

OIL SHALE

accomplishment plan



**environmental
protection
agency**

**rocky
mountain
prairie region**

october 1974

ACCOMPLISHMENT PLAN

Region VIII

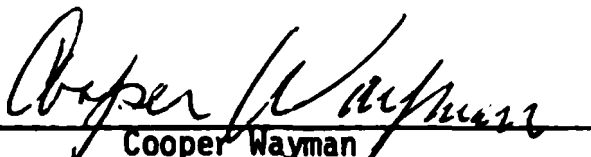
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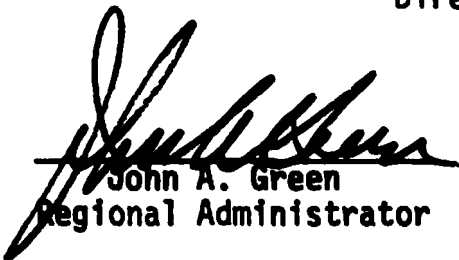
EPA Activities Relating to Oil Shale

(Colorado, Utah, Wyoming)

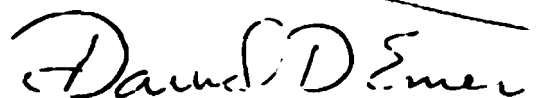
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Abstract

This Accomplishment Plan presents the rationale and allocation of EPA resources to carry out its responsibilities in light of major oil shale development in the Rocky Mountain States of Colorado, Utah, and Wyoming. The Plan addresses primarily a regionally-coordinated effort, although the magnitude of potential development calls for additional participation by headquarters and other local and National groups.

The Plan emphasizes that, to be effective, an EPA Region VIII oil shale program must be based on as comprehensive and accurate an assessment of environmental impacts as possible, must be based on a use of existing EPA, other Federal agency, State and local planning and regulatory authorities, the development of selected, new authorities and must be based on a coordinated and cooperative program that involves Federal, State, and local entities. The Plan also recognizes that to be timely, data, partial results, and assessment methodologies must be made available to those entities with responsibilities for decision making.

The Accomplishment Plan details the manpower and monetary requirements that Region VIII has projected as necessary to initiate a comprehensive assessment of oil shale development. The projections are based upon specific tasks described in some detail in the text. It should be noted that many of the items listed relate to efforts underway or proposed by other EPA and by other agencies. In most cases, the work effort and funding shown would not perform all the tasks listed or inferred. In those cases the effort included in this Plan involves the expenditure of small amounts that may lead toward or supplement a larger effort -- perhaps involving funding from outside EPA.

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PREFACE

Region VIII has given careful thought to the potential environmental impacts associated with oil shale development and to the proper, timely, and forceful role and mechanisms with which the Region will address these problems. This Accomplishment Plan is a result of this thought and of the Region's actual experiences with coal and oil shale development to date. The Accomplishment Plan has as its main themes: (1) the adequate and comprehensive collection and analysis of data related to methodologies, alternatives, and environmental parameters; (2) the full and timely use of available EPA planning, control, and analysis programs; and (3) cooperation with and support of relevant Federal, State, and local governmental agencies both presently existing and as may be necessarily created.

Though scarcely completed, certain aspects of the Accomplishment Plan, because of rapid changes and acceleration of development in the region, already need revision and re-emphasis. There is an urgent need to immediately begin addressing the problems of community development, community facility degradation, rapid urbanization of small towns and rural areas, and the general pressure of large and sudden influxes of people on the quality of life of the area. The need for regional planning money, planning assistance and expertise, for construction grant monies, community facilities planning, and for both a regional and community level environmental planning program is evident. Though the main themes of the Accomplishment Plan are still relevant and will serve as an overall guide to a Region VIII program, more immediate actions and needs will be described which will be considered as the first phase of the program.

The manpower needs and identified contracts and study efforts of the Accomplishment Plan, though including planning and program implementation aspects, are oriented toward the gathering and analysis of environmental data and examination of alternative technologies for development. These manpower and study needs should be considered in view of the immediate needs that will be described.

The role of regional and community planning instituted with the express purpose of achieving orderly development and control of the environmental, community facilities, land use, and social-economic factors that make up the broad concept of quality of life, is a major and pressing aspect of oil shale development. Without the immediate instigation of planning on Federal, State and local levels, oil shale related developments will occur in a haphazard and detrimental manner. Participation by the public and industrial interests will be encouraged as a vital part of these efforts. Proper planning, backed by controls, can go far to alleviate these impacts.

The Accomplishment Plan has described the data and methodology developments that will be the basis for any comprehensive planning program. It has also described the authorities and broad programs that are the basis of EPA planning programs. An important area of concern which will be explored as part of the Accomplishment Plan is the adequacy of existing laws and authorities as related to prevention of environmental degradation due to oil shale development.

Institutional Concerns

A most important and pressing need for Region VIII is to become fully involved in existing and future inter-governmental institutions that have been created to address oil shale impacts and its problems. These would include the Federal Regional Council, the Oil Shale Environmental Advisory Panel, the Federation of Rocky Mountain States, and other organizations that may be created.

Region VIII must be fully prepared to take a strong leadership role in these institutions. Any lesser role will probably assure that environmental constraints, the major purpose of the Prototype Program being their assessment, will not be adequately evaluated. This effort will require the devotion of considerable regional input for the proper execution of the EPA role.

State & Local Assistance

EPA programs involved in the community impacts planning effort would include: (1) Section 201 Facilities Planning, Section 208 Areawide Planning, and Permits under FWPCA-72; (2) Air Quality Maintenance and Significant Deterioration Areas, Standards, and Permits under the Clean Air Act; solid wastes and water supply programs; NEPA and the EIS process; and other authorities. These program efforts with their wide range of influence must be coordinated into a truly active planning effort that meshes media and that results in enforceable plans that are implemented.

On a larger regional environmental planning basis involving present EPA programs, the same authorities as listed for community impacts would apply but would be a sub-set of the larger river basin planning, airshed, E.O. 11752, and NEPA efforts. These larger regional planning concerns would require expertise in land use, water quality, transportation and environmental/natural resources.

A major aspect of an EPA environmental planning effort will be the influencing of and assistance to the planning and investigative efforts of other Federal, State, and local agencies. The previously listed EPA programs already work in this manner but because of the institutional arrangements and pressing needs of oil shale development specific mechanisms for EPA assistance need to be executed.

Inter-governmental organizations may serve as an overall planning/coordination entity, as previously discussed. For example, multi county Councils of Government have been established in the oil shale area and are presently developing their planning programs. Region VIII should be prepared to give full environmental/community impact/regional land use planning input into these programs.

Construction grants for wastewater treatment facility construction will be an important EPA concern. Area communities, many already at or beyond treatment capacity, will be severely impacted by the large influx of people. It is estimated that \$14 million will be required for construction of treatment works to meet the needs of the Prototype Lease Program. Present state construction grant allocations do not meet present needs. Consequently, a means to provide wastewater treatment construction funds to the oil shale impact area needs to be defined. The possibility of establishing a national priority and earmarking such funds should be explored.

Summary of Resource Needs

The attached Accomplishment Plan provides for EPA resources to principally conduct technical investigations and monitoring related to regionwide environmental aspects of oil shale development. These EPA resource needs are summarized in the following table. These are to be utilized to support those planning and regulatory entities with responsibilities in the three-State area of the oil shale resource.

Oil Shale Accomplishment Plan Resources Summary

	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
Man Years	1.2	8.00	11.68	15.12
Contract Support		\$300K	\$637K	\$957K

The following table summarizes estimated additional resource needs for direct state and local assistance for environmental planning and construction related to EPA authorities.

State and Local Assistance Needs

Planning and Management

Inter-governmental Coordination*	\$ 100,000
AQMA Planning	300,000
208 Planning	1,250,000
303(e) Planning	300,000
Solid Wastes Planning	175,000
Assistant to Local COG's	500,000
	<u>\$2,625,000</u>

* Funded - FY 1974 to Colorado West COG

In addition to financial assistance, direct personnel assignment to inter-governmental agencies such as the Council of Governments is considered a desirable approach. Such assignment could be either through inter-governmental personnel assignment or by assigning EPA personnel to the field. Three positions for this purpose would be considered a minimum effort. One person has already been assigned to work with the Western Colorado Council of Governments.

INTRODUCTION

Energy Demand and Environmental Protection

National fuel shortages have focused attention on the critical role that the nation's energy supply plays in national affairs. The so-called "energy crisis" has revolved around a relatively sudden recognition by the public and by government that problems of energy supply, energy costs, energy conservation, and the environmental constraints involved in energy exploitation are national issues of great and immediate importance.

There has been much concern in the face of this "crisis" that a crash program based on a "full-speed-ahead" philosophy of energy exploitation would prevail. Though much of this sentiment still exists, more recent events and an easing of the crude oil shortage have allowed for a more rational analysis of an energy program based upon wise use and conservation of the nation's energy resources. The critical role of environmental protection and its emphasis on the best use, for the greatest good, and for the long-run, of the nation's resources is being asserted in a positive manner and is assuming its proper role and prominence in national affairs.

The fact that short-term energy considerations have not been allowed to overwhelm legitimate environmental protection concerns attests to the role and the high regard with which the American people hold the quality of the nation's environment. It now becomes a duty of EPA to carry on existing programs and to initiate new ones that will assure the protection of this environment and the consideration of the long-term quality of life of the nation while protecting its environment and conserving its vital energy resources.

Region VIII of the Environmental Protection Agency, comprised of the States of Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota, is the scene of the energy demand-environmental concerns dilemma. The Region contains vast reserves of oil shale, coal, uranium, oil and natural gas (much in formations characterized by low permeability). At the same time the Region is the scene of some of the nation's most valuable and least spoiled environmental resources. Taken together -- growing energy demand and public desire to protect environmental values -- these two aspects will tax to the fullest extent the Environmental Protection Agency, its environmental protection programs, and those entities in the States with planning and regulatory responsibilities. Figure 1 gives an idea of the current status of the oil shale lands in Colorado.



FIGURE 1
Typical View: Piceance Creek
Basin, Colorado

An Oil Shale Environmental Protection Program - Overview

Exploitation of the various energy resources of Region VIII and the secondary impacts caused by and associated with this development promise to be the primary challenge and threat to the environmental quality of the Region. Energy development in response to national demand is accelerating and the nature and quality of the environment over large areas is already stressed. Environmental protection programs and planning and control efforts must be comprehensive, regionally based, and innovative to prevent wholesale degradation.¹

Oil shale exploitation and the environmental effects associated with it -- both on-site (primary) and off-site (secondary) -- will be major challenges. Meaningful objectives, program elements, program focal points, resource needs, data gaps, etc., must be ascertained now and a comprehensive planning effort directed at oil shale development undertaken.

Already involved in the comprehensive Northern Great Plains Resources Program -- an interagency inventory of coal resources, developmental possibilities, and environmental and social/economic constraints and impacts in the coal areas of Montana, Wyoming, and North and South Dakota² -- EPA needs to initiate a program backed by similar effort and planning and implement a policy of investigation and assistance with regard to oil shale developments in Colorado, Utah, and Wyoming.

The oil shale problem is first a regional problem and thus only a regional approach that considers secondary impacts will be effective. Planning efforts directed at site-specific problems will be most important but must fit in with an overall program that is aimed at the larger impacts -- growth, population, watershed, air shed, salinity, etc. -- and their cumulative effects. Regional planning efforts will be the key to effective management of the area.

Because of the imminence of oil shale development -- Federal leases have been issued, private development is underway, companies are tooling up and preparing actual mining plans, etc. -- there is a

1. This is not to say that the quality of the western environment has never before been stressed. The mining that fouled the environment in the past also opened much of this country to those of us who enjoy its beauty and who populate its urban areas. Fortunately, the area has sorbed many of these impacts. Now, however, the potential for stress is greatest. The geographic concentration of such industrial development as is proposed and discussed is of a scale an order of magnitude greater than previously experienced.

2. "Accomplishment Plan - Northern Great Plains Resources Program", Region VIII, EPA, Denver, Colorado

great need for all levels of government, including EPA Region VIII, to give immediate attention to problems of community development and urbanizing pressures in the oil shale region. The prevention of "sprawl development" and other unregulated land uses, the amelioration of overwhelming pressures on local facilities (schools, roads, sewage plants, water supply, etc.) and the overall protection of the quality of life in the region require that immediate attention be given to these problems that a sudden and large influx of people into the area will bring. Planning efforts for these problems, though an intimate part of the overall regional planning effort, need to receive high priority in EPA efforts. It is also critical that the decision-makers be made aware of the probable impacts of development, alternatives available to them, and how their actions relate to National and other broad-scale activities.

The actual organizational structure needed by government to address oil shale development, both inter-agency and intra-agency, is another priority item of our Oil Shale Program. Such questions as the following need to be addressed and answered soon:

1. Are existing intra-agency organizational structures adequate to address the problem?
2. Do existing structures need strengthening or should new ones be proposed?
3. What authorities should an intra-agency group have? Data gathering? Actual planning? Controls? Coordination?
4. Are existing EPA authorities adequate for the job of protecting the environment in the area?
5. What authorities will planning and regulatory entities need to do their jobs?
6. How does Region VIII EPA interact and influence relevant Federal, State and local entities on environmental matters?
7. What type inter-agency setup best meshes with the intra-agency organization and what type is most effective for the needed planning, data gathering and assessment, and controls functions?

The planning and regulatory functions found under the various EPA authorities have direct relationship to environmental planning and control decisions. The passage of national land use legislation (as currently proposed) could give EPA a special review role over State

plans and planning functions and could even more specifically require a strong environmental planning effort for the area. Whether or not this legislation is passed does not change the need for EPA, through the existing FWPCA, Clean Air Act, NEPA, and Executive Order authorities, to work with appropriate Federal, State, and local entities in planning for the use of oil shale land on an environmentally acceptable basis.

History of Oil Shale Development

The organic-rich sedimentary rocks known as kerogenetic calcareous marlstone of the Green River Formation of Colorado, Utah, and Wyoming offer the greatest promise for oil shale production in the world. Known as the "rock that burns", to Indians and early settlers, knowledge of oil in shale has a long history,³ but in few countries has this fossil fuel been economically and commercially exploited. Lack of development in the United States has been the result of abundant economical local alternatives, inexpensive foreign imports and tax laws favoring overseas development. Sufficient interest in the recovery of shale oil crude developed in the late 60's so that in 1968, the Department of Interior offered to lease three public oil shale tracts in Colorado. (Oil shale on public lands is a "leasable mineral" subject to the provisions of the Mineral Leasing Act of 1920, as amended. Responsibility for leasing and managing public oil shale is vested in the Secretary of the Interior). Response to this 1968 lease offer was poor and no land was leased.

The present prototype leasing program which has been evolving since 1969 contained a plan to lease six 5120 acre tracts, two each in the states of Colorado, Utah and Wyoming. (Results of the lease sales to date are shown in Table 1 and lease locations are shown in Figure 2.) If fully developed, this and limited private operations as presently proposed might produce a 400,000 barrel/day industry by 1981. Further requests for additional leases, if granted, might establish a one million barrel/day operation by 1985.⁴ This could be a small beginning on the mining of an estimated 600 billion barrels of shale oil in high grade and theoretically "recoverable" deposits. (Figure 3)

3. We are told that one earlier settler discovered "oil shale" the hard way. It seems that when lighting the housewarming fire in his new fireplace, the stone fireplace ignited and burned the new house down. The stones were "oil shale".

4. Predictions of total capacity at selected points in time are tenuous at best due to the indestructible link between the price of oil and the plans of industry. As of October, 1974, preliminary plans show the following production capacities for shale oil: Colony Development Corporation (private land): 50,000 bpd by 1978; Gulf-Standard (Prototype tract C-a): 100,000 bpd by 1982; ARCO, The Oil Shale Corporation, Ashland and Shell (Prototype tract C-b): 50,000 bpd by 1980; Phillips, Sun, White River Shale Oil Corp, Sohio (Prototype tracts U-a and U-b): 100,000 bpd by 1980; Occidental-Garrett: 75,000 bpd by 1980; Union Oil: 50,000 bpd by 1980. This totals only 425,000 bpd by 1982.

