
CHAPTER 4

The Changing Scene Between 1974 and 1979

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Introduction

The Prototype Program began in a climate of optimism in 1974 that was soon altered by changing economic conditions, technical and legal problems, and regulatory uncertainties. As a consequence, all of the lessees re-

quested suspensions of operations in 1976, and four of the original industrial participants withdrew. This chapter discusses the problems encountered and their effects on development.

The Changing Economic Situation

In 1974, bidders for the Prototype Program leases assumed that the recent tripling of the world oil prices would make shale oil competitive in the energy marketplace. This assumption was based on preliminary financial estimates completed during the stable economic period that preceded the Arab oil embargo and before detailed studies were performed on specific facilities on specific sites in the oil shale region. As noted in chapter 6 of volume I, subsequent economic estimates were much less favorable, Table 2 shows the upward trend in estimates of investment requirements for shale oil plants, and the trend is further illustrated in figure 5. As shown, between 1973 (the year of the lease offerings)

and 1976 (the year of the suspensions requests), estimated costs for an oil shale plant tripled.

Various increments of the cost escalation are attributable to general inflation, to extraordinary cost increases for capital goods, to increased costs of environmental protection, and particularly to the improved accuracy of later, more detailed engineering studies. " Regardless of the reasons, the lessees were alarmed by the sharp reduction in their potential profits, and their distress was exacerbated by problems encountered during predevelopment activities on the lease tracts.

Table 2.—Cost Estimates for Oil Shale Processing Plants

Time of estimate	Estimated cost ^a \$ million	Source of estimate	Reference ^b
1968	\$138	Department of the Interior	1
1968	144	The Oil Shale Corporation	2
1970	250	The National Petroleum Council	3
1973	280	Department of the Interior	4
1973	250-300	Colony Development Operation	5
Early 1974	400-500	Colony Development Operation	6
Late 1974	850-900	Colony Development Operation	6
1976	960	The Oil Shale Corporation	7
1977	1,050	The Oil Shale Corporation	7

^aplants use underground mining and above-ground retorting Production Capacities are approximately 50,000 bbl/d of shale oil syncrude
^breference list The cost trends are analyzed in REFERENCES 6 and 8

SOURCE Off Ice of Technology Assessment

Problems on Colorado Tract C-a

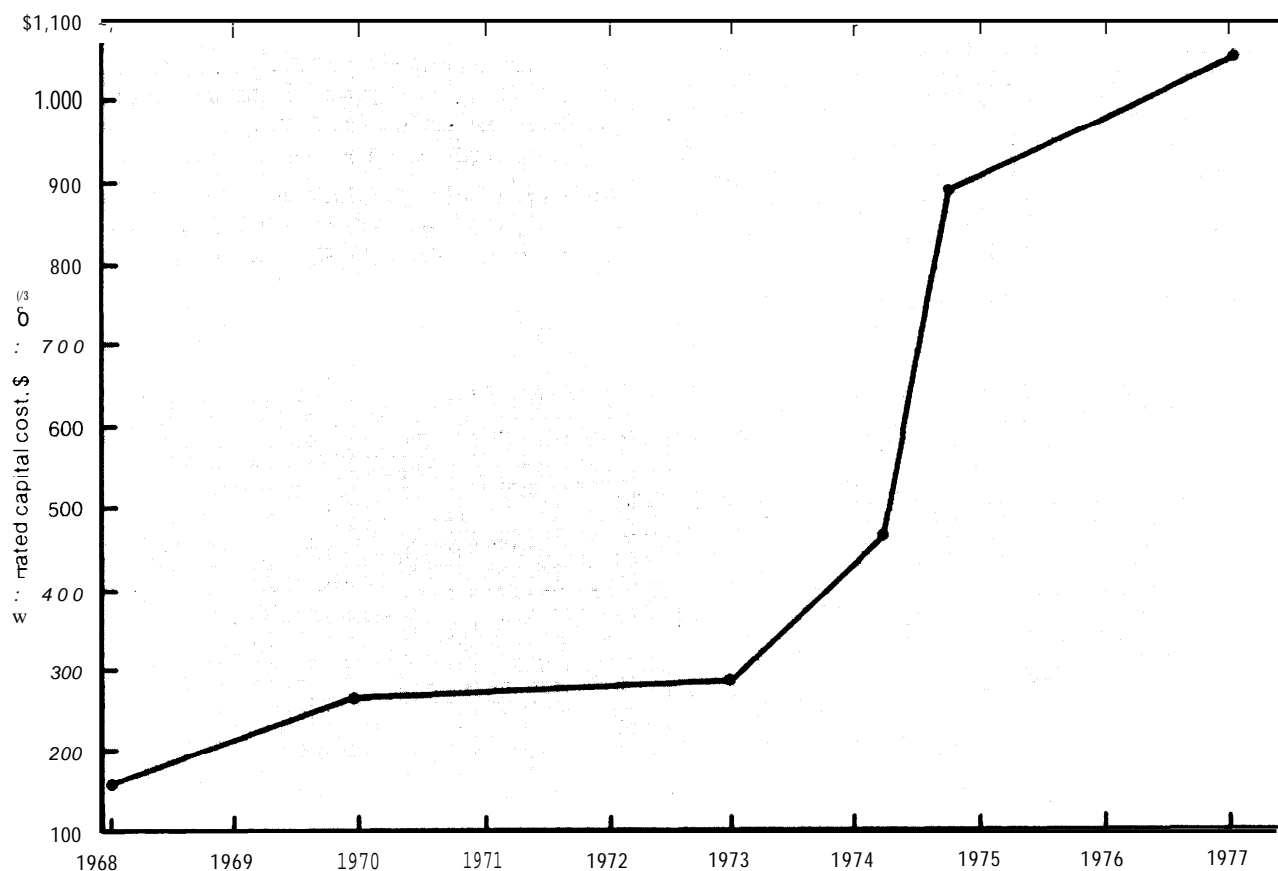
In 1973, the Department of the Interior (DOI) indicated that tract C-a appeared amenable to open pit mining because of the relatively thin overburden covering the oil shale zones, and that aboveground retorting would most likely be employed. Rio Blanco Oil Shale Project, the lessee, incorporated this concept in its initial development plan, which was submitted to the Area Oil Shale Supervisor's Office in March of 1974. Figure 6 is a sketch of the proposed open pit mine design. Rio Blanco's concept for developing the tract is shown in figure 7. Mining would begin in one corner of the tract, and the pit would gradually be enlarged until it encompassed the entire tract surface. After several years,

freshly stripped overburden would begin to be returned- to the mined-out area, and the pit would thereafter be backfilled at the same time that new areas were being mined. In the interim, mining and processing wastes would be disposed of on 84 Mesa, a highland to the northeast. * Retorts and other processing facilities would be permanently located on an area adjoining the tract north boundary.

The use of off tract lands for waste disposal and processing sites was a key feature. In evolving the plan, Rio Blanco analyzed alternative development concepts with 'respect to

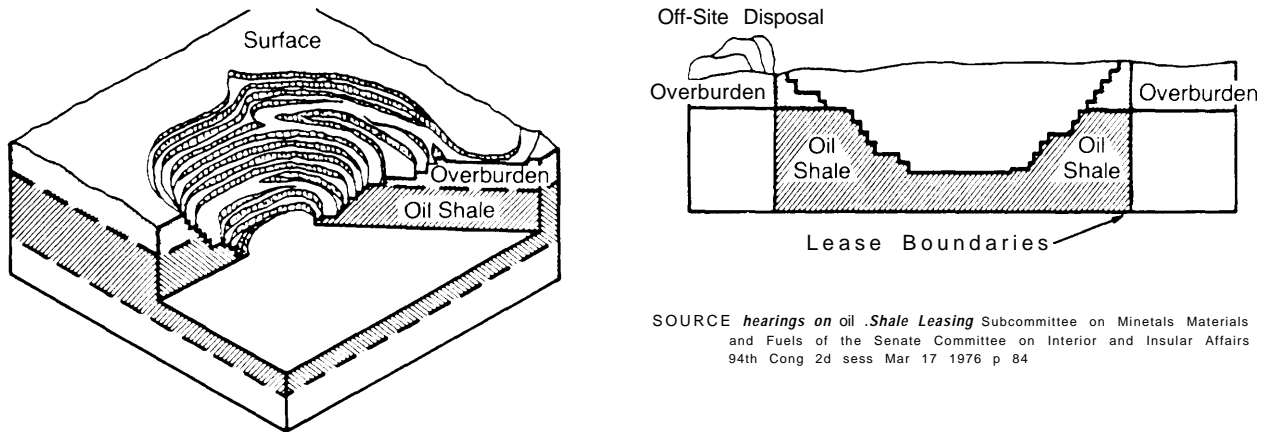
*This specific site was not considered in the environmental impact statement (EIS). The EIS discussed off tract disposal only as a hypothetical possibility not as part of the proposed action.

