to know from industry if it will mostly be doing underground mining of oil shale. In this case, we need to know how many mining engineers will be required, how many safety inspectors, how many lease supervisors. . . . In the research area, we want to train students so they can do oil-shale R & D. We also want to make sure that the Mines faculty can provide assistance to the industry by contributing to the basic store of knowledge about mining, crushing, retorting, refining . . . of oil shale.

Finally, in the service area, there is a role that is not being well filled today—that of trying to link technical know-how with mineral policy-making needs. Mining schools have not adequately fulfilled their obligation to society to provide information and knowledge, for example, when mining-related legislation is being considered that may be detrimental to America's interests. The mining industry has had insufficient understanding of lawmaking and at the same time, the general public has not understood what the mining industry is and how minerals should be handled in terms of the public interest.

So, I feel there is an increasing need for faculty members with their credibility—they presumably have less of a vested interest—to step forward and link themselves into the policy arena. This may be accomplished by presenting expert testimony in Congressional hearings, or fulfilling speaking engagements, or writing articles for popular magazines.

Also, we want to maintain our service to industry and government in the continuing-education field. We want to keep on presenting conferences, courses, special institutes, like our annual Oil Shale Symposium.

S.C. Mr. Welles, you've addressed your official government and academic roles. What about your personal perspective on oil shale?

J.W. In my opinion, contrary to what many people may feel, we must have energy availability—at least a minimum amount in order to have a healthy economy. We need energy in order to have jobs, tax revenues, homes and food. If we don't have energy and a healthy economy, people won't think about anything else because they'll be hungry. And hungry people are not worried about the environment, about culture, about anything much except food.

We must realize that right now we have no inexhaustible source of energy that we can tap in sufficient amount to keep our economy going with the same number of people at the same income level for more than 30 or 40 years. Thus, we must be searching for a way to cut back on our use of exhaustible resources—while at the same time we must be looking for new sources to replace our energy supplies. And it is imperative that we do this thoughtfully, so that the transition involves minimal disruption—so that our economy doesn't break down and so we can continue to have a good life.

What does this mean for Colorado? It means that since we have far more than our share of energy resources, such as oil shale and coal, in the national interest we must do our part in producing energy for the country—and ourselves. Right now we are a net importer of energy. So for us to say to the rest of the nation, "We're not going to share our resources," is wrong. If we are extra-endowed with energy resources, we have an obligation to share.

Therefore, Colorado will need to develop its oil-shale, coal and other resources. However, we also have a need to develop our resources in as environmentally sound a way as we economically can and in a way that conserves the resource. We must recognize we have an obligation to future generations; thus we must provide access to resources that may be unrecoverable now, but are potential reserves for the future.

We, as a state, also need to forge a real partnership with the federal government and with industry in terms of having good cooperative relationships—rather than fighting as we have in the past. Western energy development is extremely complex. It's not just oil shale in Colorado, but in Utah and Wyoming too—and it's water for the region, and railroads and population centers and utilities . . .

S.C. Do you feel oil shale will be developed?

J.W. Almost every forecast counts in oil shale as a future energy source. And I feel oil shale is going to be developed—when the price is right, and when water availability is assured, and when the policy-makers get their acts together so they don't keep tying the industry up in knots and when industry and government can assure environmentalists that the job can be done in a sound manner—that is, the cost-benefit trade-offs are reasonable.

And that leads to perhaps the biggest problem of all in energy and minerals development—communication. It's tragic how easily and often misunderstandings arise because some information is not communicated. We need effective networks that transfer information to everyone who needs to know what is going on . . . credible information. And that's why a magazine like SHALE COUNTRY serves a fine purpose.

A.N.

Letters To The Editor

Too Pretty?

"I cannot tell you how much I appreciate your periodical, SHALE COUNTRY. Having handled the reams of technical material that is piled in our libraries, I had felt the importance of such a simplication for the people who haven't the knowledge to read those reports.