TABLE 1

Result of Oil Shale Lease Sales as of October 1, 1974

<u>Tract</u>	<u>Date of Sale</u>	<u>Winning Bid</u>	<u>Company</u>
Colorado C-a	January 8, 1974	\$210,305,600	Standard of Indian Gulf Oil Corporation
Colorado C-b	February 12, 1974	\$117,778,000	Atlantic Richfield Ashland Oil Company Shell Oil Company The Oil Shale Corp.
Utah U-a	March 17, 1974	\$ 75,596,800	Sun Oil Company Phillips Petroleum
Utah U-b	April 9, 1974	\$ 45,107,200	White River Shale Oil (a consortium of Standard Oil of Ohio Sun Oil Company Phillips Petroleum)
Wyoming W-a	May 13, 1974	No Bids Received	
Wyoming W-b	June 11, 1974	No Bids Received	

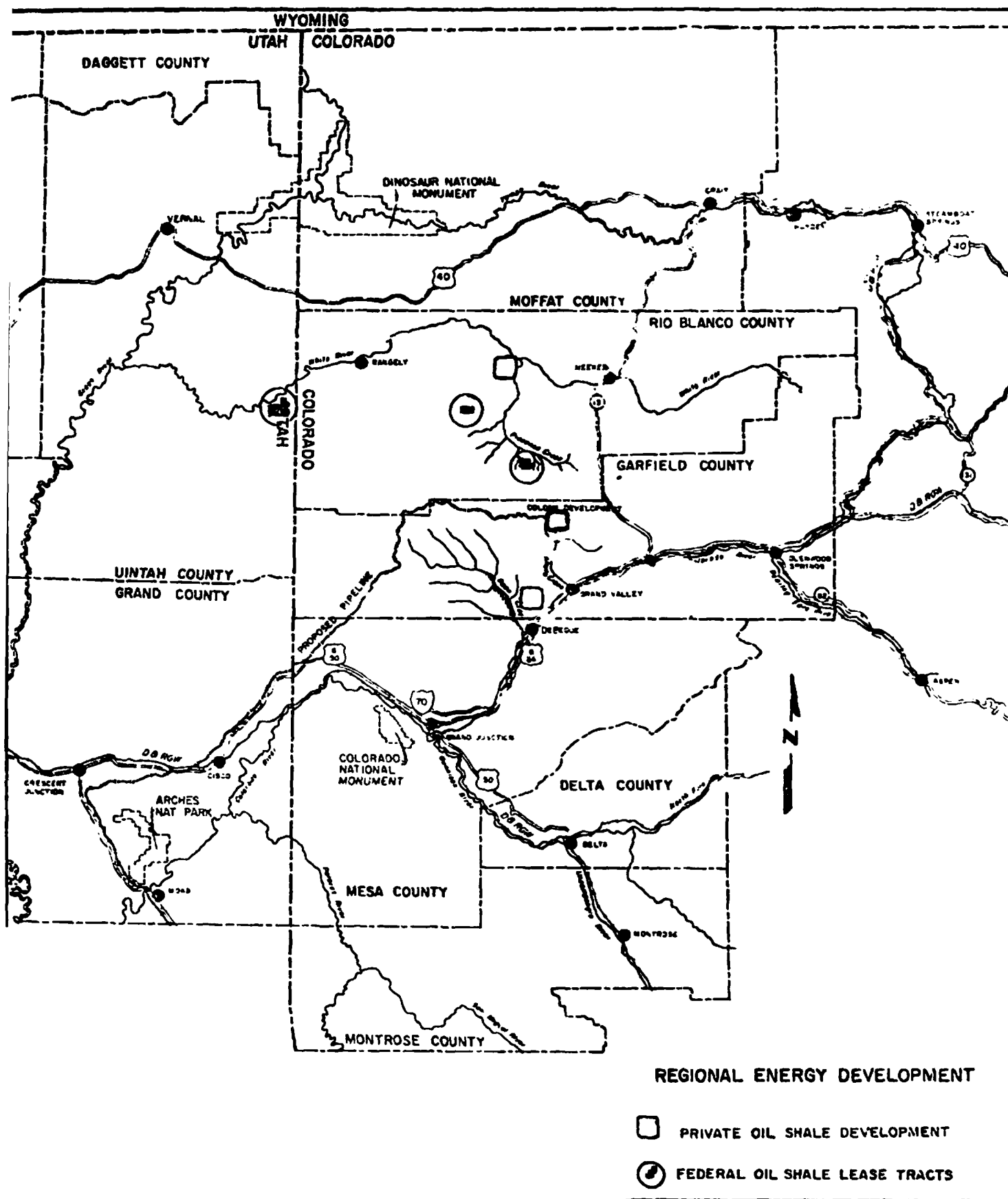
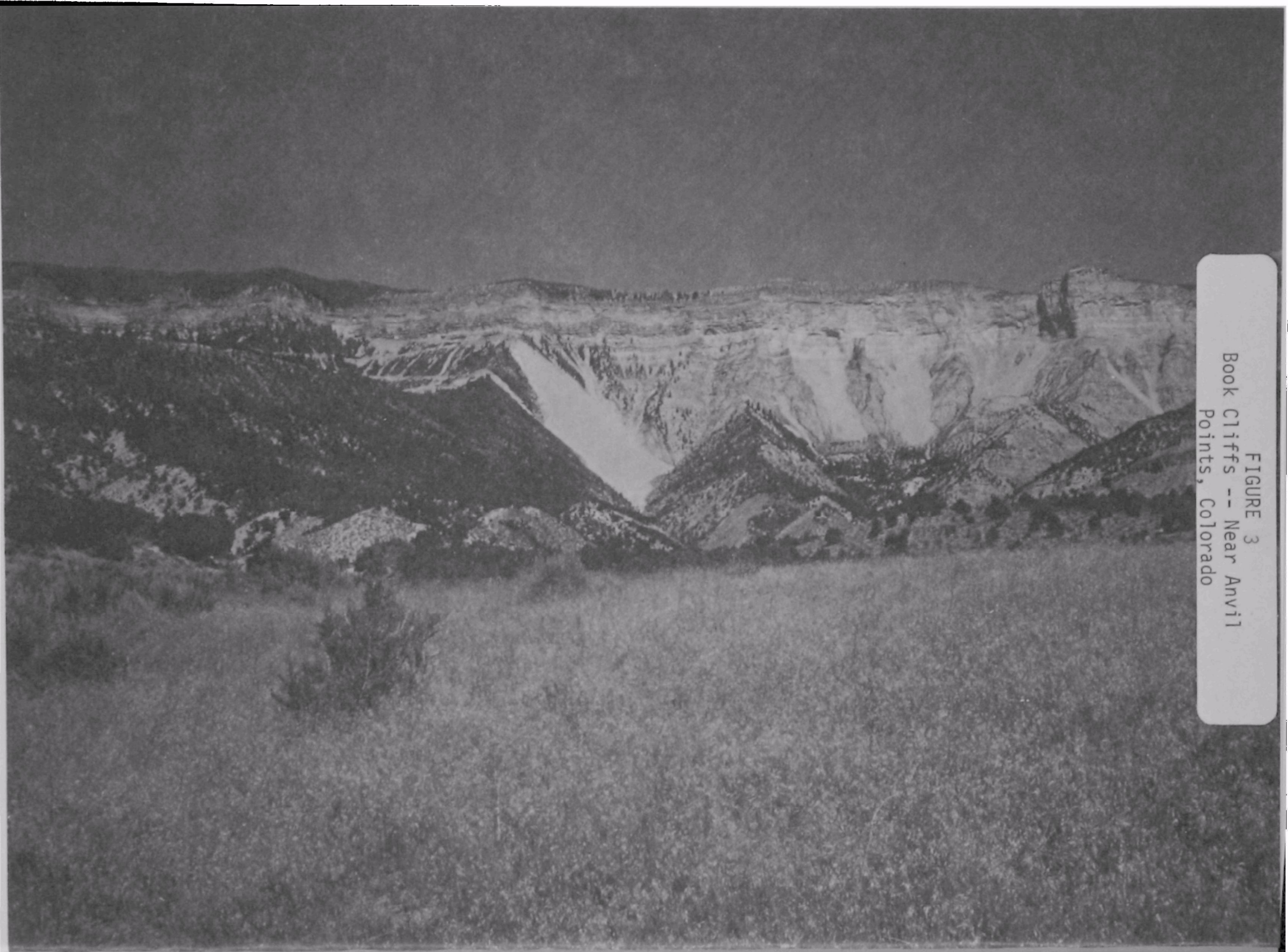


FIGURE 2
GENERAL GEOGRAPHIC LOCATION OF THE SIX OIL
SHALE TRACTS IN COLORADO, UTAH, AND WYOMING

FIGURE 3
Book Cliffs -- Near Anvil
Points, Colorado



Physical Description of Oil Shale Resource

The oil shale deposits of Colorado, Utah and Wyoming lie beneath 25,000 square miles (16 million acres) of land. About 17,000 square miles (11 million acres) contain oil shale of potential value for commercial development in the foreseeable future.⁵ Some 80% of the known higher grade oil shale reserves are located in Colorado, 15% in Utah, and 5% in Wyoming. Of the more than 11 million acres of oil shale land potentially suitable for commercial development, about 70% are public lands administered by the Department of the Interior. These public lands contain 80% of the high-grade oil shale. Extensive deposits of sodium minerals such as dawsonite (an aluminum mineral) and nahcolite (a potential sulfur oxide scrubbing agent) are associated with the oil shale deposits.

In previous years, the U. S. Bureau of Mines and various private companies have conducted pilot-scale operations to develop the technology for mining and retorting oil shale. Conventional oil shale processing consists of the following operations: mining, crushing, retorting, refining (including upgrading), and waste disposal. Oil shale may be mined by either surface or underground methods. At least three significantly different oil shale surface retorting processes have been developed. Shale oil will be partially refined or "upgraded" on site and transported via pipeline to another area for final refining or use. Sulfur oxides, saline water and spent shale (because of its bulk, salinity and color) present the major known waste control problems from the primary effort.

In addition to conventional technology, in-situ techniques have been tested to retort the oil shale underground.⁶ The in-situ technique could eliminate many environmental problems associated with mining, surface retorting and waste disposal. However, some in-situ techniques involve substantial underground mining. Of most significance, though, is that in-situ technology is not generally thought to be developed to the extent that prediction of technical or economic success is warranted.

Oil shale development at the one million barrel per day level of operations will require up to 80,000 acres over a 30-year period for mining, processing, waste disposal, utility corridors, urban needs and

5. Final Environmental Statement for the Prototype Oil Shale Leasing Program, U.S. Department of Interior, Volume I, page I-2.

6. The shale is heated underground and little solid material is brought to the surface.

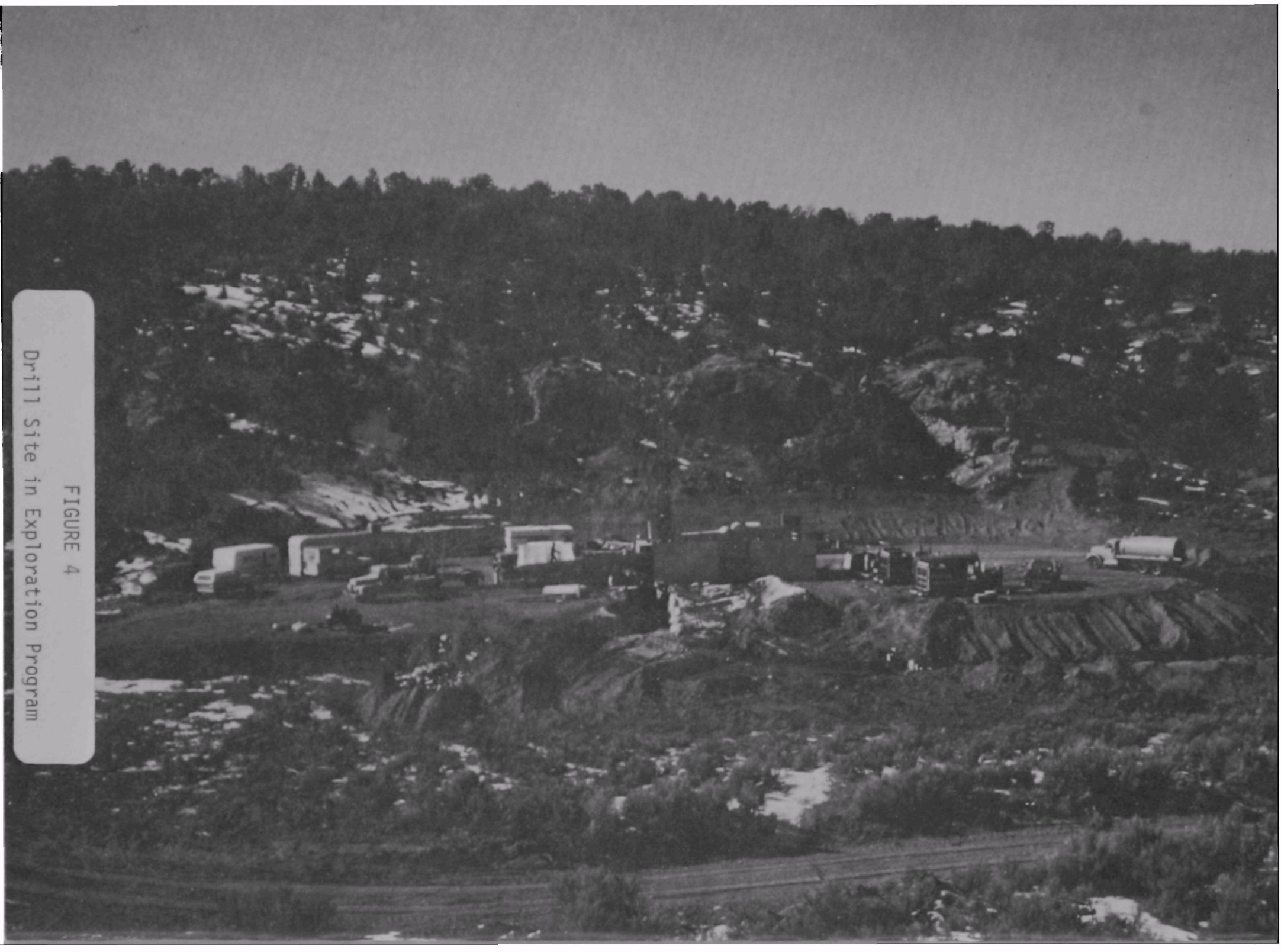


FIGURE 4
Drill Site in Exploration Program

other associated facilities.⁷ About 50,000 acres will be required for production, 10,000 acres for utility corridors, and up to 20,000 acres for urban expansion.⁸

Environmental Constraints

The environmental impacts associated with oil shale development are potentially severe. A large region of the western United States, a region noted for its high quality environment, will be subjected to stresses and changes that must be ascertained and controlled to the greatest possible extent. Yet the impacts will be relatively concentrated by the geographical smallness of the area.

The Prototype Leasing Program is first concerned with the on-site primary impacts involved in the lease areas. The off-site impacts, however, will be ones that a long-term and regionally based environmental program must also address. In reality, the dividing line between on-site and off-site environmental impacts, is something of an artificial division and the line between such "primary" and "secondary" is not clear. As has been noted, the environmental impacts from oil shale exploration, mining, and refining and the associated population increases, and urbanization with attendant increases in recreational pressures are interrelated. Thus a comprehensive regional approach is required.

The following is a partial list of potential environmental impacts of concern to EPA:

(1) Disposal of "spent shale" or the host rock once the kerogen has been removed -- concerned primarily with saline character of material, sediment yield from drainage system thrown into further disequilibrium, and vegetative growth and viability. (Figure 5) Surface and underground disposal.

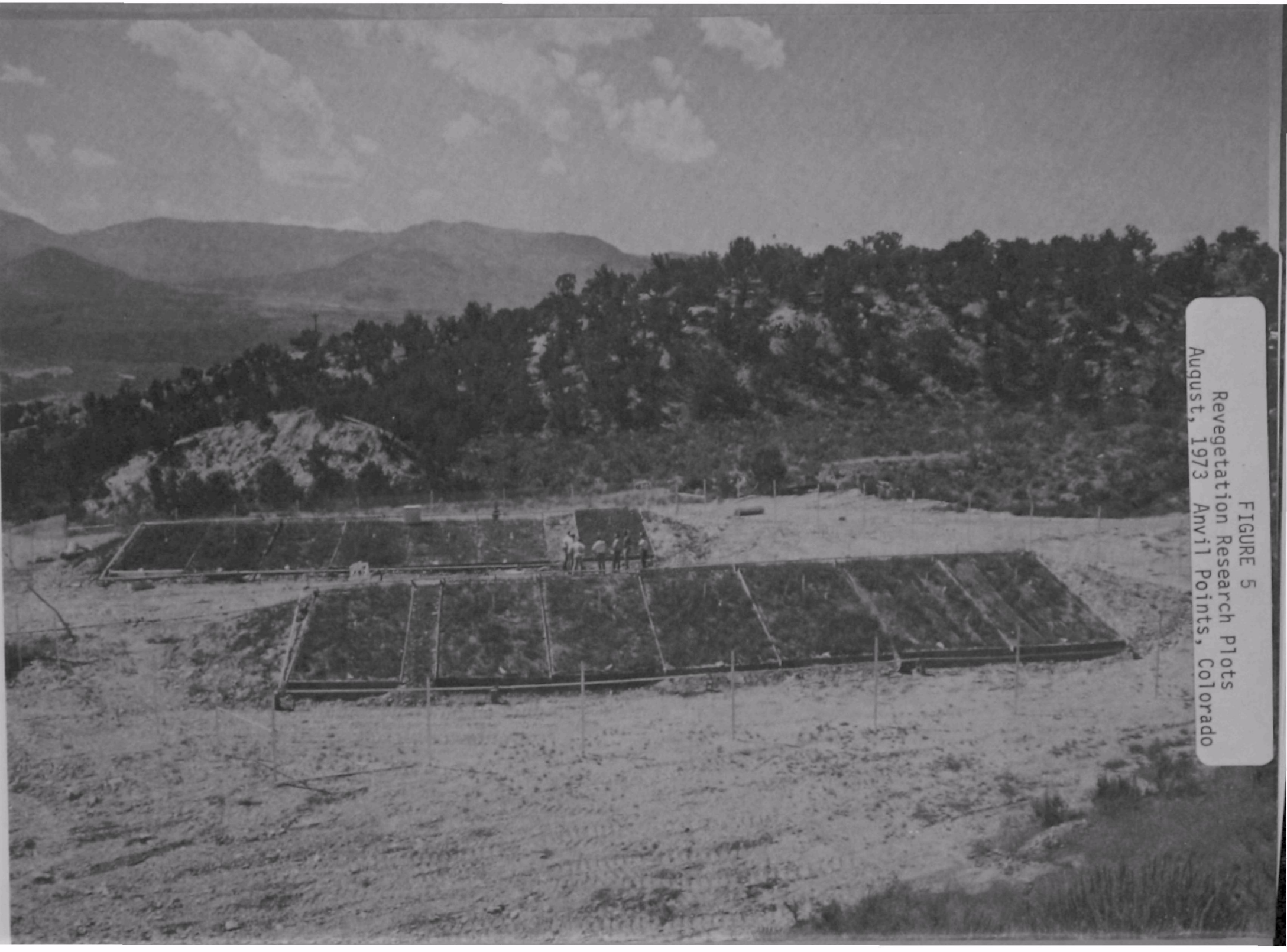
(2) Ability to pre-plan, control, maintain and regulate community services for growing cities. Choices as to ultimate size of urban centers. Lack of funding in early stages of oil shale development.

(3) Water pollution from disposal of saline ground water, non-point pollution from sedimentation caused by land disturbance, leaching of spent shale, and possible process water effluents.

7. Final Environmental Statement for the Prototype Leasing Program, Department of Interior, Volume I, page III-23.

8. Ibid, page III-25.

FIGURE 5
Revegetation Research Plots
August, 1973 Anvil Points, Colorado



(4) Salinity increases caused by consumptive use of surface waters. Consumptive use of area water will affect Colorado River salinity levels because of salt concentrating effect (water needs estimated at 123,000 acre-feet/year for a one million barrel per day industry; 16,500 acre-feet/year for associated domestic needs; and 19,000 acre-feet/year for associated electrical power production.⁹

(5) Possible water and air quality problems from heavy metals, carcinogenic materials, and municipal wastewaters discharges.

(6) Land use changes such as land disturbance from mining and processing activities; wildlife disturbance (critical male deer, raptor, mountain lion); loss of agricultural land.