Figure 5.— Engineering Cost Estimates for 50,000-bbl/d Shale Oil Syncrude Plants



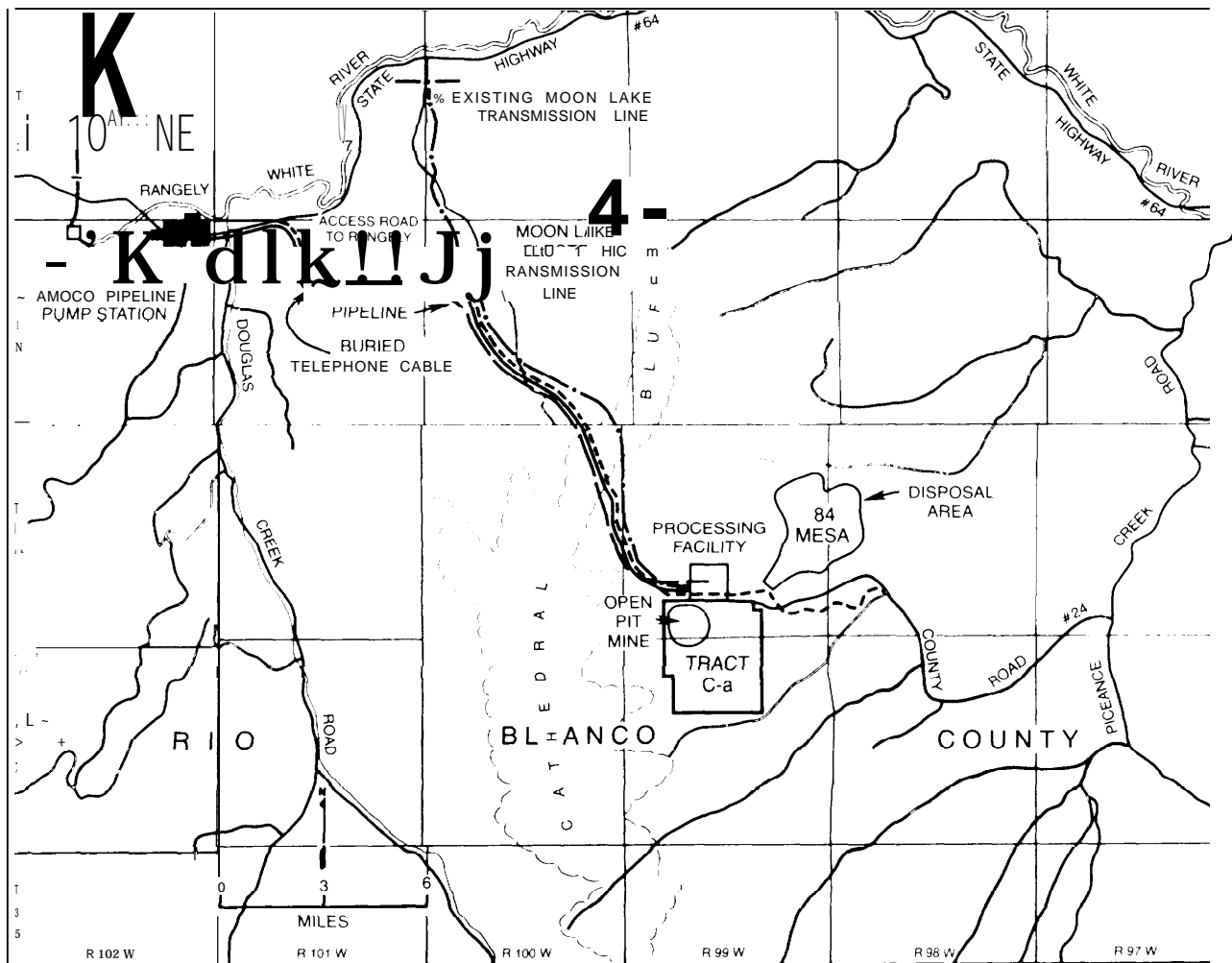
SOURCE: Office of Technology Assessment

Figure 6.—Open-Pit Mining Concept Featuring Off tract Waste Disposal



SOURCE *hearings on oil .Shale Leasing* Subcommittee on Minerals Materials and Fuels of the Senate Committee on Interior and Insular Affairs 94th Cong 2d sess Mar 17 1976 p 84

Figure 7.—Original Development Plan for Colorado Tract C-a



SOURCE Rio Blanco oil Shale Project Detailed Development Plan Tract C-a Gulf Oil Corp and Standard Oil Co Indiana March 1976 p 1-3

resource recovery, economics, ease of operation, and overall environmental impact, but rejected them all.^{9 10} Underground mining was rejected because resource recovery would be only one-fifth that of a comparable open pit mine. On-tract disposal of solid wastes was rejected because the area covered could not have been mined by open pit without excessive materials handling. Underground mining of the disposal area was rejected because resource recovery would be only one-fourth of that achievable by open pit mining of the entire tract. Finally, several sites within the tract boundaries were considered for the processing facilities but were rejected because of the economic advantages of mining the entire surface.

Rio Blanco had reason to expect that DOI would allow the use of off tract lands. In 1970, DOI'S Solicitor had expressed the opinion that DOI had authority to allow such usage. Furthermore, several references to off tract land use were made in the 1973 EIS. For example, in the volume on specific impacts of oil shale development, it was stated that:¹¹

about 256 million cubic yards of loose waste (overburden) material could be disposed of offsite in Water Gulch which lies to the west of the (C-a) tract.

Two options were also described for disposal of processed shale, both involving off tract disposal areas, " Finally, the EIS noted that: '{

If this (C-a) tract is mined by surface mining methods, it is expected that the entire surface would be excavated , . .

This would be possible only if the processing facilities were located off tract. Offsite land use was also mentioned in DOI'S advertisement of the lease sales in 1973, as follows:¹⁴

The Department recognizes that in some situations lands outside the leased tracts may be required . . . for roads and other purposes . . . Moreover, since this is a prototype rather than a general leasing program, the Department may in the future find it desirable to conduct investigations, studies, and experiments under section 101 of the Public Lands Administration Act (13 U.S.C. 1362), particularly in connection with the disposal

of spent shale. In order to facilitate these experiments, the Department is withdrawing from all forms of appropriation under public land laws . . . certain lands in the vicinity of the tracts offered for lease.

The referenced Act allows the Secretary of the Interior to perform work on his own initiative or in cooperation with others involving the improvement, management, use, and protection of the lands and resources under DOI'S jurisdiction. Under this broad authority, and with the concurrence of DOI'S Solicitor, leases were awarded for tracts C-a and C-b on the basis of proposals that included the possible use of off tract lands for waste disposal. In the case of tract C-b, off tract areas were relatively small, involving only about 250 acres. Rio Blanco, however, proposed to use about 6,400 acres of off tract land for development of tract C-a. This was an area larger than the tract itself.

It is apparent from testimony presented by DOI after the leases were awarded that DOI was not fully confident of its powers to award off tract land use. In February 1974, Secretary Morton testified:"

We have a legal opinion from our solicitor that we would have the authority to grant additional areas if this became necessary. I would like to make sure that we were not on thin ice from a legal point of view , . . Specific authority for the grant of such rights under a general leasing program for oil shale is not apparent. However, the prototype program is of a different nature . . . Particular questions have arisen about the disposal of spent shale. At this time, it is not clearly known what the effect of spent shale disposal piles will be. This matter can only be determined by actual experimentation with and study of disposal sites, This is a very proper type of study to conduct under a prototype program . . . However, the question of granting off lease disposal sites, other than sites used for investigations, studies, and experiments, may arise. Accordingly, the Department has proposed statutory language which would give it full authority to grant offsite tracts if they are needed.