"I would, however, suggest that the beautiful photographs on the covers of this magazine are a bit misleading. They attract readers it is true, but they also must bring forth the cries of the non-resident, vociferous environmentalists. The shale country is not pretty country, but is a drab, dry and desolate area with sparse vegetation and little wildlife. Would an occasional cover of this grey country shown like it really is be a bad idea?"

Mrs. Elberta Francis
Grand Junction, Colo.

(Editor's note: Mrs. Francis, it would be a good idea and it's one we have thought about often because we well realize that shale country certainly could not win any beauty contest. It is stark, it is barren, it is arid, it is desolate. But somehow our photographers have made those characteristics very photogenic. At the same time, many other readers have expressed to us their appreciation for our presentation of shale country's "best side." They say that the magazine and its four-color covers attract national attention to an area that is very important to America, but has received little recognition in the past.

But your point is an important one and one others have also passed onto us. So we will seriously consider featuring some grey pictures on the cover; we already do inside the magazine. In the meantime, if other readers of SHALE COUNTRY have an opinion about the proper way to "picture" the area, please let us know.)

Pops Place

"In your November 1975 edition of SHALE COUNTRY magazine, someone sure misled you on the Dinosaur story. Pop Blackburn, deceased and buried on Orchard Mesa, was founder of 'Pops Place.' In 1942 he sold it to Earl and Ivia Gadd (my parents). Later they sold it to Floyd Cady and then bought it back and kept it until about 12 years ago. I think he sold it to Escalante Land & Cattle Co. out of Scottsdale, Ariz. After my folks sold out, it was closed and no longer called Pops Place.

Presently I live in Grand Junction, just three houses south of the house Pop and Mom Blackburn lived in about the time of their deaths.

June Sherrill
Grand Junction, Colo.

(Thanks, Mrs. Sherrill, for clarifying the story surrounding Pops Place.)

With Modification

"In your April 1976 issue of SHALE COUNTRY, page 2, the statement was made that 'shale oil . . . is directly substitutable for imported oil on a barrel for barrel basis.' I feel it is needless to state that I have been a protagonist for shale oil for nearly all my professional life; however, I fear I must point out that this statement is not true. Shale oil is a man-made product, just as coal gas is man-made from coal. Because shale oil is a manufactured product, its chemistry is notably different from crude petroleum oil and, hence, for any transport use, other than boiler fuel, shale oil cannot be directly fed to a modern refinery as can petroleum.