(7) Air quality degradation from shale processing, refining, and fugitive dust, including (a) particulates from mining, crushing, and general solid materials handling; (b) burning of retort off-gases from shale ungrading or for generating on-site power; and (d) possible air contamination due to surface vehicles and traffic. The major potential pollutants in gaseous emissions from the plant include sulfur dioxide, nitrogen oxides and to a much lesser extent, possible small residual concentrations of light hydrocarbons, potential carcinogens, and carbon monoxide.

(8) Solid waste disposal problems resulting from disposal of spent shale and other shale processing residue. (Figure 6)

(9) Population growth (estimate of 160,000 new people in region by 1985) and attendant urbanization. (Figure 7)

(10) Pressures on sewage treatment plants, local infrastructure, and air pollution problems due to rapid population growth in area towns.

(11) Increase in nonpoint water pollution from erosion (construction, roads, vehicle use, etc.) and possible proliferation of septic tank systems.

(12) Construction of water storage and conveyance facilities in scenic areas -- attraction of secondary growth around reservoirs.

(13) General increase in air pollution from secondary industrial and commercial sources.

FIGURE 6
Spent Shale Disposal -- Anvil
Points, Colorado





FIGURE 7
Typical Urban Water Quality Problem

(14) Conventional electrical generating plant expansion involves impacts on air, water, and land resources.

(15) General pressure and demands for increased use of area recreational lands, both private and public (ski areas, wilderness, hunting and fishing resources).

(16) General increased demand and use of area resources timber, minerals, land, building materials, etc.

(17) Expansion and new construction of roads, airports, railroads, and pipelines and associated impacts.

(18) Surface effects of mining such as subsidence.

(19) Changes in the subsurface flow patterns in the mined areas.

In summary, the land, air, water, biological, and human and community impacts associated with oil shale development will be major concerns of a Region VIII environmental program. These primary and secondary impacts will do much to change the nature and probably the quality of the environment of a large region now noted for its unspoiled nature. Even small-scale development such as that embodied in the Prototype Program will change the present way of life significantly. The complex regional nature of these impacts will require a comprehensive regionally-based program to minimize and avoid where possible environment degradation from these impacts. The rapidly developing nature of the impacts associated with specific site impacts -- the Prototype Federal Leases and local communities facing immediate urbanizing pressures -- requires that a definitive program be undertaken now, while some time remains.

OBJECTIVES OF AN OIL SHALE PROGRAM

Objectives of the Prototype Leasing Program

Under the authority and guidance provided by the Mineral Leasing Act of 1920 and other public land laws, the responsibility for managing and leasing public oil shale lands is vested in the Secretary of the Interior. The prototype Oil Shale Leasing Program has been formulated to make available for private development under controlled conditions a limited number of leases (six) of not more than 5,120 acres each. Specifically the objectives of the program are to:¹⁰

- (1) Provide a new source of energy that will increase the range of energy options available to the Nation by stimulating the development of commercial oil shale technology by private industry;
- (2) Insure the environmental integrity of the affected areas, and concurrently, define, describe, and develop a full range of environmental safeguards and restoration techniques that can be incorporated into the planning for a possible mature oil shale industry in the future;
- (3) Permit an equitable return to all parties in the development of this public resource; and
- (4) Develop management expertise in the leasing and supervision of oil shale development in order to provide the basis for future administrative procedures.

We view it as the opportunity to more thoroughly quantify the effects of oil shale extraction and use on the environment. In our opinion, no significantly larger development of oil shale should take place until the Prototype Program provides sufficient data for public consumption that show the larger development to be acceptable.

In summary, the Prototype Program will serve to stimulate the development of a new source of energy, develop this new source by encouraging the involvement of private industry, and to do so in a manner that should do the least damage to the high quality environment of the oil shale region.

¹⁰⁾ Final Environmental Statement for the Prototype Oil Shale Leasing Program, Dept. of Interior, Volume III, Page I-1.

Further, the Prototype Program is to provide the results and informational back-ground that will be used to formulate comprehensive resource utilization programs and regional land use plans. Additional lease of public oil shale lands will not be considered until the prototype development program and resulting impacts under this prototype program have been fully evaluated.¹¹ (Emphasis added)

It must be emphasized that the primary purpose of the Prototype Program is to gain an understanding of the environmental impacts of oil shale development. If these impacts are found to be unmanageable and to out-weigh benefits then further large-scale development of Federal leases will not be allowed until controls are developed.

It is clear that EPA's role in the Prototype Program, as it will be in any future oil shale development, will be to make certain that all environmental factors, constraints, and trade-offs are adequately analyzed, discussed and evaluated. EPA must utilize all its legislative authorities to make certain that the environment is given adequate protection. At the same time, EPA must evaluate new requirements for legislation.

Local, State, and Federal Entities and Key Decision Points

Oil shale development, both the Prototype Program and larger full-scale development, will impact and in turn be impacted by a number of local, State, and Federal entities. Because they must make important decisions concerning oil shale development, these entities need to be identified. The various entities and the general realm of their responsibilities include:

- (1) Department of Interior - responsible for the Oil Shale Leasing Program and most other resource development decisions on oil shale region public lands, further subdivided into:
 - (a) Bureau of Land Management - responsible for actual oil shale leases, controls most public lands and mineral rights off the Prototype leases and private lands, that would be impacted by roads, pipelines, and some secondary energy development;
 - (b) Bureau of Sport Fisheries and Wildlife - in charge of Federal fish and wildlife programs and key involvement in protection of important fish and wildlife values in oil shale region;
 - (c) Bureau of Outdoor Recreation - involvement in public recreational aspects (wild rivers, hiking, wildlife, etc.) in the high recreation value oil shale region;

¹¹⁾ Ibid, page I-13.

- (d) U. S. Bureau of Mines - important functions in technology development for energy resources - over-all energy use and conservation programs;
 - (e) U. S. Geological Survey - provides the mining supervisor who will possess wide ranging powers (including those over environmental matters) for the Oil Shale Lease Program - also has important resource evaluation and water quality monitoring functions;
 - (f) U. S. Bureau of Reclamation - lead agency in development of water supply needed for oil shale development;
- (2) Department of Agriculture - the U. S. Forest Service will be involved with secondary impacts from timber, mineral, water, and recreational demands on regional National Forest lands. The Soil Conservation Service will probably be involved in watershed projects and erosion prevention from secondary developments;
 - (3) Federal Energy Administration - FEA involvement in the oil shale program will be a comprehensive one aimed at the larger picture of national energy supply and use;
 - (4) Atomic Energy Commission - AEC is involved in energy development, including possible oil shale development, by nuclear means - important energy development alternative programs are in the realm of the AEC;
 - (5) States of Colorado, Utah, and Wyoming - State government - its various organizational entities, administration, judicial, and legislative realms - and its possession of much of the actual police power over private lands is a major focal point involved in oil shale development. Secondary off-site development and associated impacts will be especially pertinent to State government in the oil shale region. Federal environmental programs include important State involvement and therefore, much of the actual local implementation of Federal environmental programs reaches the local level via State programs and implementation;
 - (6) Local government in Colorado, Utah, and Wyoming - Municipal and county governments in the oil shale region will bear the brunt of most off-site or secondary impacts from development and attendant population and economic activity increases. Land use planning master plans, zoning, subdivision regulations, etc. are within the realm of these local entities. The inclusion of environmental programs into planning and decision processes on non-Federal lands must involve and be directed toward these local governments.

Each of the listed agencies and levels of government has important controls and influence over the environment associated with oil shale development. Local and State agencies have primary authority over secondary impacts on private lands, though Federal agencies have important functions in this area, also. The Federal agencies listed above have many authorities and responsibilities for the problems associated with shale development. The major point is - EPA needs to fully recognize the authorities and responsibilities of all concerned levels of government in the oil shale region and be prepared to work with them on a comprehensive program of environmental protection.

The actual organizational structure under which EPA works with and through these Federal, State, and local organizations could be one or a combination of several options. These would include: (1) a structure similar to that of the Northern Great Plains Resource Program;¹² (2) a Northern Great Plains Resource Program type structure with the inclusion of actual planning and control function; (3) creation of some new multi-agency, Federal-State organization based on any number of jurisdictional and institutional constraints; and, (4) the working through, but strengthening of, existing organizations and programs (River Basin Planning, Area-wide Planning under FWPCA-72-AQMA under the Clean Air Act - the Federal Regional Council - River Basin Commissions, etc.) that now exist.

With the large-scale transfer of Federal funding to various activities in the oil shale area, it is necessary to provide the most effective method of utilizing these funds.

Over-all EPA Objectives in an Oil Shale Program

Over-all, the Environmental Protection Agency's main objective in an oil shale development program is to make certain that all environmental values and factors are taken fully into consideration in all planning and decision making related to oil shale development. Concurrently, EPA will follow its mandate in providing for protection of the environment utilizing its legislative authority.

In relation to this, EPA will provide a full analysis of long-term environmental and associated quality-of-life values and impacts and assure that they are included to the fullest degree possible in National and Regional energy development decisions. This effort will provide local, State and Federal entities and the public with a picture of (1) an analysis of all possible environmental impacts from shale development, (2) true costs of energy use and oil shale development, (3) a proper evaluation of possible energy - environmental trade-offs, and (4) the information needed for long range decision making on this vital aspect of energy development. The analysis must contain common denominators with which comparisons may be made to other energy levels in other situations.

¹². Accomplishment Plan, Northern Great Plains Resources Program, 1974, Region VIII, EPA, Denver, Colorado, page 133.

ROLE OF REGION VIII - EPA

Oil shale development is a national issue - the size and importance of the resource make it so. Over-all energy/environmental related strategy will, therefore, require the involvement of many EPA offices. Actual on-the-ground involvement and a broader area of program development and implementation will be the primary function, however, of Region VIII EPA. Not only will program direction come from the Washington level to the Regional office, but the reverse flow of information and program elements from the Region to the National level will be critical to the formulation and implementation of over-all programs. A joint National-Regional effort is envisioned that will draw upon the abilities and programs of each level. Direct involvement in oil shale environmental impact analysis, planning, and control will be carried out by the Regional office.

The broad areas of EPA interest in oil shale development were listed in Part C, OBJECTIVES OF AN OIL SHALE PROGRAM. This section will more specifically spell out Region VIII-EPA involvement in an oil shale program. Major elements of this program involvement include:

- 1. A vigorous application of the relevant legal authorities under which EPA operates. By being the "watch dog" agency EPA can help to insure a full consideration of all environmental factors associated with oil shale development;**
- 2. A closely-coordinated effort with other interested agencies to collect and analyze environmental data required by all decision makers involved in oil shale development activities. This effort will include the collection of baseline data as well as prototype monitoring data, and will include distribution of the data to the appropriate decision makers.**
- 3. A comprehensive regional planning effort consisting of the following elements: (a) institutional arrangements that would simplify the timely participation of individual citizens and local, state and federal governments in providing input to the oil shale development process; (b) a close working relationship among all interested groups, including local, state, and federal agencies, to ensure the proper consideration of environmental values related to development decisions; (c) a definition of all authorities and key decision points related to oil shale development which must be coordinated among the appropriate planning groups and regulating agencies; (d) a flexible EPA program structure which will facilitate timely and influential inter-action with other agencies having key decision points or with other groups requiring information and/or assistance; and (e) the fuller use of EPA planning functions and EPA support of other Federal, State, and local planning organizations on environmental concerns.**

4. Participation in inter-agency programs to the extent of possibly being the lead agency for environmental considerations related to water, air, or solid waste groups, with further input into other related program areas (socio-economic, wildlife, etc.).
5. Provision of a regional focal point for the integration of all EPA agency-wide program involvement (HQ, NERC's, OR&D, A & W, Enforcement, etc.).
6. Participation in the process of formulating a regional and national strategy on energy development, use, and conservation.

In summary, EPA through its Region VIII offices will set up an oil shale program that will provide the means and the methods to fully evaluate the environmental problems associated with oil shale development. At the same time, Region VIII will undertake full involvement in the ground-level of decision making by involved agencies and groups in order to assure the full consideration of environmental values in activities in the oil shale region. A true cost/benefit analysis and development of alternatives and mitigative measures for the environment will be provided.

The role of Region VIII EPA will be that of assuring the proper analysis of environmental impacts associated with both on-site and off-site oil shale development-related impacts. Region VIII will most importantly insure that this analysis of environmental impacts will be fully considered in all decisions related to oil shale development. The Region will supply the cutting edge of EPA legal authorities and planning functions to the base-level oil shale area resource management and use decisions. Importantly, the Regional office will work with the National EPA office in formulating environmental-energy strategy as it involves oil shale.

The regional office will not perform all the necessary work by itself. The limited staff will provide coordination for other EPA efforts and will provide exput input to programs such as those conducted by the office of Research and Development of EPA.

DETAILED WORK ACCOMPLISHMENT PLANS AND RESOURCES REGIONAL ORGANIZATION, COORDINATION, AND MANAGEMENT

Regional Coordinator

The complex nature of the prototype and private development of oil shale, the close alliance of this development with EPA responsibilities, and the discharging of these responsibilities through EPA's Regional offices document the need for the assignment of a technical oil shale focal point or coordinator within the regional office. The assignment must involve a person with some technical expertise in energy resource development, mining, water resources development, earth and atmospheric sciences, secondary impacts associated with development, and environmental problems peculiar to the West and with demonstrated managerial capabilities. The person should possess or be in a position to acquire the authority to pursue EPA's objectives in monitoring oil shale development.

The oil shale coordinator must be able to devote essentially full time to many oil shale problems. He must have certain inter-divisional authority to coordinate and implement regional inputs concerning oil shale with such implementation limited to that authorized by the Accomplishment Plan for oil shale. He will also serve as a liason between NERC, Division of Field Investigations, and R & D personnel who may or should perform selected activities for Region VIII concerning oil shale development.

The Regional office will have, as outlined in this Accomplishment Plan, certain individuals who will be assigned to work essentially full time on oil shale activities within the Region, from periods ranging from indefinitely at a full-time rate, to part time, for as little as a week. While many of these activities will not be under the direct supervision of the coordinator, it will be necessary for both the individuals and the coordinator to consult frequently on EPA activities related to oil shale. When inter-divisional coordination and support is required, the coordinator will arrange such support within the framework of this Accomplishment Plan.

It is proposed that the coordination function utilize approximately 1.0 work years of effort in each fiscal year. This amount includes secretarial and other direct support functions. (Table 2)

Regional Organizational Options

The coordination effort required for a successful EPA oil shale program is the critical element in any regional organizational structure dealing with oil shale activities. This effort has been detailed in the previous section. In addition to the regional coordination effort it has been estimated that Region VIII should have at least seven work years of effort involved in monitoring all aspects of oil shale development activities during FY 75. The specific detailed tasks with which these people will be involved are presented in tabular form in the following sections.

TABLE 2
REGIONAL COORDINATION

<u>Activity</u>	<u>FY 74</u>	<u>FY 75</u>	<u>FY 76</u>	<u>FY 77</u>
1. Coordination of EPA technical activities concerning Oil Shale Development in Region VIII. Insure that all oil shale staff activities and normal program activities such as basin plans, air quality maintenance areas, etc. are closely coordinated and cooperatively achieving EPA's objectives. This includes and requires inter-divisional direction of activities.		1/2	1/2	1/2
2. Coordination of responses to and solicitation of information from the public and local sectors. This includes assuring public participation in EPA oil shale activities.		1/8	1/8	1/8
3. Review of Accomplishment Plan, objectives, and direction of EPA oil shale activities.		1/8	1/8	1/8
4. Serve as special technical representative to Regional Administrator as Oil Shale Environmental Advisory Panel representative -- assist Regional Administrator in insuring EPA committee assignments on the panel are accomplished.		1/4	1/4	1/4
TOTAL: Work Years	0.0	1.0	1.0	1.0

There are several ways that these people could be organized to accomplish EPA's objectives regarding oil shale development. This section briefly discusses the various organizational options available to the region, and describes the current structure used to coordinate oil shale activities.

The four organizational options discussed in the following sections are:

1. Establishment of another "coordinated" unit on an interdivisional basis similar to the EPA regional Northern Great Plains Resources Program (NGPRP) effort.
 2. Selection of an existing regional organizational entity in the operating division to coordinate oil shale activities with staff.
 3. Establishment of an oil shale coordinator at an upper management level operating out of a regional Energy Office with most staff assignments made through regular operating division channels.
 4. Establishment of a new branch, section or division dealing with oil shale activities.
1. Option one is to establish a "coordination office" within operating divisions consisting of one professional, with adequate clerical support, to coordinate most all EPA activities relative to oil shale. The remaining professional input would come from within the existing regional organization. Persons with expertise required for certain projects would be asked to provide input, as described in Accomplishment Plans such as this one and as deemed necessary by the coordinator. These persons could work full time or part time on oil shale problems, ideally with a mix of some full time to provide a wide base of expertise, continuity and priority in addition to providing liaison with other regional programs. An example of this type organization has existed within the region as the NGPRP.
 2. The second option is to select an existing organizational supervisor to function as a coordinator of oil shale activities. As an interim measure this would allow coordination to begin immediately with a minimum amount of disruption and lost time. It would have the advantage of an absolute minimum of duplication of existing programs, as all staff would come from existing program and no new organizational entities would be formed. However, it would have the potential disadvantage of competition with other supervisory personnel in all divisions for expertise to work on oil shale problems.
 3. A third alternative structure would be to establish a regional oil shale coordinator at an upper management level operating out of an Office of Energy Activities (OEA) responsible for coordinating all

regional energy activities. The OEA would be closely associated with the Administrator's Office in order to provide direct and timely advice on energy/environment matters. For the purpose of this paper, we will assume an OEA staff consisting of about three professionals, both technical and non-technical, plus clerical support. It is assumed that one of the technical staff would be the full time oil shale coordinator. If the Energy Office consisted of only one managerial energy advisor it is strongly recommended that a competent technical assistant be assigned to the advisor to assume day-to-day coordinating responsibilities related to oil shale activities.

Staff support for the oil shale coordinator would be drawn from all regional divisions as required. Additional full time staff personnel (overtarget) would be required in addition to the staff support obtained from existing regional resources. A distinct advantage of having the coordinator located in the Energy Office would be the ease of obtaining inter-divisional staff support through the respective division directors. Other advantages could accrue from the placement of the coordinator near top level management where an overview of oil shale and energy problems might be obtained, in addition to the fact that division heads would be routinely briefed in staff meetings on the progress of oil shale activities as well as the additional support requirements. The coordinator would pass on from top level management the priorities for work assignments to the divisions, thereby eliminating competition from other programs.