The proposed language was included in two identical bills, S. 1040 and H.R. 5442,

which would have amended the Mineral Leasing Act of 1920. Among the provisions of these bills were a doubling in the size of tracts that could be leased and the granting of secretarial discretion regarding use of off-tract areas. These amendments were important, because the Prototype Program was based on section 21 of the Act, which authorizes the Secretary of the Interior to lease oil shale deposits on public lands "and the surface of so much of the public lands containing such deposits, or land adjacent thereto, as may be required for the extraction and reduction of the leased minerals."¹⁶ However, the same section provides that no lease may exceed 5,120 acres. No consideration is given to use of off tract areas for waste disposal.

In the opinion of the Comptroller General of the United States, the provisions of the Public Lands Administration Act did allow DOI to use off tract lands for waste disposal in connection with a research and testing program. The provisions were not clear with regard to commercial operations.¹⁷ In the absence of a clear legislative charter, DOI hesitated to allow the lessees to proceed with development plans that depended to a large degree on such strategies. To do so could have been interpreted as a violation of the Mineral Leasing Act,

Many in Congress responded negatively to DOI'S proposed legislation. The statement of Congressman Vanik of Ohio is illustrative of those who opposed it:¹⁸

Using (the Public Land Administration Act) as precedent, the Secretary of the Interior will allow millions of tons of shale waste to be dumped on adjacent Federal lands that are not leased by the oil companies under the Prototype Leasing Program. This seems to me a very severe stretching of the apparent intent of (the Act).

Although the language of the bills required that the Government be reimbursed the fair market rental for any off tract land used in support of oil shale leasing," some members of Congress saw the bill as a giveaway to industry. In any event, the bills did not pass the 93d Congress, and DOI was left without clear

authority to allow commercial operations outside of the lease-tract boundaries.

A similar issue had arisen during the construction of the trans-Alaska oil pipeline when DOI had sought to issue a special land use permit for disposal outside the pipeline right-of-way. The action was challenged and, in *Wilderness Society v. Morton*, the court ruled that—since the Leasing Act provided specific authorization for the basic activity (pipeline rights-of-way)—the Act's specific limitation could not be ignored by using special land use permits.²⁰

The decision was reached in 1973, after the Prototype Program was developed but before the leases were sold. DOI'S Solicitor reviewed the lessees' development proposals in light of the decision and concluded that the ruling also applied to the Prototype Program. On December 20, 1974, Rio Blanco applied for permission to use off tract areas, but early in 1975, DOI denied the application.

This sequence of events was documented in 1976 during hearings on H.R. 11163, a DOI-sponsored bill to amend the Mineral Leasing Act to allow secretarial discretion regarding use of off tract areas by participants in Federal leasing programs. The following exchange took place between Mr. Chris Farrand, Deputy Undersecretary of the Interior, and Congressman Jim Johnson of Colorado:

Mr. Farrand. We specified in the original environmental impact statement that we anticipated it would be developed by open pit and that the disposal of some of the spent shale would be made offsite.

We also indicated in a withdrawal notice that we published at about the time that the notice of sale was issued that we were withdrawing certain lands around the tract for possible use in experiments with spent shale disposal sites.

Third, in a letter to Senator Jackson in January of 1974, we indicated we had authority to allow offsite disposal or to make lands available for such disposal through an existing program we call the special land-use permits system.

Unfortunately, partially as a result of the decision in the trans-Alaskan pipeline case and as a result of a review by our Solicitor's office, we found we did not have the authority to grant off site disposal. For that reason, we have come back to Congress to ask for an amendment to the Mineral Leasing Act to allow us to utilize lands in the vicinity of oil shale leases and make them available to the lessees only for very specified purposes attendant to the development of an oil shale lease itself.

Mr. Johnson. But it was originally your intention and understanding that you had this authority at the time you entered into the contract for C-a, the lease contract, and both parties understood this was the case?

Mr. Farrand. There was apparently some disagreement within the Department but we conveyed to the public and perhaps to the lessees themselves that we had the authority. It was our mistake because we did not have that authority. This is the best I can say. It was an error, *

The bill was designed to allocate an additional 6,400 acres of Federal land for use in development of the lease tracts. About 4,100 acres would have been used for 84 Mesa disposal area. The off tract processing facilities would have occupied an additional 1,500 acres, and the balance would have been used as waste transportation corridors and for other purposes. DOI's position was that the additional land would allow Rio Blanco to maximize resource recovery without reducing access to oil shale resources on the off-tract areas. Mr. Farrand noted in his testimony that open pit mining would allow recovery of 5 billion bbl of shale oil. If underground mining had to be substituted because of the ban on use of offtract areas, only about 1 billion bbl could be recovered.

This position was disputed by a U.S. Geological Survey analyst who maintained that the 84 Mesa site contained more oil shale than did tract C-a, although at greater

depths. He expressed concern that waste disposal on the mesa would preclude future development of its resources by open pit mining, and that roughly \$10 billion in mineral values would be lost to the public as a result.²² DOI argued that the overburden on the mesa was too thick for open pit mining, and that resource recovery by underground mining would be reduced only about 5 percent by the additional weight of waste materials from tract C-a.²³

Congress rejected the bill. The kinds of opposition it faced were summed up in the testimony of Senator Haskell of Colorado.²⁴ He noted, first, that the Mineral Leasing Act seemed clear in denying authority for off tract disposal. Second, he called attention to the original C-a detailed development plan (DDP) that indicated the tract could accommodate open-pit mining with ontract disposal while producing 50,000 bbl/d for 30 years. Finally, he expressed a concern that DOI was attempting to promote oil shale beyond the levels initially contemplated for the Prototype Program.

The latter concern was also expressed by Representative Schroeder of Colorado in connection with her bill to prohibit dumping of spent oil shale on any Federal lands not specifically included under the Prototype leases. Her testimony on the bill includes the following statement:²⁵

... I strongly believe that oil shale development carried forth under the supervision of the Federal Government should proceed at a pace which permits careful and complete evaluation of its impacts, I believe we will only have such evaluations if development is carried forth according to the schedule of such programs as the Department of the Interior's Prototype Oil Shale Leasing Programs in Colorado and Utah . . . Any more efforts than this become the sort of crash program for which the Federal Government is famous

I think everyone who bid on these Colorado tracts thought it would be enough land to carry on the prototype programs the leasing program envisioned,

The sentiments expressed in connection with amendments to the Mineral Leasing Act

*Environmental protection groups had questioned off tract disposal as early as 1972 in comments on the draft EIS. They met with the Colorado Director of BLM in December 1973, before the lease sales, to protest. DOI should have been well aware of the opposition.

continued to prevail. The Federal Land Policy and Management Act of 1976 includes the following:

Nothing in this Act, or in any amendments made by this Act, shall be construed as permitting any person to place, or allow to be placed, spent oil shale, overburden, or by-products from the recovery of other minerals found with oil shale, on any Federal land other than Federal land which has been leased for the recovery of shale oil . . . ²⁶

Rio Blanco encountered other problems on tract C-a when environmental monitoring programs measured high background levels of hydrocarbon emissions, apparently from sagebrush and other vegetation, that might have precluded any significant development

under certain interpretations of air quality regulations. This problem, although unusual, illustrates the problems cited by the tract lessees with respect to regulatory uncertainties. Because of its importance and because similar circumstances were encountered on the other lease tracts, the problem of high background emissions is discussed in a separate part of this chapter.

The legal, political, and environmental problems encountered on tract C-a, when coupled with the uncertain economic feasibility of oil shale development, led to Rio Blanco's request for a suspension of lease terms in July of 1976. Details of the request are discussed later.

