HEALTH IMPACTS OF ENVIRONMENTAL POLLUTION IN ENERGY-DEVELOPMENT IMPACTED COMMUNITIES

EXECUTIVE SUMMARY

Based on a Report Prepared for the Office of Energy Activities
ENVIRONMENTAL PROTECTION AGENCY
Region VIII
Denver, Colorado 80203

Under Contract No. 68-01-1949
N. L. Hammer, Project Officer

By
COPLEY INTERNATIONAL CORPORATION
7817 Herschel Avenue
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INTRODUCTION

This summary is the condensation of a report prepared by Copley International Corporation under contract with the Environmental Protection Agency, Office of Energy Activities, Denver, Colorado. The work that provided the basis for this report was designed to assist EPA in evaluating the environmentally-related health impacts associated with developing energy resources in Federal Region VIII. This Region consists of the states of Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

The following specific tasks were performed between January 5 and September 5, 1976, in accomplishing this work:

- Means were explored for appraising the current extent of health impacts in affected communities.
- The scope and adequacy of pertinent health information available in state repositories was determined and readily available material was summarized and evaluated.
- The potential health impacts resulting from development of energy resources were identified and evaluated.
- Approaches and economic considerations in providing health services in communities affected by energy developments were defined.
- Formats and protocols were developed for collecting and consolidating data needed for adequate planning to prevent or reduce adverse health effects related to energy developments.

Results of these activities are summarized in subsequent sections of this report.

BACKGROUND

The rapid initiation and expansion of energy-development activities, beginning in the early 1970's, have a profound effect on the environment and and lives of citizens in the Mountain Plains Region. Many of the adverse effects have been reflected in health-related impacts associated with community environmental services. These impacts affect health of residents in the community and the availability of personal health services to the community. The intensity of the effects and inherent ability of communities promptly to cope with potentially detrimental conditions usually has been related inversely to the size of the community affected. Public officials in the Region generally have dealt for the past two decades with problems associated with declining populations. They have not faced problems resulting from expanding populations and rapid industrial growth.

The communities that first experienced impacts from development of energy resources usually had little advance notice of the pending development and scant experience that provided bases for effective response. Guidelines for anticipating potential problems, developing plans, and initiating appropriate action generally were not available. In many communities, long entrenched attitudes and patterns of living were related to nonindustrial activities and to preservation of existing environmental conditions. The prevalent value systems generally were not compatible with the initial manifestations of activities associated with development of energy resources. Newcomers frequently were dissatisfied with community services and became frustrated or resigned to adjustment for a temporary stay. A sense of belonging to the community generally was not sought by them or fostered by the established residents. For these and many other reasons, a wide spectrum of health-related problems soon emerged.

The sequential repetition or concurrence of causes and effects can easily be visualized: population influx, depletion of available housing, acquisition of mobile and temporary housing, inadequate water supply and sewage disposal, deterioration of environmental hygiene, increase in disease, unmet demand for medical services, and so on. Overt contamination of the environment occurred in some areas because of inadequate sewage and solid waste disposal. Substantial increases, as much as ten-fold, in the use of community mental health services have been documented. This most likely reflects the reactions to stressful living conditions. Communities, institutions,

industry, individuals, and other components of society reacted, and the resulting interventions prevented or aborted many potentially untoward conditions. Local resources usually were severely taxed.

At various points in the course of events, the individual states and communities, agencies of the Federal government, industries, and other organizations became involved. They provided the initiative to develop competence for planning community services in the areas adversely affected by development of energy resources. These efforts have made substantial contributions toward formulating solutions for existing problems and in preventing occurrence or worsening of others. As a result, more orderly arrangements have been made for working relationships between industry, state and Federal governments, communities, and other concerned organizations. Some states have enacted legislation regulating the siting of major facilities. Among other effects, this assures more adequate lead time for planning and promotes regulation of other factors to reduce the extent of impact. Assistance programs now are better defined, although much apparently still needs to be done along this line.

Guidelines are being formulated for planning to deal with the special aggregation of problems relating to impacts of energy developments. Such guidelines already are available locally for some functional areas, e.g., housing, law enforcement, health, and education. An indication of the improved competence, and confidence, in some communities is indicated by the optimism with which further local energy developments are viewed. Some communities have weathered the initial impacts and now have planning organizations staffed and operating. Community resources have been augmented or developed to meet current and anticipated needs, and the prevalent community attitude indicates willingness or enthusiasm to accept further growth. In some instances there is local opposition to developing new communities to serve energy developments. This may occur where the development sites are within commuting distance of established communities that have experienced and solved problems associated with similar activities. The apparent concensus is that the established communities should share the perceived advantages of the new industrial enterprise.