4. The fourth oil shale organizational option would be to establish a separate branch or section in an existing, or perhaps new, division to handle all oil shale activities. If a new "Energy Resources" Division were formed the oil shale development problem would reside in a separate section or branch in parallel with other developing energy sources such as coal, nuclear, solar, geothermal, etc. The more likely situation would be for a new branch or section to be formed within an existing division, with the branch or section chief to be the oil shale coordinator. There are both positive and negative aspects to this type of structure.

After much deliberation, we have established an Office for Energy Activities in the Office of the Regional Administrator. This choice most closely resembles option number 3. The ongoing NGPRP coordination effort has been moved to that office and a staff of five professionals has been provided for the present. Two branches exist under the Director -- one for environmental planning and the other for the more environmental sciences and engineering phases of extraction and use of fuels. This office coordinates the energy-related activities of the operating divisions. All new requests for oil shale efforts are directed to that office. The office has the ability to respond directly to certain types of requests and to provide input to other requests for outputs.

In addition, it was decided that direct personal assignments to intergovernmental agencies such as the Council of Governments was needed. Therefore, as a start, one position was assigned to the Office of Energy Activities, and filled with a person in Rifle to assist the Western Area Council of Governments. The OEA serves as the focal point for such assignments.

Specific Task Group Assignments

1. Introduction

The "Task Group Areas" which have been identified as significant areas of concern in developing a comprehensive program for EPA involvement in oil shale development are presented in the following section. While each "Subject Area" or "Task Group Area" is treated separately, certain activities identified under one "Subject Area" may include, or be quite similar to, those listed under one or more other areas. An attempt has been made to eliminate the duplication of resource allocation in these areas, however.

The descriptions of each task group are based upon EPA's concept of the work to be performed. However, these are not hard-and-fast assignments to be performed by EPA alone. Many of these activities will be conducted by groups other than EPA. Since this plan cannot adequately address the activities of groups other than EPA, and can only really address those activities for which the regional office has a perspective, the listings may appear inadequate in places and too comprehensive to the point of duplication in others. The tasks described are those which the regional office will either support for other entities, coordinate, precipitate, or accomplish on its own.

It should be noted that in the following tables the quantity of effort includes both professional and secretarial in terms of work years. Also, it should be noted that the Task Groups and the areas of concern they each cover are based on a "media" concept (air, water, land, etc.) In reality, an on-going investigation, planning, control, and assessment program crosses these Task Group lines. However, division by planning, control, etc. would be crossed by disciplines such as geology, economics, and engineering. By identifying specific Task Groups it is easier to conceptualize the nature of the job to be done in terms of personnel required.

2. Task Group for Subject Area A - Mineral Resources, Regional Geology and Mining Processing.

This group has the responsibility of assisting with the quantification of the oil shale and associated resources (dawsonite, sodalite, nahcolite, halite, natural gas, tar sands, gilsonite, coal, etc.). The effort will analyze maps and other representations showing geology, slope, soil and geological engineering features that are important to the exploration for and siting of oil shale mines, retorts, refineries, dump sites, pipelines,

power plants, transmission lines, urban centers, transportation routes, and secondary industry in the area.

In addition the task of this group will cover the assessment of all available mining and processing technologies including alternative mining methods, retort processes and spent shale disposal techniques with emphasis on the economic, environmental and secondary impacts. Of concern will be efficient and safe mining practices and in-situ mining methods.

This task will include reviews of land and mineral ownership, leasing and mining laws, geologic aspects of land reclamation, trace-element composition of spent shale and product, analysis of mining methods, dumping, and transporting spent shale and products. Input will be supplied to reviews of regulations controlling the exploration and extraction phases of oil shale development. The effort will consider development scenarios for the use of other Task Groups. Expertise for these areas would include geology, mining engineering, and chemical engineering.

Resource estimates for accomplishing the work of this task group are estimated as follows: FY 1975 - 1.50 work years, \$20,000 for contracts; FY 1976 - 2.25 work years, \$45,000 for contracts; FY 1977 - 3.00 work years, \$90,000 for contracts. Secretarial support included in these totals is estimated as .08 work years for FY 1975, .50 work years for FY 1976, and .58 work years for FY 1977. (Table 3)

As an introduction, the contract monies listed above and under subsequent listings are summaries of monies to be held by the regional office for disbursement. They will be used for complete funding of certain efforts performed perhaps by state organizations, other Federal agencies, or private contractors or universities. The monies will be used as "seed" money or supplemental funding when it appears appropriate to precipitate or carefully examine an effort supported or with the potential to be supported by other groups.

3. Task Group for Subject Area B - Water Aspects

Task Group B has been given the responsibility of evaluating for EPA all aspects of surface and ground water quantity and quality. Studies of water quality and pollution control will involve some collection and interpretation of ambient surface and ground water data, assessments of the monitoring network, determination of significant discharges and their effect on water uses, identification and evaluation of problem areas, and formulation of alternative means for solving the problems. Existing data collection networks will be supplemented. All data collection activities will be coordinated among interested parties in order to best utilize the expertise available. As part of the coordinated effort, preliminary and final mining plans will be reviewed for adequacy of water quality monitoring.

Water "requirements" for all the various uses (processes, cooling, conveyance, domestic, reclamation, etc.) will be determined. Possible return waste flows will be identified and characterized along with the corresponding treatment potentials and costs. Discharge permit requirements will be developed. Since the primary water quality problem in the oil shale area is salinity, a major effort will be made to evaluate the effect of development on salinity loads in the affected streams. In particular, spent shale revegetation and leaching problems will be studied

TABLE 3
TASK GROUP A -- MINERAL RESOURCES, REGIONAL GEOLOGY AND MINING PROCESSING

	<u>Activity</u>	Work Years			
		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(1)	Review of Accomplishment Plans and periodic analysis of plan output to insure that important parameters and formats for various assessment routes are evaluated. Consultation for Oil Shale Environmental Advisory Panel.	1/12	1/24	1/16	1/12
(2)	Review probable impact of extraction and use of oil shale resources within the area regarding the following procedures: The problems to be assessed with the various mining methods such as subsidence and dewatering of underground operations; altered watersheds and erosion of surface and open pit mines; and operations which include compaction methods, water consumption, and leaching, for either surface, underground, or off-site disposal of spent shale.	1/2	1/2	1/2	3/4
(3)	Assessment of available technologies to determine optional mining and processing systems which minimize detrimental impacts. Analysis of alternative mining methods, retort processes and spent shale disposal techniques. Coordination with other tasks to provide data on such alternatives.		1/4 (\$20,000)	3/8 (\$45,000)	1/2 (\$90,000)
(4)	Provide analytical assistance for trace element analysis of oil shale, product, retort and refinery flue gases, spent shale, and associated economic minerals (including heavy metals, fluorides, and carcinogenic agents).		1/24	1/16 (Contract - Part of Surface Resources Task Group contract)	1/12

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(5) Secure data on reclamation techniques and analyze for minimal environmental impact. Assess final land use and ascertain if reclamation proposals will meet such requirements. Provide information on soil mechanics, optimal compactation effort, optimal water content, heat build up, chemical stabilizers, surface contouring, top soil storage and placement, leaching potential, construction and maintenance of check dams, and landscape aesthetics. This effort must be in cooperation with the surface resources task group and meet their specifications for land reclamation. Considerable emphasis will be given to the long-term stability question.	1/24	1/4	1/4	1/3
(6) Review and evaluation of legal restraints (leases, permits, rules, regulations, laws, guidelines) existing or desired to control oil shale extraction. Review EPA legislative controls and assess potential for new law. Evaluate state policy, their differences, and their enforcement activity. Coordinate with similar reviews by Socio-Economic and Surface Resources Work groups.	1/24	1/24	1/16	1/12
(7) Evaluate impact of oil shale development on other coordinate industries (aluminum, soda ash, trace elements, construction materials) and with potentially conflicting mineral development (natural gas, coal, water aquifers). Examine these industries to determine cumulative and interdependent environmental impact.			1/8 (Contract - part of surface resources development contract)	1/6

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(8) Interaction between Geologic and Socio-Economic Parameters. Insure that earth sciences data are considered regarding industrial secondary growth, population increase and alternative resource utilization. Provide necessary input of geological evaluations to local and state land use planning agencies.		1/24	1/16	1/12
Insure that geologic sections and unique land features of aesthetic or academic importance are considered and preserved if necessary. Review critical geologic hazards to avoid disturbance of highly erosive soils or landslide areas. Determine degree to which ground water recharge areas will be affected.		1/24	1/16	1/12
(9) Post-Development Evaluation			1/4	1/3
Provide for on-site inspection of oil shale mining, processing and dumping procedures to insure timely, consistent and proper adherence of lease, legal, and environmental restrictions. Possible inspection team to analyze on-site compliance with applicable rules and regulations and provide data on future changes regarding operating procedures. Teams will concentrate on smaller aspects of environmental degradation such as depth of top soil removal, waste dump disposal, accidental fluid spillage, spent shale compaction, and other fine points of compliance.			(Contract - part of Surface Resources Monitoring contract)	

Activity

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(10) Secretarial			1/12	1/2	7/12
TOTAL					
	Work Years	0.66	1.5	2.25	3.0
	Contract Funds		\$20,000	\$45,000	\$90,000

in depth with contract assistance and through close liaison with ongoing NERC (OR & D) contracts such as those conducted by Colorado State University.

Shallow and deep ground water reserves will be assessed for their potential use in oil shale development and also for the expected impact on these waters from oil shale and associated mineral development. This effort will be largely one of funding and coordination with other agencies such as the USGS and state engineers.

Instream water "needs" for the maintenance and enhancement of aquatic ecosystems in streams affected by oil shale development will be examined and defined. A contract effort is most likely required for the development of methodologies capable of analyzing stream flow depletion/augmentation and stream flow impoundments insofar as that may compete with the needs of the aquatic ecosystem. In this regard, new predictive surface water quality modeling techniques will be developed or else existing techniques will be modified where appropriate to obtain a model(s) sensitive to quality changes. Field investigations of streams and existing natural and man made impoundments will add significantly to the predictive capability of the methodologies for analyzing of instream "needs" and the surface water quality methodologies. Support will be given to defining, quantitatively, present water uses and needs for man.

Results from data collection and analysis, contract activities, research projects, and data from other agencies and groups will be utilized in coordinating EPA-State river basin planning efforts. The overall study results and regional environmental planning effort will be integrated into the ongoing regional EPA functions. It will be important to identify and assist with the correction of gaps in the data gathering and analysis system for the entire 3-state oil shale area.

Secondary impacts from water use and consumption, waste flows, and facility construction will be ascertained and data supplied to other work efforts.

The total allocation resources for this task is estimated to be 0.17 work years in FY 1974; 1.67 work years for FY 1975 and \$65,000 for contracts; 2.50 work years for FY 1976 and \$160,000 for contracts; 3.34 work years for FY 1977 and \$250,000 for contracts. Secretarial support included in these totals will be .42 work years for FY 1975, .75 work years for FY 1976, and .8 work years for FY 1977. (Table 4)

4. Task Group Subject Area C - Atmospheric Aspects

This task group will coordinate overall air related activities and provide a liaison with the States, EPA NERC's, the Department of Interior, and other agencies studying atmospheric problems related to oil shale development. Existing data gathering efforts will be evaluated in order to determine data needs not currently being satisfied.

The existing air quality monitoring efforts, undertaken due to requirements of the Interior Department's Prototype Leasing Program, will be augmented where necessary to provide an adequate baseline data network. Since the Lessees' monitoring efforts are on or in close proximity to the lease tracts, this work group will study the terrain,

TABLE 4
TASK GROUP B -- WATER ASPECTS

	<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(1)	Manage water related activities. Insure coordination of water related activities; liaison with other agencies and persons (task groups) involved with water and related problems caused by oil shale development. Review and Revise Oil Shale Accomplishment Plan as required.	1/24	1/12	1/8	1/6
(2)	Inventory surface and ground water quality in areas likely to be impacted by oil shale development. Ambient surface water quality network should be supplemented, ground water well inventory begun, discharges of point sources should be inventoried and sampled, nonpoint sources should be assessed. Coordinate all data collection activities, augment where necessary. Requires funds and water quality monitoring. Regional effort with State and other Federal assistance.	1/12	1/12 (\$13,000)	1/4 (\$35,000)	1/2 (\$50,000)
(3)	Water use in oil shale development must be assessed. Water "requirements" for various processes, cooling, domestic uses, and reclamation practices must be assessed. Possible future effluents and their quality, water pollution treatment potentials and their costs, and secondary water needs must be identified. Estimates of water availability must be assessed. Assistance from NERC's and headquarters (NSPS contracts for effluent guidelines) possible. Requires process engineering and pollution control technology expertise.		1/4 (\$10,000)	1/8 (\$15,000)	1/4 (\$20,000)

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(4) Define the "instream needs" of flow requirements necessary for the maintenance and enhancement of aquatic ecosystems for streams in areas impacted by oil shale development. The initial effort requires the adapting of a methodology most appropriate to the oil shale area streams. Questions to be answered involve evaluating the relative impacts of changes in streamflow caused by impoundments and diversions, and, possibly, discharges, on the aquatic ecosystem which consists primarily of aquatic life such as fish and their food chain, aquatic vegetation including stream bank vegetation, and wildfowl dependent upon the flowing streams. A contract effort required for methodology development. Possible NERC assistance in field verification. Regional coordination required.		1/6 (\$22,000)	1/4 (\$50,000)	1/3 (\$60,000)
(5) Salinity. Evaluate possible salinity increases associated with oil shale development from depletions, effluents, spent shale disposal, etc. Evaluate mitigation efforts. Evaluate physical/economic detriments to water users of increased salinity in the Colorado River Basin. Requires water resources planning expertise and economic evaluations. Regional effort with contract assistance.	1/24	1/3 (\$ 5,000)	1/2 (\$20,000)	7/12 (\$30,000)

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(6) Develop predictive surface water quality modeling techniques. Existing modeling or predictive methodologies must be evaluated and modified if appropriate. New methodologies may have to be devised. The outcome is to be the designation of the best model(s) with subsequent field verification and collection of pertinent input data. The analysis will result in a method manual which describes in detail the models available, the limitations and advantages, the sensitivities of the appropriate models to changes in key parameters and to data deficiencies. Contract effort needed, Water Resource Planning, computer expertise required, Regional coordination. Possible NERC assistance.		1/12 (\$ 5,000)	1/8 (\$25,000)	1/6 (\$50,000)
(7) Assessment of shallow and deep ground water reserves and the impact of mining and related oil shale development on these resources. A comprehensive analysis of the shallow ground water system (including ephemeral streams where shallow ground water flow is perennial), to enable predictions of potential impacts on the quality and quantity of the water should be initiated. Leaching studies of spoils materials and spent shales are appropriate along with microscale investigations of changes in water characteristics with time in the spoil materials of mines and spent shales. Deep ground water should be assessed as to its potential as water source for development. Sufficient bases to allow accurate planning of ground water withdrawals are necessary to avoid undue depletions of the ground water		1/24 (\$ 5,000)	1/16 (\$10,000)	1/12 (\$25,000)

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
reserves. Regional effort largely one of funding and coordination with other agencies such as the USGS and State Water Resources and Geological Surveys.					
(8)	Evaluate the effects of impoundments along perennial streams on water quality and the aquatic ecosystem. Little is known about the actual effects of such impoundments since there are few within the oil shale areas and none have been adequately monitored. Potential impacts on fisheries and water quality have been identified, but not measured or verified in the field. Field investigations of existing natural and man-made impoundments will add significantly to the predictive capabilities. Regional effort with possible NERC assistance. Biological, geological, hydrological expertise required.		1/12 (\$ 5,000)	1/8 (\$ 5,000)	1/6 (\$15,000)
(9)	Coordinate study data, research, results, etc., with EPA-State river basin planning efforts. Integrate study results (point sources, nonpoint sources, growth factors, salinity, etc.) and regional environmental planning effort with on-going EPA functions.		1/8	3/16	1/4
(10)	Secretarial		.42	.75	.8
TOTAL					
	Work Years	.17	1.67	2.5	3.34
	Contract Funds		65,000	160,000	250,000

meteorological conditions, and resource location in ascertaining additional monitoring sites. In addition, the task group will attempt to coordinate data gathering efforts through the utilization of a single format by all parties collecting data.

Considerable meteorological data will be collected by the Lessees' per the requirements of the Prototype Program. A review of all the available data will be performed and recommendation of sites for additional meteorological data will be made. A network to address the needs enumerated will be designed, set up and operated to collect the data.

The problem of deteriorating visibility will be addressed to a limited degree through the existing Prototype Program. Their data gathering efforts related to baseline visibility, prior to development, will be supplemented by monitoring in other parts of the Basin. Mobile samples mounted in a fixed wing aircraft will be collected in order to identify the size distribution and composition of existing aerosol concentrations.

Considerable research on various retort processes and possible control alternatives is now under consideration. A summary of such efforts, will be composited and made available to the States and other interested parties. The task group will keep all concerned parties informed of EPA NERC and Region VIII efforts in this area of control technology.

Atmospheric diffusion modeling will be employed to evaluate the potential impact of various resource development strategies on air quality. This effort will utilize all existing information on potential emissions, control options, and the meteorological data gathered in the area. This effort will evaluate modeling done by other groups; adapt models to the study area whenever necessary; and look at impacts in the vicinity of single point sources and also evaluate the potential regional impact of oil shale development strategies.