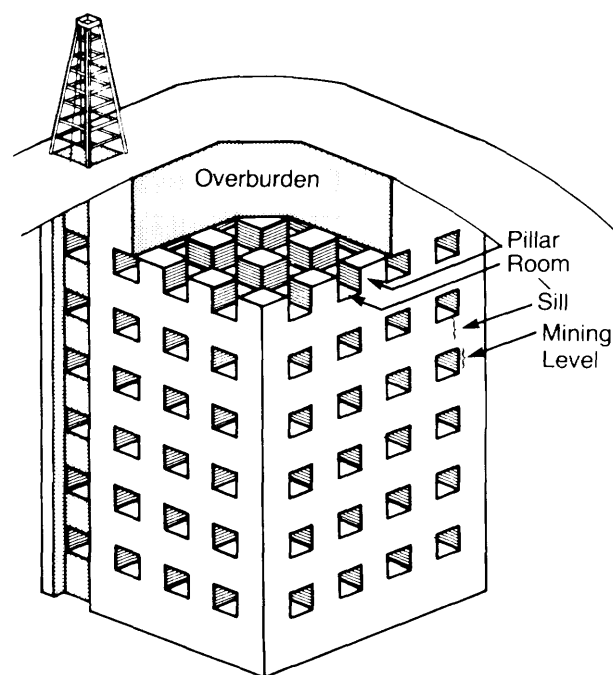
Problems on Colorado Tract C-b

In the original development plan, tract C-b was to be developed by underground room-and-pillar mining in conjunction with above-ground retorting. During predevelopment studies on the tract, the lessees encountered problems with the geological characteristics of the oil shale deposits, which made the project unattractive economically and forced evaluation of other options.

Multilevel room-and-pillar mining is depicted in figure 8. Mining begins by providing access to the oil shale zone through a vertical shaft from the surface or a horizontal drift through an adjacent outcrop. Large rooms are blasted into the mining zone, and broken shale is removed to the surface for processing. Some unbroken shale is left in place to prevent the roof from falling. Mining can be conducted on several levels if a floor or "sill pillar" of unbroken shale is left between adjacent levels. Oil shale forms the support matrix for the entire mine. Except for roof bolts and grout no other structural materials are usually required.

The great thickness of the Green River formation deposits are very favorable for room-and-pillar mining because large underground

Figure 8.—A Multiple-Level Room-and-Pillar Oil Shale Mine



SOURCE *Hearings on Oil Shale Leasing* Subcommittee on Minerals, Materials and Fuels of the Senate Committee on Interior and Insular Affairs 94th Cong 2d sess Mar 17 1976 p 83

equipment can be used, with resulting high production rates and low costs. The economic feasibility is sensitive to the mechanical properties of the oil shale, because they determine the amount of shale in the support pillars. The stronger the shale, the smaller the pillars and the higher the resource recovery. Shale that is weak because of natural fractures will require large pillars. Under these conditions, resource recovery would be low, and mining costs very high.

Preliminary studies indicated that the shale on tract C-b was strong. However, later tests showed that much of the shale in the mining zone was badly fractured, and that support pillars would have to be larger than anticipated. Resource recovery would have been unacceptably low. Because the venture's economic feasibility depended on high resource recovery, the lessees determined that the original development concept could not be pursued,

As on tract C-a, the C-b lessees also measured high background levels of air pollutants. These problems were further compounded by the unfavorable project cost estimates that were revealed late in 1974, Tosco and Atlantic Richfield began to reconsider their commitment to the leasing program, and on December 29, 1975, they assigned their interests to Ashland and Shell, withdrew from the tract, and forfeited their investments in the lease. The reasons cited for the withdrawal were inflation, questionable economic feasibility, and lack of governmental support in clarifying the effects of the background emissions on future tract development.

Ashland and Shell were left with the task of revising the development plan for the tract. They were unable to do so with confidence within the time constraints imposed by the lease terms, and in March of 1976, they requested a suspension of operations. The request is discussed later in this chapter.

Problems on the Utah Tracts

Relatively few technical surprises were encountered on tracts U-a and U-b, but the baseline monitoring programs also measured levels of naturally occurring pollutants that occasionally exceeded ambient air quality standards. The Utah lessees were further affected by legal battles between the Federal Government, the State of Utah, and private firms over ownership of lands encompassing the tracts.

In-Lieu Lands

Ownership rights are clouded over much of the oil shale area, but the situation in Utah is particularly complicated by circumstances associated with the granting of Utah's statehood. Under the Statehood Enabling Act of 1894, Utah was allowed to take title to four sections of land in each township, with the intent that proceeds from the sale or use of these sections would be applied to public education. At that time, much of Utah was unset-

tled and unsurveyed, and boundaries of many townships could not be located. Consequently, the Federal Government allowed the State to delay transfer of these sections until surveys could be completed. Subsequently, the Government appropriated entire townships for parks, monuments, national forests, and Indian reservations. These lands were removed from possible acquisition by the State. In lieu of these lands, Utah was allowed to select other areas in other townships. The in-lieu lands could be arranged in contiguous parcels, whereas the four sections originally granted by the Statehood Act were noncontiguous.

The Statehood Act allowed transfer of Federal land to the State only if the land contained no valuable minerals. In 1918, Utah sued for an exemption to this rule, but lost.²⁷ In 1927, Congress changed the law to allow selection of mineral lands under the statehood grants, but in-lieu lands were still re-

quired to be nonmineral in nature.’}’ In 1958, the law was changed again to allow selection of mineral-bearing in-lieu lands provided that the corresponding statehood-grant sections also contained minerals.²⁹ In 1960, another change allowed selection of any unappropriated public lands regardless of their mineral character. Specifically included were the oil shale lands withdrawn by President Hoover’s Executive Order 5327.

By 1960, Utah’s stockpile of in-lieu lands had reached 562,000 acres; this was subsequently reduced to 225,000 acres through the selection process. * In February 1963, Secretary of the Interior Udall, at the request of Colorado Representative Aspinall, instructed the Bureau of Land Management (BLM) to postpone transfer of additional mineral-bearing land until Congress could consider the ramifications of the 1960 amendment. Mr. Aspinall introduced a bill that would have prevented the States from selecting in-lieu lands with much greater value than the statehood sections, but the bill did not pass. In 1965 BLM announced that it was prepared to resume its review of in-lieu applications,³⁰ However, in January 1967, Secretary Udall told the Utah government that DOI would not transfer in-lieu lands of disparate value, citing as authority for this position the provisions of the Taylor Grazing Act. Nevertheless, Utah continued to apply for in-lieu selections and between September 1965 and November 1971 submitted 10 separate applications for transfer of 194 parcels of land totaling 157,225.9 acres. The land was located in the oil shale area of the Uinta basin and included the present sites of lease tracts U-a and U-b,

Interior delayed action on these applications and initiated an EIS specifically directed to the transfer of the Utah lands. The rationale was that the transfer would give a substantial block of oil shale land to a State

desirous of creating an oil shale industry that could have significant environmental consequences. The statement had not been completed as of March 1974 when the Utah tracts were leased,³²

Between January 8 and February 12, 1974, leases to tracts C-a and C-b were sold for a total of nearly \$330 million—about \$33,000 per acre. If the lands requested by Utah were regarded as having equivalent market value, their transfer would have meant a loss of over \$5 billion in mineral values to the U.S. Treasury. Secretary Morton wished to avoid or at least reduce this loss. on February 14, 1974, he notified Utah’s Governor Rampton that DOI would not exchange the in-lieu lands on an acre-for-acre basis but would rather exchange lands of equal monetary value to the statehood grant sections, thereby following the precedent set by Secretary Udall in 1967.³³

On February 26, Senator Moss of Utah complained about Secretary Morton’s position as follows:³⁴

The Secretary knows that his position is not legally sound. He is afraid, however, of the political repercussions, the unfounded charges of “giveaway” which will be hurled at him, if he does what the law requires and approves the selection lists. Therefore, tomorrow the State will file suit for declaratory and injunctive relief, seeking what has been its due for 80 years . . . Since December of 1973, I have been considering filing suit as best friend of the thousands of school children in Utah who are and have been denied rights granted to them by the Congress many years ago . . . Now, however, since the State is taking affirmative steps to bring suit, we have determined to support . . . its efforts . . . I cannot sit idly by and allow the Secretary of the Interior to delay, procrastinate and obfuscate a matter which is clear on its face. The statute in question . . . states clearly that selections for lands lost shall be based on equal acreage. The statute does not require equal value. To apply a new rule by administrative fiat is unconscionable, arbitrary, and capricious.