The advances in coping with impacts attributable to energy developments do not suggest that all, or even a substantial body, of such problems have been solved. Some communities that first experienced significant impacts are facing worsening conditions because of additional developments in their commuting area. "Front-end" funds for planning and physical developments often are difficult to come by, although some states do have various forms of severance taxes, plans for prepayment of taxes, or other means for providing such funds. Uncertainties about plans of developers, cancellation and rescheduling of projects, judicial delays, jurisdictional disputes, and other circumstances discourage or preclude advance planning in some areas. For a variety of other reasons relating to traditions of local government, some communities cannot undertake

planning far enough in advance of initiating energy developments to make the process effective in reducing or preventing predictable adverse impacts. In a few situations, the prevalent concensus is that the development should not happen and the community should not do anything about it.

THE STUDY AREA

A total of 212 impacted communities, or other local political jurisdictions, were identified during the course of this study. (See Appendix A.) The number constantly is growing as additional developments are activated. Also, some affected communities may not have come to the attention of the project team. The approximate geographic location of the communities identified are indicated in Figure 1. The number of communities by counties is shown in Figure 2.

The population of the majority of communities involved in this study was less than 1,000 persons. More than 80 percent had less than 2,500 residents.

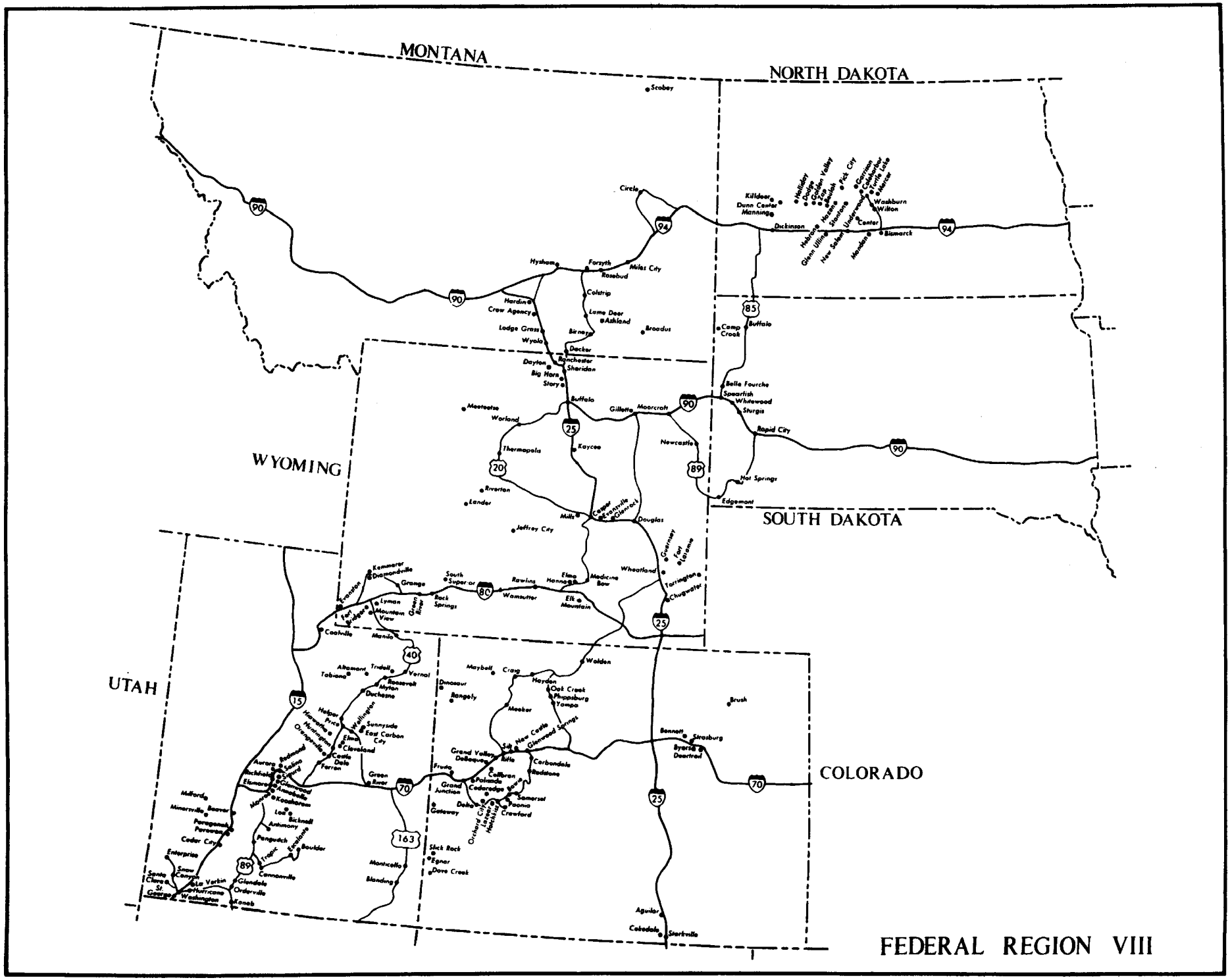

Fig. 1 Location of Communities Affected by Development of Energy Resources

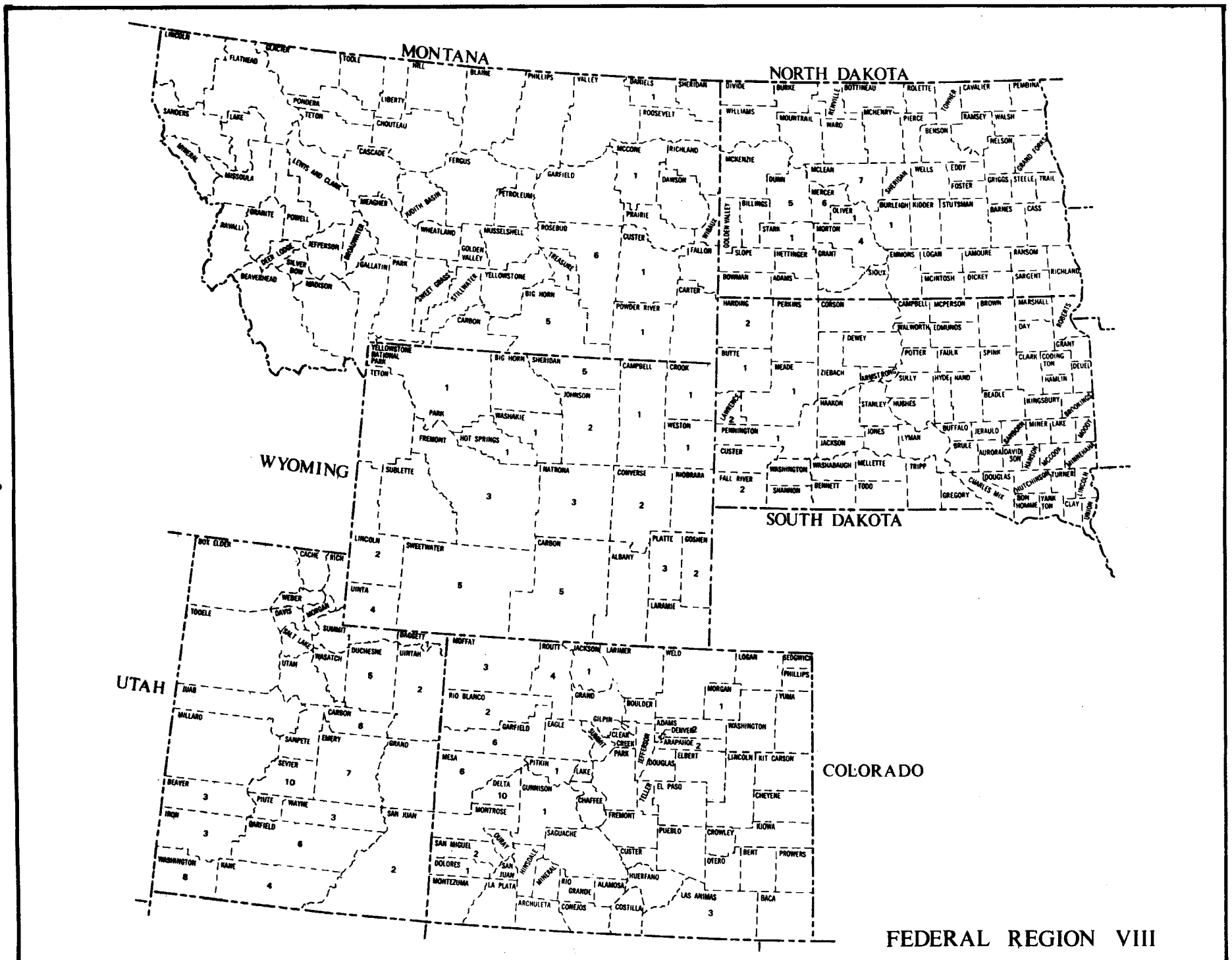

Fig. 2 Number of Energy-Development Impacted Communities by Counties

APPRAISAL OF CURRENT HEALTH IMPACTS

Unfavorable conditions in the impacted communities readily are apparent by subjective observation. However, procedures and data requirement for assessing health impacts associated with development of energy resources are not adequately defined. Objective, quantitative assessment of conditions is essential to establishing priorities for remedial or preventive actions within communities. Such assessment also is required for comparing the