The allocation of resources for the atmospheric task group is estimated as follows: FY 1975 -- 1.67 Work Years, \$50,000 Contracts; FY 1976 -- 2.50 Work Years, \$120,000 Contracts; FY 1977 -- 3.3 Work Years, \$225,000 Contracts. Secretarial support included in these totals is estimated to be 0.55 Work Years for FY 1975, 0.75 Work Years for FY 1976, and 0.9 Work Years for FY 1977. (Table 5)

5. Task Group for Subject Area D - Surface Resources

This group has been assigned the task of identifying and quantifying surface resource values of the oil shale area in terms of soils, ground water, surface uses of land, vegetation, and wildlife. Changes in

TABLE 5
TASK GROUP C -- ATMOSPHERIC ASPECTS

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(1) Manage atmospheric related activities; participate in overall air related activities; provide liaison with other agencies and persons studying air and related problems to oil shale program. Serve as lead agency for Atmospheric Aspects on the Oil Shale Advisory Panel. Review and revise Regional Oil Shale Accomplishment Plan as required.	1/5	1/4	1/4	3/8
(2) Acquire background information on air quality in the oil shale areas; assimilate data being collected by the various groups and identify further data needs. Implement a monitoring system, if necessary, to answer these needs. Region and NERC. Review preliminary mining plans for monitoring adequacy.		1/4 (\$15,000)	1/2 (\$30,000)	2/3 (\$50,000)
(3) Coordinate the efforts to gather meteorological data in the oil shale areas; identify additional data requirements and implement meteorological monitoring program where necessary. Perform modeling as necessary to estimate the impact of oil shale development on air quality. Region and NOAA. Assist in calibration of air monitoring equipment.		1/4 (\$30,000)	1/4 (\$50,000)	3/8 (\$50,000)
(4) Acquire information on the potential emissions (criteria pollutants, trace elements, other) for different processes and identify control equipment options. Region and NERC-RTP.		1/6	1/4 (\$20,000)	1/3 (\$75,000)

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(5)	Acquire information to assess the existing visibility in the area prior to the proposed oil shale development. Coordinate with other groups attempting to assess visibility. Region and NERC.		1/12 (\$ 5,000)	1/8 (\$10,000)	1/6 (\$20,000)
(6)	Participate in developing procedures and in the assessment of the impact of alternative strategies on the study area air quality. Region and NERC.		1/12	1/8	1/6
(7)	Analyze potential air pollution problems resulting from secondary population, industrial, and urban growth. Integrate results into EPA regional environmental planning functions.			3/16 (\$ 5,000)	1/4 (\$20,000)
(8)	Examine possible fugitive dust problems associated with mining and secondary activities.		1/24	1/16 (\$ 5,000)	1/12 (\$10,000)
(9)	Secretarial		.55	.75	.9
TOTAL					
Work Years		.2	1.67	2.5	3.3
Contract Funds			\$50,000	\$120,000	\$225,000

characteristics or use of these resources on-site as well as off-site will be evaluated by conventional data collection techniques and supplemented by a comprehensive surface monitoring system utilizing remote sensing techniques and appropriate expertise. This task group will also be involved in an intensified program of restoration of mined areas conducted in a comprehensive fashion. The effort will be extremely concerned with assessment of cumulative impacts from related and unrelated activities in oil shale country.

Secondary impacts of oil shale development constitute many significant environment problems and must be comprehensively analyzed in coordination with the social, economic, and cultural task group (E). Public participation will be encouraged in reviewing secondary development effects to insure that surface resources are viewed from an ecosystem point of view rather than simply an economic point of view.

The group will pursue quantitative descriptions of complete natural ecosystems and attempt economic evaluations of their value and impacts that may be felt by those systems. Obviously, the effort will require coordination with activities sponsored by others.

This task group will also compile, review, and recommend legal alternatives and constraints to be applied to the development of oil shale to insure maximum environmental protection.

Resource estimates for accomplishing the work of this task group are estimated as follows: FY 1975 -- 1.5 Work Years, \$120,000 for contracts; FY 1976 -- 2.50 Work Years, \$192,000 for contracts; 1977 -- 3.20 Work Years, \$217,000 for contracts. Secretarial support included in these totals is estimated as .75 Work Years for FY 1975, 1.20 Work Years for FY 1976, and 1.40 Work Years for FY 1977. (Table 6)

6. Task Group for Subject Area E - Social, Economic, and Cultural Aspects

The relatively complex task of identifying and quantifying much of the people-related aspects of oil shale development confronts this task group. The complexity of predicting and analyzing growth impacts related to both primary and secondary development in the oil shale area cannot be overemphasized. Only a comprehensive coordination effort with the other task groups will prevent an overemphasis of economic analysis at the expense of more difficult to quantify social, scenic, aesthetic, and recreational values.

TABLE 6
TASK GROUP D -- SURFACE RESOURCES

<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(1) Review of accomplishment plans and periodic analysis of entire plan output to insure that important parameters and formats for various assessment routes are evaluated and that appropriate changes in direction are implemented. Participation in Oil Shale Environmental Advisory Panel.	1/24	1/24	1/16	1/12
(2) Compile, review, evaluate, recommend, coordinate, with appropriate local, State and Federal legal constraints (leases, permits, rules, regulations, laws, guidelines, institutions, etc.), existing, or needed to protect, conserve, restore, or plan the use of oil shale area surface resources. Effort shall include identification and evaluation of legal/institutional mechanisms and possibilities for surface resource protection. Requires legal and public policy and institutions expertise.		1/8	3/16	1/4
(3) Analyze environmental impacts from secondary growth and activity from oil shale development. Includes analysis of use impacts and demand for minerals, timber, roads, recreational areas, wildlife, replacement farm land, urbanization, etc., resulting from shale development and accompanying activity. Coordinate with Social/Economics Group efforts on social/economic aspects of secondary growth factors and changes and resultant environmental impacts. Requires regional planning expertise with knowledge of regional ecosystems approach.	1/24	1/2 (contract - \$25,000)	3/4 (\$75,000)	1 (\$100,000)

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(4)	Coordinate, review, and implement a regional environmental/resource planning program in conjunction with appropriate local, State and Federal entities. Coordinate with other Work Groups as needed to accomplish regional analysis and planning effort. Apply and research needed analytical and planning methodology.		1/4	3/8	1/2
(5)	Coordinate local, State, and Federal planning and management efforts with EPA planning, review, and control functions. Draw together oil shale study results and other appropriate data for use in EPA environmental programs. Expand EPA land use/environmental planning program to encompass oil shale study results (air pollution, water pollution, salinity, sedimentation, growth, etc.).		1/4	3/8	1/2
(6)	Design and implement a surface resources monitoring system (includes biotic trend, erosion, increased and changed use trends, etc.) for secondary off-site and primary on-site impacts. Coordinate monitoring results with appropriate Work Group and EPA Regional personnel and with on-site monitoring program. (remote sensing, etc., techniques).		1/8 (NERC-Las Vegas- \$17,000 aerial support)	3/16 (\$12,000)	1/4 (\$12,000)
(7)	Support selected aspects of and monitor an intensified program to improve spent shale disposal methods. Such considerations would include mine placement disposal, in-site retorting, and alternative designs of land disposal methods.		1/16 (\$23,000 contract)	3/32 (\$25,000)	1/8 (\$25,000)

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(8)	Develop research needs to better understand the characteristics of spent shale and disposal as related to water quality. Specific attention will be given to chemical aspects (carbon content, soluble salts, carcinogenic agents) and physical aspects (run off, percolation, etc.). Liaison with ongoing and future research efforts funded by "outside" (extraregional) groups.		1/16 (\$35,000 contract)	3/32 (\$50,000)	1/8 (\$50,000)
(9)	Assist with a detailed analysis of potential mining areas to provide an adequate inventory of soils, ground water, geomorphology, wildlife, and vegetative conditions. Such inventory will be necessary to predict impacts on water quality (salinity) and technology necessary to control nonpoint source pollution. This inventory will include mining areas, access routes, pipeline corridors, etc.		1/8 (\$20,000)	3/16 (\$30,000)	1/4 (\$30,000)
(10)	Secretarial		.75	1.2	1.4
TOTAL					
	Work Years	.08	1.5	2.5	3.2
	Contract Funds		\$120,000	\$192,000	\$217,000

EPA's involvement will be primarily in providing management and technical assistance for the development of methods and procedures to be used in evaluating alternative development strategies and their impacts on local and regional structures. Direct EPA assistance as well as contractual assistance will be aimed at minimizing detrimental social, economic, cultural, and environmental impacts, both present and future. A large part of this effort will concern itself with identifying and developing land-use tools that are integrated with the true impact on people. This will include identifying the extent to which impacts outside the immediate oil shale area must be considered.

This task group will make efforts to determine what environmental and other information is required by the decision-makers and local interest groups and factor these needs back into this work plan as well as the programs of other relevant groups. In addition, this task group will assist in the distribution of output from all the task groups to the local interest groups. The total allocation of resources by Region VIII EPA is estimated as follows: FY 1975 -- .52 Work Years, \$45,000 Contracts; FY 1976 -- .78 Work Years, \$120,000 Contracts; FY 1977 -- 1.04 Work Years, \$175,000 Contracts. Secretarial support included in these totals will be: FY 1975 -- .12 Work Years; FY 1976 -- .19 Work Years; FY 1977 -- .6 Work Years. (Table 7)

7. Task Group for Subject Area F - Regional and National Energy Considerations

One of the primary responsibilities of this task group is the development of energy supply projections based on all energy resources located within the region and a summary of energy supply technologies, including their major environmental impacts. This task group must also insure the appropriate evaluation and presentation of regional considerations and perspectives related to regional energy supply and demand in the face of a strong national move to withdraw significant amounts of energy from the region. The work of this group might well become the most important and influential determinant of impact upon the oil shale area and the whole region.

The specific effort described here will relate to oil shale only. Concurrent efforts will be conducted by the regional office and others to assess other energy fuels and more comprehensive analyses. The effort herein projected will thus be a part of a much larger effort and will benefit from the findings of that effort. Coordination with "Project Independence" and other evaluations and predictions of the National energy situations are critical.

TABLE 7
TASK GROUP E -- SOCIAL, ECONOMIC AND CULTURAL ASPECTS

	<u>Activity</u>	<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY1977</u>
	(1) Review of accomplishment plans and periodic analysis of entire plan output to insure that important parameters and formats for various assessment routes are evaluated. Participation in Oil Shale Environmental Advisory Panel.	1/24	1/24	1/16	1/12
	(2) Management and coordination of efforts for developing an analytical and informational framework to quantify and evaluate alternative development strategies associated with oil shale development and associated secondary growth.		1/16	1/16	1/12
46	(3) Provide technical assistance in developing methods and procedures to measure and analyze alternative development strategies for local communities and for the region toward the objective of minimizing social, economic, cultural and environmental impacts, both present and future. Develop regional planning methodology and structures for addressing impacts.		1/16 (\$45,000)	1/32 (\$115,000)	5/12 (\$175,000)
	(4) Management, coordination and technical assistance in developing contractual requirements concerning social, economic and cultural aspects particularly with regard to changes expected to occur in the local and regional structures as a result of oil shale and associated development.				
	(5) Coordinate planning and management efforts with other EPA program activities and with interagency Federal, State and local planning and development programs.		1/16	1/16	1/12

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(6)	Public Participation		1/24	1/16 (\$ 5,000 contract)	1/12
	Assist with identification and quantification of public attitudes regarding oil shale development. Provide for public forum at all significant changes in land use policy of the area and assist interest groups in gaining technical information they desire. Develop valid public assessment tool (mail questionnaire random survey, newspaper questionnaire) to quantify public attitudes regarding oil shale policy for inclusion as supplemental data for the Oil Shale Environmental Advisory Panel.				
47 (7)	Secretarial		3/24	3/16	7/24
TOTAL					
	Work Year	.04	.50	.78	1.04
	Contract Funds		\$45,000	\$120,000	\$175,000

The task group will also consider the uses of oil derived from shale and the economics of various marketing alternatives. A significant question to be continuously evaluated is whether or not the proposed oil shale development will actually produce a significantly large share of the total national energy supply in view of its environmental and other costs.

The development and analysis of time frames for potential oil shale development will be coordinated with other work groups (particularly Group E) to insure adequate lead time for responsive planning on the local, regional, and national level and to insure implementation of the findings of the prototype program.

Resource allocations are estimated to be 0.10 work years for FY 1975, 0.15 work years for FY 1976, and 0.20 work years for FY 1977. Secretarial support requirements are included in these figures, but are not broken out individually. (Table 8)

TABLE 8
TASK GROUP F -- NATIONAL ENERGY IMPLICATIONS - OIL SHALE

<u>Activity</u>		<u>FY 1974</u>	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>
(1)	Coordination and input into the identification and construction of energy supply projections based on all resources found in the region and summary of energy supply technologies and their impact.	1/24	1/48	1/32	1/24
(2)	Analysis of oil conservation potential and its impact on oil demand.		1/48	1/32	1/24
(3)	Analysis of development potential - time tables for oil shale development.		1/32	3/64	1/16
64 (4)	Analysis of oil from shale uses - its major market potentials both in terms of type and location of final use. Does oil shale represent a way to increase overall oil production as to minimize imports?		1/32	3/64	1/16
TOTAL		<u>.04</u>	<u>.1</u>	<u>.15</u>	<u>.2</u>
Work Years					

SUMMARY

This Accomplishment Plan has been prepared to serve as a guide for the Region VIII offices of the Environmental Protection Agency as an oil shale impact assessment. A program was precipitated by increased activity associated with the mining and processing of oil shale in Colorado. The states of Utah and Wyoming are also becoming rapidly involved in the escalating developmental activity. Our program is designed to obtain and develop information that can assist the prototype oil shale program in determining how or whether to develop the full oil shale resource, based upon the outcome of comparisons of the desired and projected results of "development". Our program also sets objectives for protecting the environment of the area and in exercising full authorities for planning, support, and regulation in this effort.

Since the mining and processing of all of the 600 billion barrels of shale oil from about 17,000 square miles of sparsely-populated oil shale land would significantly alter the environment,¹³ the EPA must assume that those responsibilities delegated to it, especially the responsibilities to prevent pollution, to assist the States, and to involve the public, are incorporated in the decision-making process that is the forerunner of large-scale mining. Four Federal leases of oil shale land have already been awarded under a combined total bonus bid of \$448,787,600 and preliminary exploratory drilling operations are underway. Evaluation of the proposed development cannot wait.

This Oil Shale Assessment Program, as previously described, can provide the framework within which EPA can discharge its responsibilities while providing maximum support to other Federal, State, and local resources. The Program also provides the framework for evaluating oil shale in relation to other reserves of energy fuels located within Region VIII.

This Accomplishment Plan has, therefore, identified resources that should be assigned to numerous and various tasks that are both part of an Oil Shale Resources Program and part of the on-going environmental protection activities which EPA is directed to address by its statutes. EPA resources have been identified through Fiscal Year 1977. We have proposed that the Program start out at a moderate pace that allows us to review on-going efforts and to initiate a very modest amount of work during FY 1975. As efforts in the concurrent Northern Great Plains Resources Program are completed, transferred, or otherwise have need for fewer people by FY 1976, the oil shale effort will be increased.

13. Final Environmental Statement for the Prototype Oil Shale Leasing Program, Department of Interior, Volume I, page I-2.

Regionally-coordinated efforts are estimated to require about thirty-five work years of professional effort and about \$2,000,000 (cumulative total) for contracts, grants, and minor equipment through 1977. An additional \$300,000 is allocated for salary and support for four overtarget positions for the three-year period. Table 9 summarizes these resource allocations in terms of work years, salary/support, and contract funds for FY 74, FY 75, FY 76, and FY 77. The effort will most likely continue into the 1980's but its magnitude cannot be predicted since oil shale activity cannot be predicted with certainty.

The total regional resource allotment for the Program has been estimated to be 8.00 work years for FY 1975 with \$300,000 in contracts, 11.5 work years for FY 1976 with \$637,000 in contracts, and 15.0 work years for FY 1977 with \$957,000 in contracts.

It is important to emphasize that those familiar with similar efforts, including EPA's efforts in the Northern Great Plains Resources Program, are convinced that regional coordination is critical to the successful implementation of EPA's role in the Oil Shale Program. The need for this coordination is for the accurate weighing of the many complex factors inherent in a resource development of this magnitude will determine to a great extent the quality of EPA's role in this important Program.

The Program is designed to have a significant beneficial impact on the Prototype Oil Shale Leasing Program which is currently underway and will likely continue until 1979 or 1980 and the more pressing community development/urbanization problems that are rapidly becoming reality. Although the specific Task Group efforts have been herein designed to extend only through FY 1977, there will be a need to extend the more critical functions into later years. Particularly, in light of a possible move to future full-scale development of the oil shale resource, it is envisioned that certain of the activities herein specified will continue long after this particular Program is phased out. These activities either are or will become integrated with Region VIII's continuing efforts in environmental protection.

TABLE 9
OIL SHALE RESOURCE PROGRAM - EPA REGION VIII ACCOMPLISHMENT PLAN
RESOURCE ALLOCATION SUMMARY

		FY 1974	FY 1975			FY 1976			FY 1977		
Task Group	Subject Area	Work Years	Work Years	Salary, Support	Contract	Work Years	Salary, Support	Contract	Work Years	Salary, Support	Contract
A B C D E F	Regional Coordination		1.00			1.00			1.00		
	Mineral Resources and Regional Geology		1.50		\$ 20,000	2.25		\$ 45,000	3.00		\$ 90,000
	Water Aspects	.17	1.67		\$ 65,000	2.50		\$160,000	3.34		\$250,000
	Atmospheric Aspects	.08	1.67		\$ 50,000	2.50		\$120,000	3.34		\$225,000
	Surface Resources		1.54		\$120,000	2.50		\$192,000	3.20		\$217,000
	Social, Economic and Cultural Aspects		.52		\$ 45,000	.78		\$120,000	1.04		\$175,000
	National Energy Considerations		.10			.15			.20		
Totals (Rounded)		.25	8.00	100	\$300,000	11.50	100	\$637,000	15.00	100	\$957,000

Explanation: Work years includes both professional and secretarial effort. Salary and support for four overtarget positions have not been broken down by task group areas, but are listed as a total for each Fiscal Year.

APPENDICES

APPENDIX I

OUTLINE OF POSSIBLE TECHNICAL INVESTIGATIONS/COORDINATION STRUCTURE FOR OIL SHALE DEVELOPMENT

Introduction

The Central Rocky Mountains, an area which consists of large segments of Colorado, Wyoming, and Utah, has been the focus of increasing attention because the area is a potential source for vast amounts of oil in the form of oil shale. Interest in the development of oil shale and other energy resources stems primarily from the continuing growth of national energy consumption and dwindling national petroleum production. The possibility of large scale development of the oil shale reserves has, at the same time, heightened regional concern for effective land use and resource planning; including such issues as environmental quality, mined area reclamation competition for scarce water resources, development of other mineral resources, and potential effects on the people and economies of the affected States.

The local, State and Federal governments which make land use and resource planning decisions affecting the area face competing economic, social, and environmental alternatives. The Federal government continues to make decisions regarding leasing schedules for oil shale resources on public lands, regulations for air and water quality, and development of water projects. Congress is considering several measures related to surface mining. The States also are concerned with resource development; many have considered or taken legislative action related to surface mining and have prepared State Implementation Plans for air quality under the Clean Air Act. Local governments promulgate zoning and land use plans, and provide for essential public services. Regional Commissions for economic development and water supplies share similar concerns and responsibilities. Local, State, regional, and national interests are not well coordinated at this time.