*other Western States were also granted school indemnity lands. At present the States are entitled to the following acreages: Arizona California-180,000: Colorado

d o l d a h o

On March 4 1974, Utah filed suit against Secretary Morton in the U.S. District Court in Salt Lake City, seeking an order to compel him to rule on the in-lieu requests without reference to the value of the parcels involved. In 1976, the court ruled that the Secretary **was to** determine if the applications complied with the requirements of the law allowing transfer of mineral lands, and to refrain from comparing the value of the lands requested to the sections granted **at** the time of statehood.” The court further concluded that the National Environmental Policy Act was not applicable and that an environmental statement **was not** required. (DOI’S EIS **was** subsequently abandoned.) On September 14, 1976, DOI appealed the ruling to the 10th District Court of Appeals in Denver, where the **case** remained until August 1978 when the earlier decision was upheld. ⁴⁶

Tracts U-a and U-b were leased on June 1, 1974, during the court contest in Salt Lake City. The lessees were not overly disturbed by the conflict, because Governor Rampton and Secretary Morton had agreed that the lease terms would remain in effect regardless of the court’s ruling. The agreement **was** signed before the leases were sold. Under the direction of the court, proceeds from the lease **sales (some \$78 million as of May 1976)** were invested in treasury bonds with the proceeds to go to the winner of the litigation,

On May 19, 1980, the U.S. Supreme Court reversed the decision of the Circuit Court. ⁴⁷ It upheld the Secretary of the Interior’s decision to refuse Utah’s applications for State indemnity selections of public lands that were grossly disparate in value to the original school land sections. The Court held that under section 7 of the Taylor Grazing Act, which requires the Secretary to classify public lands within Federal grazing districts **as** proper for school indemnity selections, the Secretary is vested with broad discretion in establishing criteria for classification; and that the “grossly disparate value standard” used in rejecting Utah’s selection **was a** valid exercise of that discretion. The Court found that the Secretary’s action **was** wholly faith-

ful to Congress’ consistent purpose, in providing for indemnity selections, of giving the States the rough equivalent of the school land grant sections that were lost through pre-emption or private entry before they were surveyed.

Other problems, relating to the existence of unpatented mining claims overlying the Utah tracts, and an application for a State lease to develop the same areas, also existed in Utah.

Unpatented Mining Claims

Before enactment of the Mineral Leasing Act in 1920, oil shale **was** subject to disposition under the oil placer provisions of the mining laws. No new oil shale claims could be located after enactment of the Leasing Act; however, section 37 contained a savings clause which preserved “valid claims existent at date of the passage of this Act and thereafter maintained in compliance with the (mining) laws under which initiated, which claims may be perfected under such laws, including discovery. ” ³⁸

The savings clause allows those who had properly located claims to perfect them by continuing operations to satisfy the requirements for a patent. Under the oil placer provisions, claims had to be located in tracts of no more than 20 acres per individual and no more than 160 acres per association of claimants. In practice, almost all of them before 1920 were located as 160-acre association placer claims. The law requires that each claim be individually “located” (staked and marked), that there be an actual “discovery” (exposure) of a “valuable mineral deposit, ” within the limits of each claim, and that the land be “chiefly valuable” for the oil shale deposit.

Claims continue indefinitely with or without mineral production. The Mining Law requires that **at least** \$100 worth of assessment (development) work be performed each year until each claim is patented, although work can be combined for contiguous claims in common ownership, and done on only one or

some of them, if it benefits all the claims. If the annual assessment work is not performed on or for the benefit of a claim during any year, the claim can be relocated by the original claimants, or by others as long as this takes place before the original locators have resumed work. Complete title to the surface and subsurface of a placer claim can be obtained by submitting an application for a patent, performing at least \$500 worth of assessment work, and paying a fee of \$2.50/acre plus any survey costs. The right to mine and make use of the surface exists whether or not the claim is patented, but, prior to issuance of a patent, surface use is limited to that required for the claimant's mineral operations. After issuance of a patent, the owner can do whatever he wants with the land. On either patented or unpatented claims, there is no requirement that mineral production ever be commenced, nor any requirements related to the timing, method, or pattern of development.

The validity of pre-1920 oil shale mining claims has been the subject of considerable dispute for many years. The dispute centers on the meaning of the valuable mineral deposit criterion as applied to oil shale and the consequences of failure to perform assessment work prior to 1971. The uncertain status of pre-1920 claims blanketing the prototype oil shale leases in Utah was one of the principal bases for the court-ordered suspension of activities, granted at the request of the lessees.

In the late 1960's, DOI began a legal campaign to resolve the ownership issue. By 1974 all of the disputed titles in Wyoming and half of those in Colorado had been cleared in favor of the Government: none of the Utah titles had been cleared, including the claims on tracts U-a and U-b, "

At the time of the lease offerings it appeared that the Utah claims would be settled in the Government's favor and industrial bidders were apparently relying on this outcome. In 1971, DOI Solicitor Melich ruled that DOI had authority to sell the leases, even though

the tracts were covered with unpatented mining claims, if revenues were held in reserve pending the outcome of litigation. If the Government won, the revenues would be handled the same as with the other tracts, and the State of Utah would receive its percentage share as provided by the Mineral Leasing Act. If the courts ruled in favor of the holders of the unpatented claims, then the claimants would divide the money.⁴⁰ However, all Federal and State leases would be declared void. This procedure, which assumed agreement by the mining claimants (and hence no cancellation of leases) was not, in fact, implemented.

Despite the uncertainties—the lessees could not rely on permission to proceed with tracts could be lost—the White River Shale Project purchased the leases and proceeded with development. Evidently, the participants were confident that the Government would ultimately prevail, or that they would be able to negotiate acceptable terms with the private claimants, if they prevailed. On June 1, 1974, leases were issued for the Utah tracts.

This confidence may have been related to DOI'S aggressive program to invalidate the outstanding mining claims. On November 19, 1973, BLM initiated four contest proceedings against certain claims in Colorado, seeking to invalidate them on the theory that a mining claim could be valid only if the deposit could have been developed, extracted, and marketed at a reasonable profit at the time of location, and if the marketability had continued without substantial interruption from the date of location to the time of the contest proceedings. In 1970, BLM succeeded in invalidating three of the oil shale claims on other grounds, but the DOI hearing officer validated six claims belonging to Shell Oil Co. and others, rejecting BLM's marketability theory. BLM filed an appeal brief in 1970 seeking invalidation of the remaining six claims.

On June 28, 1974, the DOI Board of Land Appeals reversed the hearing officer, accepted BLM's marketability theory, and in-

validated all of the claims. The issue was not soon settled because on August ²⁰, Shell Oil Co. filed a complaint in the District Court in Denver seeking a reversal of the Board's ruling.

In 1976, the District Court reversed the Board's decision and ruled that the claims at issue were valid.⁴¹ The court held that DOI was bound by prior departmental precedent in the 1927 case of *Freeman v. Summers* ⁴² which recognized that oil shale was a valuable mineral subject to appropriation under the mining laws and that established the legal basis in patenting pre-1920 claims for more than 30 years of Department practice. The court said that by not requiring any showing of present marketability for oil shale claims, the *Freeman* case established a separate and more liberal valuable mineral test than that applied to other locatable minerals. The court reasoned that, since Congress had twice considered the issue of oil shale patentability and had implicitly "ratified" the *Freeman* decision by not reversing it legislatively, and since investors had relied upon the *Freeman* rule for over half a century, DOI was not permitted to adopt the present marketability test as a new standard for evaluating the pre-1920 claims.

The *Freeman* case arose from a protest filed in 1923 by pre-1920 mining claimants against homestead entries made by Summers in 1920. The shale claims had been located on the same land in 1918. If the claims were valid at the time of the homestead entries and continued to be valid at the time the protest was filed, the claimants had a prior right to obtain patents for both the surface and the subsurface, and the homestead entries would have to be canceled. There could be no dispute concerning the basic mineral nature of the land, since it had been classified as mineral in character in 1916. However, the mining claimants, in order to establish the initial and continuing validity of their claims, had to show that they had discovered a valuable mineral deposit on each claim, that the land was chiefly valuable for such deposit, and that they had performed the required annual assessment work.

The initial decision, in 1924, by DOI'S local register and receiver, found that the claims were invalid because oil shale deposits of sufficient value to be marketable had not been exposed and the required assessment work had not been performed. The commissioner of the land office reversed this initial decision, citing evidence that had been submitted which purported to show that rich lower strata could be profitably worked, and concluding, without any discussion, that there had been a discovery of the valuable strata. At the end of 1924, DOI'S First Assistant Secretary Finney reversed the commissioner's decision and declared the claims null and void, finding there had been no proof of sufficient assessment work and that there was no probative evidence demonstrating that the lower, unexposed beds were valuable for mining purposes.