extent of need among communities. Consequently, exploratory efforts have been made to determine the usefulness of specific indicators of adverse conditions and to define the needs for additional types of data. In this connection, the Mountain Plains Federal Regional Council conducted surveys to secure available data for calendar years 1974 and 1975 on selected factors related to impacts experienced by communities as a result of energy developments. Data were obtained by questionnaires, completed by local officials, concerning: (1) rates of population increase, (2) availability of housing, (3) adequacy of water supply, (4) accessibility of medical services, and (5) availability of resources for planning.

Indicators of Adverse Health Effects

The data collected by the FRC were analyzed to determine the reliability of the measured variables as indicators of adverse health conditions and to assess requirements for other data. The criteria selected as indicative of adverse conditions are shown in Table 1. These criteria were chosen, in some instances arbitrarily, to enable analyses of the data available and are not necessarily those that should be employed in future studies.

As is apparent, some of the factors considered in this analysis are interrelated and some are dependent upon other factors. However, since one objective of this study was to explore various means for comparing the relative intensity of health effects, all of the factors were taken into account and evaluated as though they were equally significant.

Extent of Impact

The extent of adverse health effects present at any time obviously depends on the nature and magnitude of impacts and the effectiveness of community responses in meeting the impacts. A community with adequate

Table 1. Criteria for determining adverse conditions associated with development of energy resources.

Population

Community of	< 1,000 pop.	with annual rate of increase about 6%
Community of	1,001-2,500 pop.	with annual rate of increase about 8%
Community of	2,501-5,000 pop.	with annual rate of increase about 10%
Community of	> 5,000 pop.	with annual rate of increase about 12%

Housing

Ratio of population to housing : > 3 persons/dwelling unit

Water Treatment System

Capacity used ≥ 75 percent

Sewage Treatment System

Capacity used ≥ 75 percent

Distance to Physician

> 15 miles

Distance to Hospital

> 50 miles

Distance to City of 25,000 Population

> 100 miles

Availability of Planner

None Available