These factors have led the three States, and several Federal agencies to see a need for a cooperation program to coordinate data acquisition and analysis needed for development decisions. This document sets forth possible objectives, a design outline and an organization for such an Oil Shale Resources Program.

Objectives

The primary objective of an Oil Shale Resources Program (OSRP) would be to provide an analytical and informational framework for policy and planning decisions at all levels of government. The end result is intended to be a decision-making tool for Federal, State and local interests who together must plan and manage the area's land and natural resources.

The principal issue concerns the development, nondevelopment, or rate of development beyond the prototype leasing program, of land resources within the oil shale areas of Colorado, Wyoming, and Utah. The program would provide data and analytical methodology, including the development of appropriate models, to demonstrate the economic, social and environmental consequences of various courses of action. The program would present both quantifiable and nonquantifiable implications of alternative land and resource uses. Reports would not recommend a particular development plan for the region, rather, they would provide adequate information on the balancing of values and net benefits of alternative plans to guide development of a coordinated Federal-State plan.

The second objective would be to encourage the organization of ad hoc institutional entities that will bring together all facets -- local, State and Federal -- concerned with collection and interpretation of information which will affect the future development and quality of the region. It is anticipated that this could lead toward a coordinated planning program for the entire region. The organization would draw from existing State-Federal mechanisms for socio-economic planning in the region, such as State planning groups and appropriate River Basin Commissions. Policy and decision-making authority must be retained by established agencies, organizations, and the State and local entities. The OSRP would contribute in every possible way to encourage this coordination.

A third objective would be the development of a coordinating link between data collection, research, planning and operational resource management activities that exist within many different organizations. Such a link should assure rapid interchange of technology and methodology between individual programs associated with the OSRP.

Scope and Guidance

All analyses will deal with the implications of proposed resource management actions for the three-state area. Although focus will center on the study area, the program would adopt whatever appropriate

perspective for each subject of analysis. For example, analysis of energy requirements would consider the national energy situation and its principal geographic components, as well as other demands for petroleum from oil shale.

Thus, an alternative to delayed full-scale development of oil shale or other minerals would be considered in relation to impact on the local economy, as well as impact on the esthetic and cultural values of the region, and relation to the National energy situation. Likewise, in considering energy development cases, analyses of air quality, for example, would include implications of petroleum refining in distant urban areas as opposed to refining in the study area, as well as the relative effects of each on local air quality. These two examples are meant to illustrate the wide range of potential concerns within the OSRP.

The program would foster integrated consideration of basic natural resource use and protection, including human interests and economic and social development. It would consider the full range of economic, social, and environmental consequences of alternative plans of land and resource management in the region. The accumulation of knowledge and analysis techniques has implications which extend beyond the study area and into other areas of the country that are confronted with similar problems. The resultant data could become a model for future studies or programs concerned with development of all energy resources in the Western United States.

To the fullest possible extent all concerned entities would have the opportunity to participate in the design and implementation of the program. Vehicles for participation and use of study results would include frequent reports, regular briefings of broad-based advisory personnel, direct participation in work groups when appropriate, and the periodic assembly of policy officers from involved local, State and Federal agencies, concerned individuals, and representatives of special interest groups, to discuss issues, alternatives, and possible joint regional policies.

The program would provide an objective display of data and analysis to allow a user to draw conclusions based on his particular value system.

The Program

The OSRP would consist of a series of investigations and studies dealing with a common theme, rather than a single area of concern. The overall study could be time-phased over a 5-year period and, although

a comprehensive final summary report would be issued, study results will be reported as they are completed. Frequent and timely reporting will provide maximum assistance to decision-makers on issues which often cannot be delayed until a full, final report is issued.

The proposed program has five principal sections: (1) program design, (2) regional profile, (3) constraints and alternate strategies, (4) analyses of consequences, and (5) preparation of a final report

1. Program Design. The first step of the program will be to submit this preliminary outline to other Federal agencies, States, industry, and interested citizens for review. The preliminary outline will then be expanded into a Program Design document which will discuss at length the nature of the data and methodology to be used, and will elaborate on the tasks and structure of the effort.

The draft Program Design will then be reviewed with other Federal agencies, States, regional commissions, and the public. Such review should be expedited, but data collection and the assessment and development of analytical techniques can begin simultaneously. Comments on the draft Design will be further solicited directly from interested parties through the mechanism of Advisory Committees (discussed below under Organization), and the Program Design will be the basis for an expression of views if public hearings are held. Final approval of the Program Design will be the responsibility of the Program Review Board.

The Program Design should be an evolving document rather than a fixed statement or work plan. The Program Management Team will continually modify its concepts, and refine ideas and tasks on the basis of experience gained and suggestions from co-workers and users during the course of the study.

2. Regional Profile. Data will be collected and analyzed on: (a) physical characteristics of the region, (b) resources, such as minerals and fuels, wildlife and fisheries, scenic and recreational areas, timber, agricultural products and water -- including their location, current use, ownership and control, (c) present baseline environmental quality, including data on solid waste generation and disposal, (d) regional infrastructure, (e) population density, distribution, and character, (f) regional social and economic attitudes, and (g) past and present activity. In short, complete ecological, natural resource, social, and economic inventories will be developed, as specified in the Program Design phase. Inventory will begin with a review of the available data, will identify gaps and then recommend collection of data to fill those gaps. As data are gathered, they will be published. Preliminary investigations should examine the need for maps to display land use and ownership, water, minerals, and other resources.

3. Constraints and Alternative Strategies. To provide a basis for judging the feasibility of development and management alternatives, it will be necessary to identify and evaluate legal, institutional, social, economic, environmental, and physical constraints on resource development and management. The analysis of physical constraints will include, for example, the need to commit or divert a resource such as water, for the development of coal. Existing arrangements may limit the extent to which this can be done.

As such constraints are identified, findings will be fed into other program elements to avoid duplication. This will be accomplished by continual monitoring of all tasks by the Program Management Team. These studies should also identify development stimuli. (See following section on Organization.) Because this is the phase of the study in which exercise of judgment is inevitable and the possible loss of objectivity is most likely, it may prove to be most crucial. It is, in effect, an inventory of institutions and attitudes. The relevant institutional constraints are readily identified -- The Clean Air Act, National Environmental Protection Act, mine reclamation laws, regional water compacts, mineral leasing laws, or other related State and Federal laws, land ownership, and the like. Equally important are economic and social constraints on resource management alternatives. A variety of attitudes and views must be surveyed and considered.

The output of the constraints section would be, in effect, an identification of potential issues and an improved definition of alternative goals, such as maximum contribution to the solution of the U.S. energy problem. The analysis may help redefine specific goals consistent with the requirement that the OSRP study not select a single goal or system of values, and thus prejudge results.

To produce more detailed analyses of the implications of resource management and development alternatives, general alternative management and development strategies must be postulated. One strategy should assume no further development beyond the prototype leasing program; that is, to maintain the status quo. Additionally, several strategies should be developed to represent a range of rates and intensities of new development in the region.

Strategies should include not only the physical management and development of the resources of the region, but also concomitant actions that various levels of Government and industry may have to take, such as regulation, leasing or investment. All strategies or options must consider total resource management in the region. Relationships of the proposed development strategies to regional and national demand and supply projections must be analyzed. That can perhaps best be accomplished through econometric and other appropriate models.

4. Analysis of Consequences. The proposed strategies will be analyzed to determine economic, social and environmental implications locally, in the region, and nationally. These implications will be arrayed against a variety of goals and the results presented without value judgment. The multi-objective principals and standards being developed by the Water Resources Council will be reviewed and applied to the extent possible.

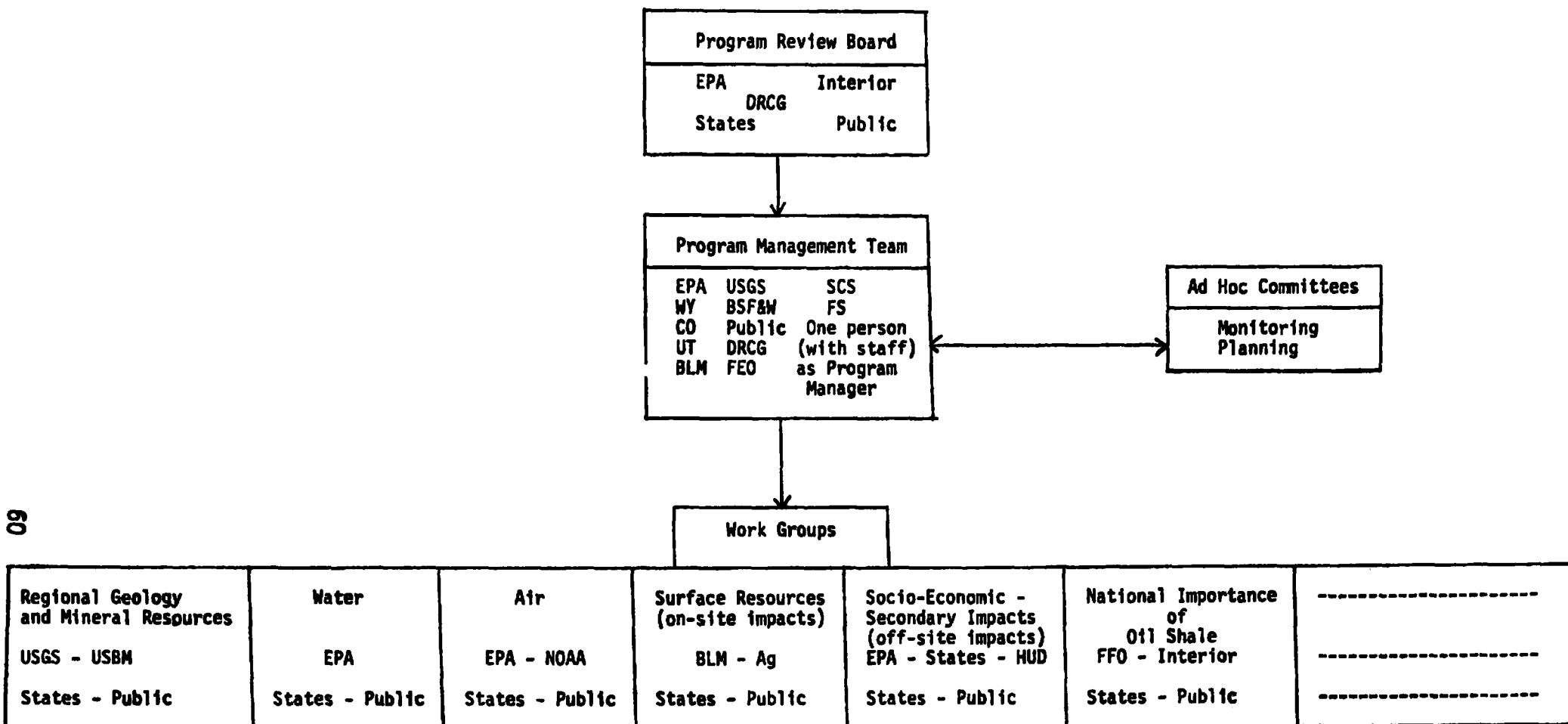
To perform these tasks, an array of analytic methodologies and/or models shall be identified, evaluated, and extended, or developed as needed. These models must address such diverse effects as national economic patterns, regional and State economic status and development activities (econometric models), air quality (emission and meteorological models), land use, and resource use. Modeling and regional profile inventories shall be closely coordinated, should proceed in a parallel manner, and should be carried out by the same people. In addition to detailed models of specific sectors, integration of sector models will be required. This will be a particularly delicate task, but necessary to provide a means of translating alternatives regarding limited areas into a comprehensible whole. The need to establish methods for assuring crosswalks between various models cannot be overemphasized.

This array of models, when fully developed and integrated, will themselves be a major product of the program and should be useful for resource planners in other areas, as well as planners in the study area who may need to further evaluate development proposals.

5. Final Report. Assuming resource and use inventories, analytical methodology, and interim results are published as they are developed, any final report will consolidate results and provide a readable overview of the program. Such a final report could serve as the principal input to an EIS on the future of oil shale, beyond the prototype program.

Organization and Participation

A schematic of the proposed organization is shown in Figure A. Figure 2B is a further breakdown of a similar organization, as it evolved for the NGPRP. Policy guidance and overall direction will be provided by a high-level Program Review Board, which will have ultimate authority over the Program. Day-to-day direction will be in the hands of the Program Management Team. The Program Manager will frequently report to the Program Review Board. Other Federal agencies and State, citizen, and industrial organizations will advise the Program Review Board and the PMT. Advisory Groups, as well as interested private entities may also desire to exchange information with the Program Management Team and participate in the working groups. Such participation would be encouraged to the fullest possible extent.



Schematic of a Proposed Oil Shale Resource Program Organization

TABLE A-1

TASK MATRIX

PROPOSED WORK GROUPS AND PARTICIPANTS

SUBJECT AREAS								
G National Energy Considerations	F Socio-Economic and Cultural Aspects	E Surface Resources	D Atmospheric Aspects	C Water	B Mineral Resources Resources	A Regional Geology	Read numbered blocks for program sections. Read successive blocks of lettered columns for work group title, proposed group makeup and type of subject matter addressed.	
Energy supply and demand Energy technology	Existing local and regional economy Social institutions Attitudes Archaeology & history Aesthetics	Soils Vegetation Timber Grassland Other Fish & Wildlife Recreation Agriculture Scenery Wilderness	PRINCIPAL AREAS OF INTEREST Compositional & regional dynamics		Surface Sub-surface	Coal Oil & Gas Uranium Other		Land form Topography Geology
L-DOI (Energy Office) P-EPA, DOC, FPC, AEC, USDA, BR, BLM, BSFAW C-OST, OEP, Indust.	L-USDA P-USDA, DOC, HEW, BIA, BLM, MPS States, Indust. Private Org. C-BOR, EPA, HUD, DL	L-USDA P-BLM, BOR, BSFAW, EPA, MPS States, Priv. Org. C-BLM, COE	AGENCY PARTICIPATION*		L-BR (Supply) P-EPA (Quality), GS (Basic data), NRBC, BSFAW, BLM, USDA, COE, MPS States, Priv. Org. C-BOR	L-BM P-BLM, EPA, USDA, BR, GS States Industry, Priv. Org. C-AEO		L-GS P-USDA, States C-BLM
SUBJECT MATTER CONSIDERED								
61	Location Distribution Importance	Location Production Current Use Ownership & control Zoning	Climate Quality	Quantity Quality Current & projected use (current plans)	Location & depth Grade Ownership & control	Scale-Coverage	1 Regional Profile	
Current & Projected energy Technology National & Regional Energy Fuel Situations	Attitudes Physical constraints on change Economic constraints on change	Ownership & control Economic Biological & physical Attitudinal Zoning	Quality Standards	Rights Compacts Quality & Quantity Standards Location Attitudes	Mineability Ownership, leases Reclamation laws Demand Attitudes	Slope Stability	2 Constraints on Changes	
Alternate regional energy resources development strategies and technologies No development	Continue current status Accelerate selective development	Continue current practices Accelerate selective development	Alternative point source locations	Surface development alternatives Ground water management alternatives No development	Extraction & exportation Local Processing Local energy conversion Local industrialization No development		3 Strategies for Change	
Satisfaction of National and Regional Energy and Fuel Demand	Preservation of current life style & values Growth of population & economy with possible disruptions & losses	Interference from other developments Preservation/Conservation Consumption	Regional quality pollutant dispersion patterns	Consumption vs conservation Quality	Consumption vs Conservation		4 Analysis of Consequences	

* L - Lead; P - Participant; C - Contributor

TABLE A-2

Implementation of the program would be the responsibility of a Program Management Team, consisting of one representative from each of the major participating agencies. The Program work would be carried out by a cross section of full and part time staff under the overall direction of the Program Management Team. The Program Management Team would best consist of field representatives of the involved agencies. Members of the PMT, ad hoc committees, and work groups should be comprised essentially of a full time personnel funded for and committed to oil shale activities and related resource development investigations.

The Program Management Team would assume direct responsibility for preparing the Program Design, interim outputs, and reports. Initial areas of responsibility would be the development of ad hoc committees, of the Regional Profile and of Constraints and Alternative Strategies, and the Analysis of Consequences. These three study areas would be broken up into specific tasks. Task Groups representing particular areas of expertise and drawing from various agencies would be formed to carry out the work of the program. The Groups would be of interagency composition, including expertise from the State and local levels as well as the private sector. Group leaders, selected on the basis of agency expertise in each particular subject, would form a task coordination committee reporting to the PMT. Specific tasks would be assigned to the individual Task Groups by the Program Management Team.

As an example, the group developing the regional profile on air quality might also continue to identify environmental constraints for the Constraints and Alternative Strategies Reports. The same group, or part of it, will also analyze alternatives and develop models. In addition, modeling expertise would be maintained with the Task Groups, providing coordination with the collection of basic data.

Some tasks, particularly those developing regional profile data, may be assigned, fully, or partially, to on-going State or Federal programs. As an example, one or more tasks, or a portion of several tasks, related to surface resources could be carried out by Agriculture's Surface Environment and Mining (SEAM) program, which could coordinate State, local, and Federal involvement through programs now in the planning stage. Leadership in other tasks or sub-tasks could be assigned to individuals or groups which now have key national roles, such as the collection and display of the geologic data base by the U.S. Geological Survey and the offices of various State geologists. As another example, on-going studies with EPA of national supply and demand of energy and clean fuels would likely provide information useful to specific tasks under Constraints and Strategies and under the Analysis of Alternatives.

Maximum reference to and use of on-going programs should prevent duplication of effort and speed completion of key jobs. However, full involvement of public agencies, industry, and individuals knowledgeable about a subject will be necessary.

Reports and Scheduling

A pattern of reports and scheduling must be developed initially by the PMT. The preliminary design phase will make dates and tasks explicit. Consultation between the Program Management Team and the Program Review Board would be frequent and informal. It may be useful to schedule periodic meetings with the Program Review Board for progress reports.

In addition to periodic oral and written progress reports to the Program Review Board, the substance of the program's output would take the form of a series of committee reports and staff papers, some of which would appear in both draft and final form. The series would include the program design, resource and use inventories, analytical model descriptions, studies of institutions, and interim results. A final report, as noted, would provide an overview and consolidation of efforts and results.