Finney's decision was the final appeal available as a matter of right. Two requests for rehearing or retrial were denied. Considerable pressure, however, was brought to bear on DOI by oil shale mining claimants from Colorado and their representatives in Congress. The Secretary of the Interior exercised his supervisory power to order the case reopened and retried, and held an open meeting attended only by oil shale mining claimants and their supporters at which the issue of discovery of the richer lower strata through geologic inference rather than actual exposure was extensively discussed. In 1927, Finney wrote and the Secretary signed a new and final decision upholding the mining claimants' protest, a decision with which neither DOI'S Solicitor nor any of his attorneys agreed. ⁴³

The decision was mainly concerned with the issue that had been the primary focus throughout the proceedings: the extent to which geologic inference could be used to support a discovery of the richer lower strata. However, it also addressed the value issue:

While at the present time there has been no considerable production of oil from shales, due to the fact that abundant quantities of oil have been produced more cheaply,

from wells, there is no possible doubt of its value and of the fact that it constitutes an enormously valuable resource for future use by the American people,

It is not necessary, in order to constitute a valid discovery under the general mining laws sufficient to support an application for patent, that the mineral in its present situation can be immediately disposed of at a profit . . .⁴⁴

DOI appealed the 1976 District Court decision. The Tenth Circuit Court of Appeals affirmed the lower court decision and held that the Department was bound by the Freeman precedent.⁴⁵ The U.S. Supreme Court agreed to review, on June 2, 1980 the Supreme Court issued its opinion affirming the decisions of the lower court that oil shale was a valuable mineral and rejecting the application of the present marketability standard. The case, *Andrus v. Shell Oil CO.*,⁴⁶ held that oil shale is a valuable mineral that is patentable under the savings clause of the Mineral Leasing Act of 1920. In its decision the Court noted that before 1920 there had been uncertainty about whether oil shale was patentable under the mining laws since there was no commercial production of shale oil. The Court found that by enacting the Mineral Leasing Act of 1920 that withdrew oil shale from disposition under the mining law, Congress at least implicitly recognized that oil shale had been locatable. Since oil shale was not then commercially valuable, the Court reasoned that Congress must not have intended any consideration of the present profitability of shale in determining whether a claim was patentable. To support its conclusion, the Court cited the Freeman decision and departmental practices over 33 years in issuing more than 523 patents as evidence of the contemporaneous administrative construction of the 1920 Act by those charged with its implementation.

In a footnote, the Court recognized that a separate value test exists for oil shale:

(The) history indicates only that a present marketability standard does not apply to oil shale. It does not affect our conclusion in *United States v. Coleman* that for other min-

erals the Interior Department's profitability test is a permissible interpretation of the "valuable mineral requirement."⁴⁷

The implications of this Supreme Court decision for the unpatented claims in Utah are not yet clear.

The Peninsula Mining Case

A further complication arose in 1974 when Peninsula Mining, Inc., a Utah firm, applied for State leases for 46,000 acres of land in the Uinta basin, including tracts U-a and U-b. Peninsula contended the Utah legal code required that the State must lease land, where available, to the first qualified applicant to satisfy the appropriate filing procedures, which Peninsula Mining did on June 21, 1974. Utah rejected the lease applications.

On December 11, 1974, Peninsula sued the State of Utah in the Third Judicial District Court of Salt Lake County, pleading that Utah had complied with applicable laws, that title should have been granted by the Federal Government within a reasonable time, and that the State was therefore entitled and obligated to issue a lease for the area. On March 5, 1975, proceedings were stayed pending resolution of Peninsula's petition to intervene in the Utah indemnity selection case. The petition was subsequently denied, Utah's motion to vacate the stay order and to dismiss the complaint was also denied by the State court, and the stay is still in effect.⁴⁸

In 1976, therefore, the lessees of tracts U-a and U-b were uncertain of the ultimate identity of their landlord. Depending on court decisions in a number of lawsuits, the landlord could be the Federal Government, the State of Utah, or one of a number of private parties. The uncertainty remains in light of the Supreme Court decision in *Andrus v. Shell Oil Co.*

Environmental Problems

The Utah lessees also encountered high background levels of naturally occurring air pollutants during their environmental moni-

toring programs. The emissions were like those found in Colorado and may have been similarly related to natural sources. Because of the ownership conflict and because the

regulations promulgated under the Clean Air Act might prohibit further industrial development, the lessees applied to DOI for a suspension of lease provisions on July 19, 1976.⁴⁹

Problems With the Environmental Baseline

Under the provisions of the leases, the lessees were required to monitor air and water quality, as well as other environmental characteristics on the tracts and their environs. The purpose **was to** compile a body of data that would define the baseline conditions before development. Any changes after development started could then be associated with the related activities. The monitoring programs were to cover a Z-year period. Early in the programs, air quality measurements detected concentrations of particulate, hydrocarbons, and ozone that **occasionally** exceeded the National Ambient Air Quality Standards (NAAQS) that were promulgated under the Clean Air Act of 1970. * This situation **was** regarded **as** serious **at** the time because the Act prohibited additional industrial development in areas of excessive air pollution, i.e., areas where pollutant concentrations exceeded any of the NAAQS.

The discovery **was** surprising because there is very little industry near the tracts. It was subsequently hypothesized that the pollutants might be emitted by natural sources within the oil shale areas or by industries and municipalities outside of the region. Particulate were related to windblown dust; hydrocarbons to emissions from nearby **gas**-fields or more likely from sagebrush and other vegetation; and ozone to long-distance air transport from the Salt Lake City airshed.^{50 51}

The leases prohibited further development until the pollution problem **was** solved, or until the NAAQS were modified. A DOI official described the situation **as** follows:⁵²

When we discovered this to be a problem we immediately contacted the Environmental Protection Agency, asked them whether in fact the situation had to be resolved legislatively or whether it could be resolved administratively. The answer the Secretary received from Administrator Train was that they believed that in July an amendment then pending before the Congress would solve the problem, but barring that they thought they could deal with it administratively and were in fact undertaking some studies to determine whether a change in the standards or a change in the approach to the ambient air quality problems might be appropriate.

I have received a draft, internal copy, of their study, which indicates that when they set the (standards) they did not understand all the interrelationships between hydrocarbons and oxides, and in fact they may have to adjust the geographical boundaries for which they set ambient air quality standards.

If they do, it might resolve the problem, Without administration or legislative help, however, I remind you that the situation presents an absolute impediment; that there can be no legal action to develop those leases under the conditions that appear to exist at this point.

The area of uncertainty in the standards relates to the reactions between hydrocarbons and nitrogen oxides (both of which are regulated) to form ozone. It was not clear that high hydrocarbon concentrations would necessarily constitute a health hazard in the oil shale area where concentrations of nitrogen oxides were very low.⁵³ What was clear was that the tracts could not be developed under the law as then interpreted.

*The laws and standards that regulate air quality in the oil shale region are discussed in ch. 8 of vol. 1.

The Political Climate

During the mid-1970's, it was generally recognized that achieving energy independence would require the cooperation of domestic oil producers, at least in the near term. However, there were growing concerns about the high profits that oil companies had made during the Arab oil embargo, Government subsidies for fossil fuel production, environmental impacts of energy development, and the costs of extracting fuels from oil shale. Pressures mounted to divest the integrated operations of the major oil companies as a means for increasing competition in the energy industry.

Perhaps it was these concerns that prompted Congress to reject several pieces of legislation that would have supported synthetic fuel production in general, and benefited oil shale developers in particular. As mentioned previously, Congress did not pass the bill that would have allowed Rio Blanco to use off tract lands, but instead adopted the language of FLPMA. In 1975, President Ford proposed an Energy Independence Authority that would have provided as much as \$100

billion for developing new energy sources. The proposal was not approved by Congress,

Also in 1975, the House of Representatives struck a \$6 billion loan-guarantee provision from the authorization bill for the Energy Research and Development Administration (ERDA). * The provision was strongly supported by the participants in the Prototype Program. Had it passed, it could have removed some, although not all, of the financial uncertainty of oil shale development. The House also rejected a Senate bill that would have allowed use of public land for research on in situ processing. In 1976, a bill was introduced to authorize \$3.5 billion in loan guarantees and \$500 million in price supports for synthetic fuels. The bill was defeated in committee. When coupled with the economic, geo-technical, environmental, and legal problems, the political climate led all of the lessees to reconsider continued involvement in the leasing program.