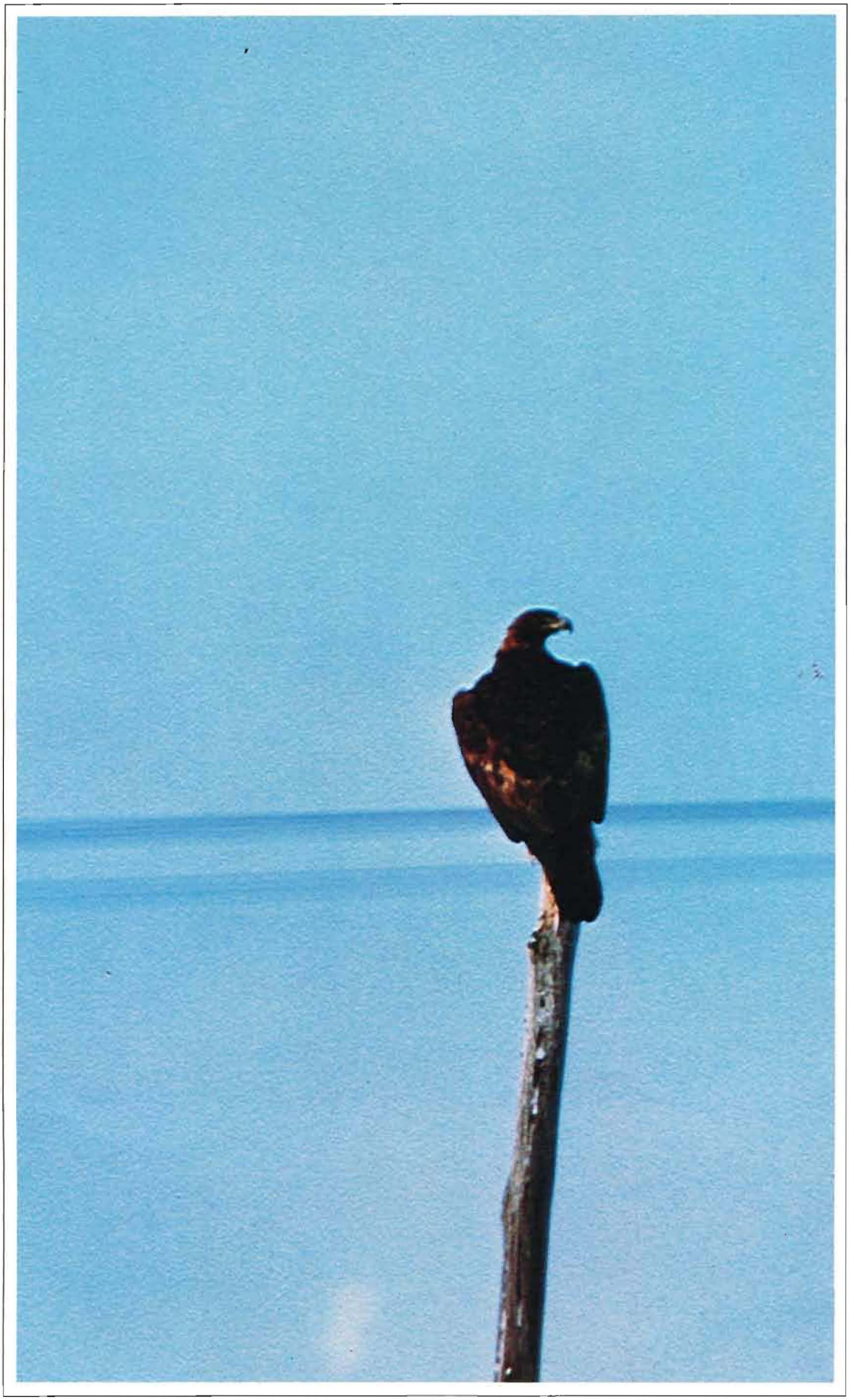
"Using a chemist's terminology, shale oil is said to be 'unsaturated' and, hence, either before being fed to a refinery or at some stage during the refining process, it has to be modified. In the very early days of thermal cracking, the undesirable properties of shale oil were not that important, and acid treating the cracked distillate was sufficient to attain an octane of about 60 on the finished raw gasoline. These days, I guess, it would be necessary to hydrogenate the crude shale oil to make it a suitable feed to a catalytic cracker. Indeed, hydrogenation was a process used by Calvo Sotelo in Spain, to make their shale oil a suitable feed. Hydrogenation is not a cheap process, other than using hydrogen from an established refinery, and even then most of the world's shale oils are relatively high in sulphur and nitrogen, the removal of which is an additional processing cost.

"Although one must be disappointed at the recent decisions of Congress and the down-turn in oil-shale activities, I feel your readers should be aware of the inherent chemical disadvantage of shale oil from the viewpoint of the manufacture of gasoline to modern standards."

R. F. Cane
Head of Department, Dept. of Chemistry
Queensland Institute of Technology
Queensland, Australia

(Mr. Cane is, of course, right; shale oil must be modified somewhat before it is fed into a refinery. However, then its refined products are directly substitutable for crude oil refined products, as coal gas would not be. By the way, SHALE COUNTRY will feature an article on the refining of shale oil in its September 1976 issue.)

Yes, shale country is grey—and drab, and dry and desolate—but still well worthy of national attention.



Golden Eagle at Piceance Basin

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