Personnel

In many cases, resources could be made available by program redirection and personnel detail with little sacrifice in on-going programs.

The Program Management Team and adequate staff must devote full time to the OSRP.

It may be necessary to contract some of the modeling effort. Certain resource inventory work and impact studies may also require explicit funding. Expenditures for preparation and publication of maps and reports could be considerable. Details of requirements and potential sources of funds will be estimated as part of the preliminary design effort.

APPENDIX II

EPA AUTHORITIES RELATED TO OIL SHALE DEVELOPMENT

This Accomplishment Plan has been prepared to detail the activities that EPA must take in the discharge of its statutory authority. All of the authorities under which EPA operates would probably have some relevance to oil shale development and the secondary impacts associated with it. The following is a list of especially relevant legislation that direct the involvement detailed previously:

(1) FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS - 1972

Section 102(a): "... in cooperation with other Federal agencies, State water pollution control agencies, and the municipalities and industries involved, prepare or develop comprehensive programs for preventing, reducing, or eliminating the pollution of the navigable waters and ground waters and improving the sanitary condition of surface and underground waters."

Excerpts: "... improvements necessary to conserve such waters"
"... authorized to make joint investigations"

Section 103(a): "... shall encourage cooperative activities by states for the prevention, reduction, and elimination of pollution, encourage the enactment of improved and so far as practicable, uniform State laws relating to the prevention, reduction, and elimination of pollution; ..."

Section 104(a): "... shall establish national programs for the prevention, reduction, and elimination of pollution and as part of such programs shall -

(1) "... in cooperation with other Federal, State, and local agencies, conduct and promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution;

(2) "... encourage, cooperate with, and render technical services to pollution control agencies and other appropriate public or private agencies, institutions, and organizations, individuals, including the general public,

(5) "... (in cooperation) establish, equip, and maintain a water quality surveillance system (utilizing all resources available)

(b): (3) "make grants

(4) "contract with public or private agencies,

- (6) "collect and disseminate, in cooperation with Federal departments and agencies, and with other public or private agencies, institutions, and organizations having related responsibilities, basic data on chemical, physical, and biological effects of varying water quality and other information pertaining to pollution and prevention, reduction, and elimination of pollution.
- (7) "develop effective and practical processes, methods, and prototype devices for the prevention, reduction, and elimination of pollution.

* * *

- (d): (2) "Improved methods and procedures to identify and measure the effects of pollutants, including those pollutants created by new technological developments

* * *

- (t): "... (in cooperation) conduct continuing comprehensive studies of the effects and methods of control of thermal discharges

Section 105(d): "... an accelerated effort to develop, refine and achieve practical application of:

- (1) "waste management methods applicable to point and non-point sources of pollutants,
- (3) "Improved methods and procedures to identify and measure the effects of pollutants on the chemical, physical, and biological integrity of water, including those pollutants created by new technological developments.

Section 107(a): "... projects to demonstrate comprehensive approaches to the elimination or control of acid or other mine water pollution

Section 201(e): "... encourage waste treatment management which results in integrating facilities for sewage treatment and recycling with facilities to treat, dispose of, or utilize other industrial and municipal wastes

- (f): "... encourage waste treatment management which combines 'open space' and recreational considerations

Section 208(a): "For the purpose of encouraging and facilitating the development and implementation of areawide waste treatment management plans ..."

- (b): "... a continuing areawide waste treatment management planning process consistent with Section 201 of this Act."
- (2) "Any plan prepared under such process shall include but not be limited to - "
- (A) "the identification of treatment works necessary to meet the anticipated municipal and industrial waste treatment needs of the area over a twenty year period, annually updated ..."
- (B) " the establishment of construction priorities for such treatment works and time schedules..."
- (C) "the establishment of a regulatory progress..."
- (f): (1) "The Administrator shall make grants to any agency designated under subsection (a) of this section for payment of the reasonable costs of developing and operating a continuous areawide waste treatment management planning process"
- Section 301(a): "Except as in compliance with this section and sections 302, 306, 307, 318, 402, and 404 of this Act, the discharge of any pollutant by any person shall be unlawful."
- Section 303(a): (1)(B) "Each State shall identify those waters or parts thereof within its boundaries for which controls on thermal discharges under section 301 are not stringent enough to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife."
- (b): "... estimate ... total maximum daily thermal level
- (c): "Each State shall have a continuing planning process approved under paragraph (2) of this subsection which is consistent with this Act."
- Section 304(a): (1) "... (publish and periodically revise) criteria for water quality accurately reflecting the latest scientific knowledge (A) on the kind and extent of all identifiable effects on health and welfare ... (C) on the effects of pollutants on biological community diversity, productivity, and stability
- (2) "... information (A) on the factors necessary to restore and maintain the chemical, physical, and biological integrity of all navigable waters, ground waters ... (B) on the factors necessary for the protection and propagation of shellfish, fish, and wildlife

(e): "...issue ...(1) guidelines for identifying and evaluating the nature and extent of non-point sources of pollutants, and (2) processes, procedures, and methods to control pollution resulting from ..." non-point sources.

Section 306(b): (1) (A) "... stream electric power plants ... (B) ... Federal standards of performance"

Section 316: (Thermal Discharges)

Section 402: (National Pollutant Discharge Elimination System)
" The Administrator may ... issue a permit for the discharge of any pollutant...upon condition that such discharge will meet either all applicable requirements under sections 301, 302, 306, 307, 308, and 403 of this Act ..."

CLEAN AIR ACT, 1970

Section 101 : "Federal financial assistance and leadership is essential for the development of cooperative Federal, State, regional, and local programs to prevent and control air pollution.

Section 102(a): "The Administrator shall cooperate with and encourage cooperative activities by all Federal departments and agencies having functions relating to the prevention and control of air pollution

Section 103(a): "The Administrator shall establish a national research and development program ... part of such program shall ... conduct and promote the coordination and acceleration of, research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention and control of air pollution ... conduct investigations and research and make surveys concerning any specific problem of air pollution in cooperation with any air pollution control agency with a view to recommending a solution of such problem

(b): "In carrying out the provisions of 103(a) the Administrator is authorized to: ... cooperate with other Federal departments and agencies, with other public and private agencies, institutions, and organizations, and with any industries involved, in the preparation and conduct of such research and other activities ... develop effective and practical ... methods ... for prevention or control of air pollution.

(c): "... conduct research on, and survey the results of other scientific studies on the harmful effects on the health and welfare of persons

(f): "... special emphasis to research on the short and long-term effects of air pollutants on public health and welfare ... may conduct epidemiological studies ... conduct ... studies on the immunologic, biochemical, physiological, and the toxicological effects ... consult with other appropriate Federal agencies to assure that research or studies ... will be coordinated

Section 104(a): "The Administrator shall give special emphasis to research and development into new and improved methods ... for prevention and control of air pollution resulting from the combustion of fuels.

Section 108(a): "... The Administrator shall issue air quality criteria for an air pollutant ... criteria ... shall include information ... on those variable factors (including atmospheric conditions) which ... may alter the effects on public health or welfare of such air pollutant ... types of air pollutant which ... may interact ... to produce an adverse effect on public health or welfare ... any known or anticipated adverse effects on welfare.

Section 111 : (Standards of Performance for New Stationary Sources)

Section 114(a): "For the purpose of (1) developing or assisting in the development of any implementation plan under sections 110 or 111(d) ... The Administrator may require ... records ... reports ... monitoring ... and sample any emissions which the owner or operator ... is required to sample"

NATIONAL ENVIRONMENTAL POLICY ACT

Section 2 : "... to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man

Section 101(a): "The Congress ... declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

Section 101(b): "... it is the continuing responsibility of the Federal Government to use all practical means ... to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may ...

- (2) "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- (3) "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
- (4) "preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
- (5) "achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities

Section 102 "...all agencies of the Federal Government shall

- (A) "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have impact on man's environment;
- (B) "identify and develop methods and procedures ... which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations;
- (D) "study, develop and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources
- (F) "make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;
- (G) "initiate and utilize ecological information in the planning and development of resource-oriented projects;"

EXECUTIVE ORDER 11752

This order requires Federal agencies to meet the standards found in FWPCA-70, The Clear Air Act, and other environmental legislation under which EPA operates.

APPENDIX III
PROPOSED POLICY GUIDELINES
WATER AVAILABILITY AND QUALITY
for the
OIL SHALE ENVIRONMENTAL ADVISORY PANEL

August 2, 1974

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Proposed Guidelines, Water Availability and Quality

KEEP IT JUDICIOUS. The Mining Supervisor should require an accounting from the Lessees in their detailed development plans of their complete planned water budgets for whatever development plans they propose. Such a water budget should indicate all planned Lessee water sources including alternatives, their quantity and quality, and all planned Lessee water uses, the quantity to be apportioned to various onsite and offsite oil-shale-related uses and the anticipated immediate effects and accumulative effects of these uses on downstream and downgradient water quantity and quality. The Mining Supervisor's approval of any detailed development plan should be conditional on concrete evidence of advance Lessee preparations to obtain sufficient water, on a reasonable use plan that guarantees necessary quantity and quality to downstream and down gradient users, and on a consistent balancing of the supply and use sides of this water budget.

The Mining Supervisor should assure that appropriate water conservation measures are undertaken and should encourage the Lessee to promote water reuse and alternate processing technology to reduce water requirements.

Non-Federal entities obtaining leases or other rights to develop Federal energy resources will be expected to obtain the water necessary for the development of such resources under State procedures unless water is available for marketing for municipal and industrial purposes from Federal water projects.

The lease notes that all water rights developed by the Lessee through operations on the leased lands shall immediately become the property of the Lessor. One of the Mining Supervisor's functions should be guardianship of these developed water rights for the Lessor.

KEEP IT CLEAN. Each lessee must comply with appropriate local, state and Federal water pollution control regulations and water quality standards. All discharges into surface waters require a permit from the Environmental Protection Agency (EPA) and/or the state which regulates the quantity and quality of the discharge. A discharge for EPA permit purposes is defined to include almost all point source return flows of water, including cooling water and other industrial effluents, municipal discharges and water pumped from mine pits. The effluent limitations in these permits are to be consistent nationally for industrial categories and reflect the application of the best practicable control technology by 1977, the best available technology economically achievable by 1983 consistent with Public Law 92-500, the Federal Water Pollution Control Act as amended. State regulations govern permit requirement for discharges to ground water.

The development of effluent standards representing the definition of best practicable technology and best available technology is presently underway or completed for certain types of facilities. Effluent guidelines for power plants and secondary wastewater treatment facilities are available. Effluent guidelines are presently being prepared for mining activities. Standards for other types of facilities, such as oil shale retorting, have not been developed and currently are not under development. All new facilities will have to apply the best available pollution control technology, process, operating methods, or other alternatives to minimize pollution, including no discharge if appropriate.

Before a discharge will be allowed and a permit granted the state in which the discharge is to occur must approve of the discharge and certify that all provisions of the Federal Water Pollution Control Act will be met. Eventually, all permits will be issued by the states and separate certification will not be necessary, but the same effluent requirements will be applied. The permits can be issued for up to five years at a time. Reapplication is necessary upon expiration and a reexamination of the adequacy of the effluent limits must be conducted. After January 1, 1975, applications for permit to discharge must be submitted 180 days prior to the time any wastewater is discharged into the rivers. If there is no discharge to surface or ground water, there is no need for a permit. It is the responsibility of the Mining Supervisor to guard against water pollution from non-point or diffuse sources such as leakage from spent shale piles, saline water storage reservoirs, and runoff from roads and other disturbed land areas. Discharges from non-point sources are not subject to state or Federal permits but control is necessary to comply with Federal and state water quality standards and regulations and environmental stipulations of the lease. Examples of the above considerations are;

(1) Disposal system for solid and liquid wastes must be designed and constructed so as to avoid landslides, control wind and water erosion, and establish conditions conducive to vegetative growth in the disposal area.

(2) Spent shale disposal sites must be selected and prepared so as to avoid downward percolation of leached and other pollutants into ground water aquifers. Surface water should be diverted around the disposal sites.

(3) The supervisor should require proper operation of all water diversion structures to insure a minimum impact on the environment.

The Federal Water Pollution Control Act prohibits the discharge of toxic pollutants in toxic amounts. Production or other waters containing injurious or toxic materials must be treated before discharge from the site.

Leach solutions and seepage from waste disposal sites such as salts, oil and other contaminants must be collected and impounded to prevent their reaching surface and ground water sources.

In order to serve the purposes of the Federal Water Pollution Control Act and to protect the public health and welfare, the Act requires that minimum standards of quality be established for all surface waters. Each state has adopted water quality standards for interstate and intrastate waters. Such standards are established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes and agricultural, industrial and other purposes. A continuing planning process has been established in each state which provides a management plan for assuring that water quality standards are met and that the actions are achieved in a timely and consistent manner.

An EPA regulation is presently under review which would establish a salinity control policy and lead to the establishment of salinity standards and an implementation plan for controlling salinity in the Colorado River System. The principal requirement of the proposed regulation is that salinity be maintained at or below present levels in the lower main stem of the Colorado River while the Upper Basin continues to develop its Compact apportioned waters in accordance with the Standards and implementation plan which are to be developed and adopted by the basin states by October 18, 1975.

KEEP IT MONITORED. Adequate surface and ground water measurement systems must be provided to determine withdrawals, usage and return flows to streams and ground water regimes.

To establish baselines of water quality, to monitor quality changes during construction and development, and to assess the water quality during operation, the lessee shall establish and maintain a network of surface water monitoring stations for use in obtaining physical, chemical, and biological data and data concerning seasonal and other variations. The use of remote sensing and automatic monitoring techniques in conjunction with the network is encouraged where such appropriate techniques may effectively serve as a supplement or approved alternate to manual monitoring. The number and locations of monitoring stations, parametric coverage, and sampling frequencies must be adequate to represent the quality of the surface waters and any changes to that quality.

Stations shall be located:

1. In stream segments largely unaffected by man's activities for determining background levels of quality and biological populations;
2. Upstream and downstream from existing or proposed diversions and discharge or nonpoint drainage to determine any future; effects on water quality
3. In major high quality water use areas.

In addition to the requirements contained in the lease, design, the water quality network should include but not be limited to the following considerations:

1. Field measurements such as dissolved oxygen, specific conductance, and pH
2. Parameters specifically indicated in the State's water quality standards
3. Heavy metals, and trace elements and other potentially toxic materials
4. Biological and microbiological parameters
5. General organic and nutrient parameters and specific organic parameters
6. Salinity, solids, pesticides, herbicides radiological parameters

Precipitation measuring stations must be located as necessary to determine the impact of precipitation events on water quality.

Ground water quality monitoring shall be conducted to establish baselines, to monitor quality changes during development and to assess the quality during operation. The location of stations shall be determined by the type and degree of use of ground water and the type and degree of potential pollution sources. Parameter coverage will vary with natural and manmade conditions and with the use of the waters, but should initially include all parameters included in the surface water quality monitoring program.

Emphasis shall be placed upon quality assurance and standardization for all monitoring programs. Water quality monitoring programs should be comprehensive. The initial monitoring program will serve as a screening phase after which continued monitoring of significant parameters will be conducted on an accelerator for reduced basis as required.

KEEP IT PUBLIC. The Mining Supervisor should insure that the Lessee implies with all of the lease provisions which require the submission of reports and other information relating to water quantity and quality. Accurate, continuously updated records of all monitored parameters should be kept by the Lessee and submitted to the Mining Supervisor. All such records will be available for public inspection and copying.

Reports submitted by the Lessee should include supporting data, such as maps, charts, photographs etc., and should utilize, where possible, non-specialized language.

Water use and development impacts shall be considered in determining bond requirements.

In order to assure that State and Federal water quality standards are met, report of the data from the monitoring and analysis program must be regularly submitted to the state water pollution control agency and EPA.

KEEP IT FIRM. The Mining Supervisor should act promptly and firmly to insure strict compliance with the water quality terms of the lease.

In the absence of Federal, State or local requirements, the Mining Supervisor should take whatever steps are necessary to insure that no degradation of existing water quality will occur. In this regard, the Mining Supervisor should consult with appropriate Federal, State and local agencies and other experts to determine standards of compliance.

Background Data

Introduction

The water situation, is complex and varied. The determination of water available in the Upper Colorado River Basin is dependent on physical availability, reservoir sites for regulation, water laws and quality considerations, of the Colorado River system, in perpetuity to the Upper Basin and to the Lower Basin. Two sources are available: (1) ground water and (2) surface water. The withdrawal of ground water, which underlies most of the public lands in the Piceance Creek Basin of Colorado, may be used to satisfy the initial needs for water. However, the water bearing strata may be depleted faster than it can be naturally recharged. Thus, even in Colorado, large-scale industrial development probably would ultimately depend on the continued availability of surface supplies.

Even with stringent controls to avoid or minimize contamination, the long-term effects of industrialization would result in a decline in water quality. Water quality impacts will be focused on the White River, Green River, and the Colorado River. Potential for serious degradation exists but due to the uncertainties inherent in many of the individual impacts, the degree of severity cannot now be fully quantified. The concentrating effect of stream depletion, return flows from municipal and industrial sources storage of excess groundwater from mine dewatering, leachate from spent shale, and runoff from disturbed lands may contribute to water quality problems.

Surface and Groundwater Availability

In addition to the physical availability of water at required points within the Upper Colorado River Basin, its use is highly dependent upon storage facilities and the laws and compacts that govern the Colorado River. Storage facilities are needed for most projects and uses throughout the basin for annual regulation and short-term carryover. The major main stem reservoirs, such as Flaming Gorge, Lake Powell, and the Curecanti system are required for long-term carryover storage to provide delivery to the Lower Basin under terms of the Colorado River Compact of 1922 and to allow continuous use above Lee Ferry. Thus, only a portion of the 14.9 million acre feet average annual natural flow remains available for all uses in the Upper Colorado River Basin.

The Bureau of Reclamation has estimated that 5.8 million acre feet could be consumptively 1/ used under the following primary assumption (1) release of 8.25 million acre feet annually at Lee Ferry of the Colorado River Compact, (2) operation of the storage project system of reservoirs through the most critical low-flow period of record (1931-1964), (3) capacity of the reservoir system remaining after sediment portion of water delivered, (5) evaporation from main stem reservoirs consistent with the other assumptions, and (6) allowance for shortages to irrigation users during subnormal years.