*The Department of Energy (DOE), ERDA's successor, now has generic loan guarantee authority, but has not applied it to oil shale.

Suspension Requests

By the end of 1975, the original development concepts for tracts C-a and C-b had been invalidated. On tract C-b, management was disrupted by the withdrawal of two of the original partners. In Utah, the lessees had no assurance that the development of the tracts could proceed at all, but the lessees were sure that resolving the ownership issues would require months, or even years. For all of the tracts, obtaining the necessary legislative or administrative solutions to the air quality problem promised to be a lengthy process. All of these uncertainties introduced the strong possibility of significant delays in the development schedules.

Potential delays were of considerable economic concern to the lessees. The lease terms

required full payment of the first three bonus payments but the fourth and fifth could be partially or even fully offset by investments in tract development. In order to qualify for the benefits of the offset provision, investments had to be made prior to the fourth and fifth anniversaries of the lease sales. That is, at least one-fifth of the original bonus bid (plus interest) had to have been spent on the tract before the fourth anniversary and an additional one-fifth before the fifth anniversary. If no work were done, the total amount of the bonus bid would have to be paid to the Government. Therefore, any delays that lowered the amounts of investment in the fourth and fifth years reduced the financial attractiveness of the projects. Many millions of dollars would be lost by each of the participants if in-

vestments were not made according to original schedules.

The lessees saw only three possibilities:

- . to relinquish the leases,
- . to expedite preparation of new development plans and to press for resolution of legal and regulatory uncertainties, or
- to request suspension of lease requirements until the uncertainties could be resolved.

The first choice would have entailed the sacrifice of three-fifths of the bonus bids for a total financial loss of over \$270 million (see table 1) if all participants withdrew. The Prototype Program would have ended, and its termination would have eliminated a commercialization opportunity that was still attractive to industry. The second alternative would have involved much risk, even if only technical crash programs were required that were completely controlled by the companies. These risks were magnified by the necessity of involvement with the courts and the regulatory agencies. The third possibility was allowed by the provisions of the Mineral Leasing Act of 1920, as amended, but only for the purposes of encouraging the greatest ultimate recovery of the mineral.⁵⁴

The lessee's concerns may have been related to the uncertain economic feasibility of oil shale development. However, the leases did not authorize suspensions for economic reasons. In order to qualify for a suspension, a lessee would have to provide a justification in terms of resource recovery and conservation. On March 3, 1976, the remaining tract C-b partners requested a temporary suspension to study whether lands owned by the lessees could be exchanged for lands near the tract, thereby increasing the resource base that could be concurrently developed and overcoming some of the problems created by

the weak shale.'')' The request also cited the potential conflict with the Clean Air Act regulations, and the need for time to consider legislation to allow off tract land use. In addition, the transmittal letter mentioned a hostile governmental attitude towards the oil industry, as exemplified by price controls on petroleum and proposed legislation for severance taxes and divestiture. However, the principal foundation of the request was the need for further studies of a concept for developing the tract that would minimize wasting the public's resources. An 18-month suspension was requested. On August 20, DOI'S Area Oil Shale Supervisor granted a 12-month suspension (from September 1, 1976 to September 1, 1977). The lessees were required to continue environmental monitoring programs.

On July 2, 1976, Rio Blanco requested a 2-year suspension on tract C-a, citing the high background levels of natural air pollutants, denial of off tract land use, economic uncertainty, the absence of a favorable political climate, and the need to prepare new development plans that would maximize resource recovery.^{56 58} DOI granted a 1-year suspension (until September 1, 1977) with the provision for continuation of baseline environmental monitoring.

On July 19, 1976, the lessees of tracts U-a and U-b requested a 2-year suspension, citing that the time was needed for additional study to develop methods for improving resource recovery with acceptable costs, to determine whether the tracts could be developed in compliance with air quality regulations, and to develop an economically feasible retorting technology. DOI granted a 1-year suspension (from November 1, 1976 to November 1, 1977).>[] Continuation of baseline environmental monitoring was required,

Events During the Suspension Periods

During the suspension period, environmental uncertainties to tract development were

removed through actions by the Environmental Protection Agency (EPA) and the State of

Colorado. In a letter dated July 5, 1977, to DOI'S Area Oil Shale Supervisor, EPA's Region VIII Administrator stated:⁶⁰¹

EPA does not feel that the air quality as represented by measurements on the Federal lease tracts precludes the development of the oil shale resources. Utilization of interpretative rulings, existing regulations, and policy statements would indicate that if a facility is designed to meet all appropriate State and Federal emission regulations and the applicable "incremental type" ambient standards, i.e., State and PSD, it may be constructed.

It is noteworthy that the statement implies that changes in policy were not required to accommodate development. EPA conclusions were based in part on analyses of the nature of fugitive dust in rural areas and the problems with high ozone concentrations in areas that contained no man-related sources of ozone or its precursor hydrocarbons.'')' Since ozone and its precursors can be transported long distances, EPA's analysis indicated that regulatory actions directed at protecting air quality in rural areas would be more effective if applied to the distant urban areas that were the likely sources for the pollutants. In addition, it was indicated that areas like the oil shale region, which have low ambient concentrations of nitrogen oxides, are less subject to air quality degradation as a result of hydrocarbon emissions from new sources (like oil shale plants) than are industrialized urban areas with high concentrations of nitrogen oxides. Because of the insensitivity of ozone concentrations to changes in the concentration of hydrocarbons, controls implemented in the oil shale region would have little effect on ozone levels.

The fugitive dust analysis indicated a difference between dust in urban areas and in rural areas. Rural dust is generally wind-blown material from sparsely vegetated land and unpaved roads. It is typically native soil and is not contaminated with industrial particulates, absorbed industrial fumes, or other potentially toxic substances. Furthermore, dust in rural areas is generally composed of relatively large particles: it is the smaller size

particulate that are most harmful to human health and welfare. Urban dust tends to contain more smaller sized particles, which are often made up of industrial particulate, either alone or adhering to natural particles. These are often contaminated with industrial vapors and gases, automotive exhaust fumes, rubber tire particles, and other materials that have been related to adverse health effects.

In summary, EPA concluded that stringent hydrocarbon emission regulations in the oil shale area would have little effect on ozone concentrations in the atmosphere. It also concluded that rural dust is substantially and significantly different from suspended particulate in urban areas, and is less likely to cause harm, even if present in concentrations in excess of the NAAQS.

The Region VIII EPA Office drafted a rural ozone policy that allowed construction of new hydrocarbon sources in rural areas where baseline ozone and hydrocarbon concentration exceeded ambient air quality guidelines, provided that the facilities complied with emission standards and regulations for preventing additional degradation in air quality. The policy was proposed only if the new sources were not near cities with populations larger than 200,000. It was however, never adopted by EPA in Washington.

A rural fugitive dust policy was also drafted, but never adopted, that allowed construction of new particulate sources in rural areas where baseline particulate concentrations exceeded the NAAQS, provided that the sources complied with emissions standards and used the best available pollution control methods. It was proposed that the emissions from the new sources, when added to emissions from other man-related sources in the same area, could not exceed the particulate standard developed for the area.

The second environmental problem was related to the standards for prevention of significant air quality deterioration (PSD) that were proposed by the Colorado Air Pollution Control Commission for controlling sulfur di-

oxide (SO_2) concentrations. The Colorado standards that applied to the oil shale region are compared below with the corresponding Federal standards.

	Allowable increase in SO_2 concentration, g/m^3	
	Federal PSD standard for Class II areas	Colorado PSD standard for Category I areas
Annual average	15	3
Maximum during any 24-hr period	100	15
Maximum during any 3-hr period	700	75

An atmospheric dispersion modeling study performed by the Colony Development Operation indicated that the Colorado 3-hour PSD standard could not be satisfied by even the smallest practical oil shale retort, and would certainly be exceeded by a commercial-scale retort even if the best available air pollution control methods were used. Thus, oil shale plants would be prohibited in Colorado's oil shale regions.⁶² In March 1977, hearings were held concerning the proposed regulations. Considerable testimony was presented both favoring and opposing the regulations.

The PSD standards for the oil shale region were subsequently revised to agree with the Federal standards.⁶³ According to the Colony study, this revision would have permitted an industry of at least 400,000 bbl/d in the Piceance basin.⁶⁴ It also would allow other developments (such as powerplants) to be built in the oil shale area and other parts of the State.

Also during the suspension periods, the technological approaches to developing tracts C-a and C-b were revised. As noted previously, Tosco Corp. and Atlantic Richfield withdrew from the C-b tract in December 1975 as a result of escalating project cost estimates. On November 2, 1976, Shell Oil Co. withdrew from the tract because of continued economic uncertainties, and on November 4, Ashland Oil Co. (the last of the original four participants) announced a partnership with Occidental Oil Shale, Inc. The companies proposed to develop tract C-b with Occidental's modified in situ (MIS) retorting

technology.* MIS processing reduces the need for aboveground facilities because the retorts are underground. Waste disposal, although still a substantial problem, is considerably less than in aboveground retorting operations. Because large, permanent underground openings are not needed, the technique was believed to be applicable to structurally weak shale deposits like those encountered on tract C-b. Furthermore, it was claimed at that time that MIS processing would produce shale oil for about half the cost of aboveground retorting, and that resource recovery would increase fourfold (from 300 million to 1.2 billion bbl).

On March 1, 1977, the tract C-b lessees submitted a modified DDP to DOI's Area Oil Shale Supervisor that changed the approach to tract development to MIS processing. On May 25, Rio Blanco submitted a plan for developing tract C-a by MIS methods, rather than by open pit mining and aboveground retorting as originally proposed. At the same time, Rio Blanco also applied for an extension of the suspension period beyond the September 1 deadline, if the problems with environmental baseline measurements were not resolved prior to that time. The request was denied because the issue was resolved by the EPA Regional Administrator on July 5. On August 30, DOI approved the modified DDP for tract C-b's MIS operations. On September 1, suspensions for tracts C-a and C-b were terminated. On September 22, DOI approved the modified DDP for tract C-a.

The suspensions for Utah leases were not terminated at the original November 1 deadline. On April 17, 1977, the Utah lessees filed a complaint in the U.S. District Court in Salt Lake City, seeking an injunction against the Federal Government to prevent continuation of the lease provisions until the issues surrounding ownership of the lease tracts were resolved. On July 1, Judge Ritter granted the injunction because:⁶⁵

- a. If plaintiffs proceed with development of the leased deposits, they would be sub-

*MIS processing and other oil shale technologies are described in ch. 5 of vol. 1.

- ject to the risk of losing the monies and resources expended in development.
- b. If plaintiffs retain the leases, but do not proceed with development, they would suffer the loss of monies paid as bonus payments that otherwise could be spent on development.
 - c. If plaintiffs relinquish the leases, they would risk the loss of the monies expended to date on bonus and rental pay-

ments and preparation of the Detailed Development Plan,

The injunction was issued with an effective date of May 31, 1977, and was to continue until ownership of the land and the right to develop the tracts were settled by the resolution of the suits between Utah and DOI, Peninsula Mining and Utah, and DOI and the holders of rights to unpatented mining claims.

Resumption of Activities and Current Status

Tract C-a

In January 1978 shaft sinking began on this tract in preparation for a modular MIS retort demonstration program. The program was to involve five sequential retorts of increasing size, and was to be completed by 1981. These retorts were to be based on a concept developed by DOE's Lawrence Livermore Laboratory. They were to lead to commercial-scale operations by 1987 in which MIS retorts would be used in conjunction with TOSCO 11 retorts to produce 76,000 bbl/d of crude shale oil. In 1979, Rio Blanco executed a licensing agreement with Occidental Oil Shale that provided access to proprietary technical information acquired during Occidental's field experiments with MIS retorting. Also in 1979, Rio Blanco submitted another modified DDP in which its schedule was changed to include the operation of three modular MIS retorts through 1981. The first retort will be about 30 ft on each side and 200 ft high, and will be used to develop techniques for rubbing and combustion. It was scheduled to be burned in June of 1980. The second retort will be 60 ft on each side and 400 ft high and will also be burned in 1980. The third experiment may involve two parallel retorts, each 60 ft on each side and 400 ft high, or a single retort measuring 60 ft by 150 ft by 400 ft high. Rubbing will be completed late in 1980 and the burn is scheduled for mid-1981. Additional retorts may be constructed and burned after the end of 1981. The retorts will probably be of commercial size and may be as high as 700 ft.

Rio Blanco is also considering Lurgi-Ruhrgas aboveground retorts to process the shale that must be mined to create the in situ retorts. Current plans are to invest \$100 million in a modular retort development program in which a 4,400 ton/d Lurgi-Ruhrgas module would be used to produce about 2,000 bbl/d of crude shale oil. An agreement for the engineering design phase of the program was signed by Rio Blanco and American Lurgi Corp. on July 16, 1979. The plant could be in operation within about 3 years. Commercial-scale operations at about 76,000 bbl/d could be attained by 1987 if there are no further project delays.

Tract C-b

In February 1978, a contract was let for shaft sinking on this tract in preparation for an MIS retorting demonstration. Shaft sinking and the preparation of surface facilities began in early 1978 and are continuing. On December 15, 1978, Ashland Oil Co. announced its withdrawal from the tract effective February 14, 1979, leaving Occidental as the sole developer. Ashland's decision was prompted by:⁶⁶

... economic studies that suggest increased capital and operating costs may reduce profitability in the face of technical, political and regulatory uncertainties. This decision is in keeping with Ashland's corporate policy to emphasize projects that promise cash flow commensurate with capital requirements.

Ashland transferred its share of the lease to Occidental at nominal cost, but retained the right to recover its development investment of about \$37.5 million from any sales revenues that may ultimately result from commercial operations on the tract,

On July 25, 1979, Occidental sold a half-interest in the tract for \$110 million to Tenneco Oil Co. The tract will be developed jointly by the companies, Tenneco would have full rights to use Occidental's MIS technologies both on the tract and in any other development ventures in which it may become involved. Full-scale commercial production of 57,000 bbl/d is anticipated in 1986. No plans have been announced to process the mined shale in aboveground retorts.

Tracts U-a and U-b

Ownership of these Utah tracts is still uncertain. Although the U.S. Supreme Court found in favor of the Federal Government in the in-lieu lands case, they found in favor of the Colorado claimholders in the case of the unpatented mining claims. Although the claims in question are in Colorado, the outcome could have implications for future development in Utah. If the precedent is applied to the unpatented mining claims overlying tracts U-a and U-b and if these claims were declared valid under the precedent of the Shell Oil decision, the existing Federal leases in Utah could be affected. The issue remains unsettled as of the time of this writing.

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⁴⁶*Ibid.*, n. 11, p. 15. *U.S. v. Coleman*, 390 U.S. 599 (1968).

⁴⁷For discussion, see Cameron Engineers, Inc., *Synthetic Fuels Quarterly Report*, vol. 14, No. 3, September 1977, p. 5-28.

⁴⁸*Hearings on Oversight—Prototype Oil Shale Leasing*, Subcommittee on Minerals, Materials, and Fuels of the Senate Committee on Interior and Insular Affairs, 94th Cong., 2d sess., Nov. 30, 1976, pp. 76-80.

⁴⁹*Ibid.*, at p. 3.

⁵⁰*Ibid.*, at p. 51.

⁵¹*Ibid.*, at p. 3.

⁵²*Ibid.*, at p. 62.

⁵³*Ibid.*, at p. 58.

⁵⁴*Ibid.*, at p. 73.

⁵⁵*Ibid.*, at p. 66.

⁵⁶*Ibid.*, at p. 49.

⁵⁷*Tract C-a Annual Progress Report, September 1977 - December 1978*, Rio Blanco Oil Shale Co., Denver, Colo., March 1979, p. 1-1-2.

⁵⁸Supra No. 49, at pp. 71-72, and 76-80.

⁵⁹J. A. Green, EPA Region VIII Administrator, letter to P. A. Rutledge, Area Oil Shale Supervisor, July 5, 1977,

⁶⁰Supra No. 49, at pp. 101-105.

⁶¹*Cameron Engineers, Inc., Synthetic Fuels*, vol. 14, No. 2, June 1977, p. 2-6.

⁶²Supra No. 48, at pp. 2-12 and 2-13.

⁶³Supra No. 62.

⁶⁴Supra No. 48, at p. 5-19.

⁶⁵*Prototype Oil Shale Leasing Program*, Department of the Interior, U.S. Geological Survey, Area Oil Shale Office, Grand Junction, Colo., Jan. 15, 1979, p. 15.