1/ As defined in Article III of the Upper Colorado River Basin Compact.

It must be recognized that the determination of the 5.8 million acre-feet as a possible limit of Upper Basin use is only valid for the particular set of assumptions mentioned above. Other combinations of assumptions, particularly those associated with downstream deliveries; period of years used for water supply and system operation; future condition of reservoirs due to sediment accumulation; the distribution of uses - i.e. irrigation, industrial or export; and the future year to which uses are projected would alter the total water available. Reduction of deliveries at Lee Ferry would increase the level of available water for use in the Upper Basin by far the greatest amount. Other assumptions could either increase or decrease the available supply by a smaller but substantial annual amount.

An engineering consultant's study performed for the Upper Colorado River Commission ^{2/} determined that 6.3 million acre-feet would be available for consumptive use if 7.5 million acre-feet only released at Lee Ferry and no shortages were required of Upper Basin users. The above cited studies illustrate the effect of differing assumptions on the probable water supply available for use in the Upper Colorado River Basin. Thus, estimates of water supply will likely remain within a range rather than a single figure.

The Upper Colorado River Basin Compact of 1948 gave Arizona the right to the consumptive use of 50,000 acre-feet per year, and the remaining water is apportioned to the other Upper Basin States in the following percentages:

Colorado.....	51.75
New Mexico.....	11.25
Utah.....	23.00
Wyoming.....	14.00

Estimated Colorado River water availability, 1974 depletion including main stem evaporation, committed future uses, and water remaining are as follows:

State	Share at 5.8 MAF level	Estimated 1974 depletion	Estimated Future Committed Use	Remaining Water Year 2001
Colorado	2,975,000	2,097,000	850,000	29,000
Utah	1,322,000	811,000	381,000	130,000
Wyoming	805,000	387,000	371,000	47,000

The estimated future committed uses are based upon commitments in authorized federal and non-federal projects. It is unlikely that all of the projects to utilize estimated future committed uses will be constructed as projected.

^{2/} Water Supplies of the Colorado River, Tipton and Kalmbach, Inc.,
Denver, Colorado. July 1965.

Water available from existing and potential facilities is as follows:

State	Thousands of Acre-Feet		
	Amount From Existing Facilities	Amount From Additional Facilities	Total Without Augmentation
Colorado	Green Mt. 45 } Ruedi 33 }	78. 1/	167. 5/
Utah	Flaming Gorge	130. 2/	142. 5/
		West Divide 77. 1/ Yellow Jacket 100. 3/ Yampa River 100. 3/ Jensen Unit 7 Upalco Unit 2 Uintah Unit 3	
Wyoming	Fontenelle	258. 6/	258. 5/
Upper Basin Total		466	289. 4/ 567. 5/

- 1/ Presumes use to be from the Colorado River in the vicinity of Rifle, Colorado.
- 2/ Presumes use near the Green River in Uinta Basin of Utah, but would be marginally located with respect to development in White River Basin.
- 3/ Could be used in Colorado or Utah.
- 4/ Would exceed compact entitlements.
- 5/ Maximum available for oil shale development from presently uncommitted supplies.
- 6/ Part of this water has been identified for coal resource development.

It should be stressed that while the remaining uncommitted supplies both undeveloped and from existing facilities, could be made available for oil shale development, there will be many competing uses for this water. These include domestic, agriculture, power generation, coal gasification and liquefaction, municipal and other industrial, and fishing and other recreational uses, and as a practical matter, significant quantities will probably be utilized by competing uses.

Groundwater might satisfy demands in Colorado for much of the processing needs through 1987 for those mines on Federal lands in the northern part of the Piceance Creek Basin. In fact, some mines might initially pump more water than could be used because of dewatering problems. Limited explorations to date indicate there are no known significant dependable quantities of groundwater in or near the prototype oil shale lease tracts in Utah or Wyoming. The amount that must be pumped is related to local aquifer characteristics and to the method of mining. The quantity that could be used depends on the quality of the groundwater and how much change in quality takes place. The quality of the groundwater will be different and the rate of quality change will be different at different places in the basin. In the event that groundwater quality were not suitable for all uses (which might be true in some areas soon after development and in all areas before a mine is exhausted), then part of the demands must be met by diversions from the White River, Green, Yampa, and Colorado Rivers.

Reference to Related Documents, Regulations and Guidelines

1. Rules, regulations and procedures relating to administration of State Water Law
Colorado
Utah
Wyoming
2. State Water Quality Standards
Colorado
Utah
Wyoming
3. Report by Secretary of Interior "Task Force on Water for Energy," to be appended later.
4. Public Health Service Drinking Water Standards
5. EPA Regulations for National Pollutant Discharge Elimination System (Effluent Permits)
6. EPA Effluent Guidelines
Secondary Treatment
Power Plants
7. EPA Oil Pollution Prevention Regulations
8. EPA Colorado River System Salinity Control Policy and Standards Procedures
9. EPA Guidelines Establishing Test Procedures for Analysis of Pollutants
10. U.S.G.S. T.W.R.I. Series Publications
(Techniques of Water-Resources Investigations)
Book 1 - Surface Water Techniques
Book 2 - Collection of Environmental Data
Book 3 - Applications of Hydraulics
Book 4 - Hydrologic Analysis and Interpretation
Book 5 - Laboratory Analysis
Book 6 - Modeling Techniques
Book 7 - Automated Data Processing and Computations
Book 8 - Instrumentation
Book 9 - Water Data Reports (Preliminary)
Plus Professional Papers, Water Supply Papers and Open File reports.
11. Previous panel memoranda recommending monitoring techniques and analytical measurements (e.g., see 4/23/74, 5/17/74, 5/27/74, et al memoranda and attachments of George L. Snyder)
12. Previous panel memorandum dated 5/16/74 "Water Available for Oil Shale Development in the Upper Colorado River Basin and Related Water Quality Aspects" - Paul T. Sant

APPENDIX IV
AIR GUIDELINES

Submitted to the
Oil Shale Environmental Advisory Panel

Ad hoc Air Workgroup
John A. Green, Chairman
July 17, 1974

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National

Colorado

Utah

Wyoming

Air Emission Standards

National

Colorado

Utah

Wyoming

Other

EPA Promulgated Indirect Source Review Regulation

Introduction

Each lessee will be required to adhere to the pertinent local, State, and Federal air regulations. The National Ambient Air Quality Standards (NAAQS) apply to each of the oil shale States unless the State has a more stringent standard, in which case the State standard would apply. Under Section 110 of the Clean Air Act of 1970, the States were required to develop implementation plans to achieve the NAAQS. The emission limitations included in the plan must be met, and the proposed facility must undergo a new source review to determine if a permit to construct should be issued by the State. The new source review, which applies to stationary sources and also certain highways, airports and parking lots, involves an evaluation to determine whether emissions from the facility or the mobile source activity associated with the facility and the resultant air quality are compatible with the pertinent State and Federal standards.

Air quality maintenance areas are being identified where special plans will be developed to insure that the NAAQS are maintained. If a State adopts a maintenance plan for an area which includes the oil shale deposits, then the lessee will have to adhere to the provisions of that plan also.

EPA has promulgated standards of performance (emission standards) for certain source categories. If a new source falls into one of presently 12 categories, including storage vessels for petroleum liquids, some refinery facilities and electric power generating plants, then the applicant must meet the emission limitations spelled out in the regulation.

EPA proposed non-significant deterioration regulations in July 1973, but to date no regulations have been promulgated. One of the source categories considered of concern under such regulations is oil shale retorting. When any such regulation, State or Federal, is promulgated, the lessee will be required to adhere to that regulation also.

Any recommendations made by the air quality advisory committee and adopted by the Panel and mining supervisor would also be followed by the lessee.

SUMMARY OF LEASE STIPULATIONS RELATED TO AIR QUALITY

1. Baseline Data
 - a. Air Quality monitoring - 2 years at 4 stations
 - (1) Particulate, SO₂, H₂S -- mandatory
 - (2) HC, NO_x, others -- conditional
 - b. Meteorological data collection - 2 years at 1 station
 - (1) Wind speed and direction
 - (2) Temperature at 30 feet and 100 feet above plant
 - (3) Relative humidity at ground level, 30 feet and 100 feet above plant
 - c. Lessee maintains records of all baseline data collection and monitoring programs
2. Operations Data
 - a. Air Quality
 - (1) Begin 6 months prior to development operations and continue through extent of lease period
 - b. Meteorological

Same period as air quality
3. Observe all local, State, and Federal air quality regulations
(See appendix for specifics)
4. Minimize fugitive dust emissions
5. Lessee must submit annual progress report on development program and this will report on monitoring programs

AIR GUIDELINES

General

The panel should recommend to the Mining Supervisor that:

1. Each lessee should be required to develop an environmental analysis report for his specific site and development plan.
 - a. The report should discuss environmental impacts and include, but not necessarily be limited to
 - (1) Siting considerations
 - (2) Proposed mining method
 - (3) Retorting and/or in situ process
 - (4) Waste disposal plan
 - (5) Land reclamation plan
 - (6) Air and water quality considerations
 - (7) Control equipment
 - b. The impact of primary air pollutant sources (e.g., fugitive dust, retorting, refining, and associated power plants) should be quantified.
 - c. Consideration should be given to quantifying the impact of secondary sources (e.g., automotive, offsite construction, and recreational activities) on air quality.
 - d. Adverse findings disclosed by the environmental analysis should be corrected and the mining plan modified accordingly.
2. He support a program to regionally evaluate the impact of several oil shale operations on the surrounding air quality.

Planning Stage

The Panel should recommend to the M.S. that:

1. The appropriate State agency and EPA have an opportunity to review and comment on any pre-planning by the lessee which pertains to air quality and report back to the Panel. Items of consideration would include
 - a. Evaluation of the location of monitoring sites by EPA and the relevant State agency.
 - b. Air pollution control technology, and
 - c. Air monitoring equipment.
2. The lessee determine permit requirements for a new source to insure that all the necessary environmental data and equipment information are available.
3. The point of estimated maximum concentration be chosen on the basis of an acceptable computer diffusion model employing the meteorological data currently available. If after the two year baseline data gathering period a worse site is identified by the lessee, State agency or EPA via a refinement of meteorological parameters or via more specific process siting data, the monitoring sites should be relocated for the next phase of program.
4. EPA and State meteorologists review meteorological data needs. Surface readings will not provide adequate data for diffusion modeling and upper atmospheric wind and temperature data may be required.
5. The lessee be required to insure that averaging times for air quality monitoring be performed on a schedule compatible with the relevant air quality standards.
6. The lessee be required to monitor for SO₂, particulates, H₂S, NO_x, HC, and oxidants. Available EPA Quality Assurance manuals for air quality monitoring should be followed.
7. The lessee be required to use the best available control technology in controlling emissions. Technical assistance on control equipment issues could be supplied to the Panel by the State air pollution control agency and EPA.
8. Since this is a prototype operation, the lessee be encouraged to utilize new and original ideas to reduce emissions from the facility and related operations.

9. The lessee analyze quarterly composite particulate samples for trace elements during the baseline data collection program.
10. The lessee consider ways of providing mass transit as a means of reducing the secondary impact.

Exploratory Workstage

The Panel should recommend to the M.S. that the lessee be required to continue air quality and meteorological monitoring during this phase of their development, if this stage extends beyond the two year baseline study.

Construction Stage

The Panel should recommend to the M.S. that:

1. The lessee be required to minimize the amount of land disturbance during the period of construction.
2. The lessee be required to pave roads where possible to reduce fugitive dust. Any minor unpaved roads must use fugitive dust controls.

Operations Stage

The Panel should recommend to the M.S. that:

1. An operations manual be submitted by the lessee for all phases of the operation. This manual should include, among other things:
 - a. Proper control be exercised of all dust emissions as a result of materials handling operations. Consideration should be given to covering conveyors, capturing crushing emissions, wetting down storage piles, etc.
 - b. Consideration to be given to routine dust suppression procedures such as wetting down exposed areas where spent shale is disposed. This type of effort must be compatible with other environmental considerations, i.e., not create salinity problems, etc.
 - c. Procedures to be followed by the lessee in the case of an air stagnation situation. Such procedures should be compatible with the relevant state air pollution control agency requirements.
 - d. Maintenance plans and procedures for insuring optimal reliability from the emission control equipment. Frequent inspections should be provided for, and emission monitoring conducted.
 - e. Procedures be established for treating malfunction situations, especially where the ambient air standards might be violated.
2. The lessee develop an air quality monitoring program, complete with calibration procedures, instrument replacement schedules, etc., to insure the quality of the information which is collected.
3. If at any time during the operational stage of the program, air quality standards are violated under normal operating conditions, the lessee must curtail operations to the degree necessary to meet the standards. Normal operations would only be resumed after the lessee had submitted and received approval of an emission control plan.

APPENDIX V

Mr. William Rogers
Chairman
Oil Shale Environmental Advisory Panel
Building 67, Room 638
Denver Federal Center
Denver, Colorado 80225

Dear Mr. Rogers:

As follow-up to earlier staff meetings on water quality monitoring, I have enclosed a list of parameters we feel should be monitored for at each surface water quality monitoring station for the tracts C-a, C-b, U-a, and U-b. The listing also recommends a frequency and, where appropriate, detection limits. Although this list may seem extensive, we have given it careful consideration and feel it represents a minimum program when one considers both cost and coverage.

Please note that the list also contains recommendations for reducing the number of parameters and the frequency of measurement should redundant or unnecessary data be collected. In view of the unknowns related to needed water quality monitoring at this time, I hope your approval of a data collection program would also retain the ability to add parameters and/or stations, and to increase frequency should such increases be warranted.

We regret that our recommendations are only now reaching you. However, such recommendations imply the commitment of significant resources and cannot be made hastily. Concurrently we may be evaluating significant changes in oil shale operations based on these data and we would not wish to find appreciable deficiencies in the data after many years of collection. Proper attention to these details now can help us assure that later delays in the program are not encountered as a result of our own mistakes caused by haste. Should you have any questions regarding this list or how it was developed, please feel free to contact us.

Sincerely,

"Signed"

John A. Green
Regional Administrator

Continuous Measurements

Specific Conductance

Temperature

¹Turbidity

Semi-Monthly

pH	Bicarbonate	Total Alkalinity
² Dissolved Oxygen	Bromide	Ammonia
Suspended Solids	Carbonate	Kjeldahl Nitrogen
Dissolved Solids	Chloride	Ortho Phosphorus
Calcium	Fluoride	Total Phosphorus
Magnesium	Nitrate	
Potassium	Nitrite	COD
Silica	Sulfate	Phenols
Sodium	Sulfide	Oil & Grease

Monthly

³Gross Alpha

⁴Gross Beta

Fecal Coliform

Fecal Streptococcus

Total Coliform

1. Principal stations on perennial streams only - S-M on other streams.
2. In addition to semi-monthly measurements, quarterly detailed surveys lasting 24-48 hrs of dissolved oxygen will be run. These surveys will involve measurements at sufficient frequency to characterize diurnal D.O. fluctuations.
3. If gross alpha activity exceeds 4 picocuries/liter, specific analyses will be made for Uranium, Thorium, and Radium 226.
4. If gross beta activity (exclusive of K₄₀) exceeds 100 picocuries/liter, specific analyses will be made for Uranium, Thorium, Radium 226, Lead 210 and Radium 228.

Monthly (Cont.)

	Minimum Acceptable Detection Limit (mg/l)	Analytical Detection Limit
Aluminum	.1	.01
Arsenic	.01	.01
Barium	.4	.4
Boron	.05	.0002
Cadmium	.005	.001
Chromium	.05	.01
Cobalt	.02	.02
Copper	.05	.005
Cyanide	.0005	.0005
Iron	.05	.004
Lead	.01	.01
Lithium	.5	.02 - 1.0
Mercury	.001	.0002
Manganese	.01	.005
Molybdenum	.005	.001
Nickel	.05	.01
Selenium	.001	.001
Vanadium	.02	.02
Zinc	.05	.005

Quarterly

BOD-5 day

⁵TOC

Color

Dissolved Gas

5. If the TOC concentration exceeds (10) mg/l, the sample will be further analyzed for dissolved organic carbon (DOC) and suspended organic carbon (SOC). Further an acid extraction will be done with analysis for sulfur and a base extraction will be done with analysis for nitrogen.

Quarterly (Cont.)

Odor	Suspended Sediment	⁶ Bed Sediment
	Minimum Acceptable Detection Limit (mg/l)	Analytical Detection Limit
Antimony	.1	.06
Beryllium	.01	.001
Silver	.01	.01
Strontium	.1	
Titanium	.5	.06
Zirconium	.75	.02

Asbestos and similar fibers

Semi-Annual

Pesticides	⁷ Polycyclic Aromatics	ABS	MBAS
Bismuth			
Gallium			
Germanium	To be included in spectrographic semi-quantitative scan of trace elements		
Thorium			
Tin			
Yttrium			

6. Bottom sediment samples will be collected and analyzed for mineralogy, particle size distribution and rate of deposition.

7. If neutral oil fraction of organic extraction warrants.

Additional Considerations

- a. Three consecutive samples below the "minimum acceptable detection limit" would reduce a parameter to the next lowest frequency.
- b. Six consecutive samples below the "minimum acceptable detection limit" would reduce the parameter to semi-annual (or annual depending on a).
- b. No fewer than four measurements would be run for any parameter unless no flow occurs for both years of the baseline data collection period.
- d. If one quarter were to pass with no flow at a station or stations recorded on scheduled sampling days, there shall be increased effort to have personnel available to sample any flow event.
- e. Two quarters shall never pass without a sampling being collected unless the company can conclusively show that no flow occurred in the second three months.
- f. Semi-annual shall mean one late winter-spring measurement and one late summer-fall measurement.
- g. Quarterly sampling shall mean in addition to the semi-annual measurements two additional measurements in different hydrologic and seasonal circumstances.
- h. All data shall be collected in a manner that attempts to characterize flow in terms of precipitation events (location, amount, duration, time, etc.)
- i. Attempts shall be made to correlate TDS as a function of flow. If a correlation is found, intensive surveys of particular precipitation events shall be conducted to determine which parameters cause the correlation.
- j. Microinvertebrate sampling shall also be conducted in such a manner that it is thoroughly coordinated with the water quality monitoring program.
- k. Additional modification of the monitoring schedule, both increases and decreases, can be made if comprehensive USGS, EPA, State, BLM, and citizen review warrants.



"Sec. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation . . ."

National Environmental Policy Act