Availability of Plan

None or adopted before 1972

financial resources, an effective planning organization, and no serious constraints to providing personal and community health services could, no doubt, deal effectively with impacts that would create difficult circumstances in communities where less satisfactory conditions prevail. Such factors are difficult to quantitate and were beyond the scope of this analysis. Accordingly, the extent of impact was determined by considering only the adverse conditions indicated in Table 1.

The communities which had more than six adverse conditions were designated as significantly impacted, those with four to six adverse conditions as moderately impacted, and those with three or fewer adverse conditions as potentially impacted. There are obvious objections to using all factors without assigning comparative weights on the basis of presumed relative significance. Such a procedure does not distinguish between relatively independent and highly dependent variables, or between highly significant and comparatively insignificant factors. Efforts were made, accordingly, to define more sensitive indicators of adverse health effects.

The factors for which data were available were analyzed singly and in various combinations. It was found that communities judged to be significantly impacted by use of any of the indicators tested were, in most instances, also classified as significantly impacted by using a combination of indicators. This combination of indicators identified the simultaneous occurrence of adverse conditions of population increase, water supply, and facilities for sewage disposal. Obviously, the concurrence of adverse conditions associated with these three factors have a potential for creating critical, hazardous health problems.

Data on all factors were available for 39 communities. In addition to these, data were available for population, water supply, and sewage disposal facilities for 33 communities. The latter communities were classified as significantly impacted, moderately impacted, or potentially impacted according to the following criteria:

- Significantly Impacted - Adverse population conditions for either the 1970-1974 period, or 1974-1977 period, or for both periods; and, adverse conditions for both water supply and sewage disposal. (See Table 1.)

- Moderately Impacted - Adverse population conditions for either the 1970-1974 period, or 1974-1977 period, or for both periods; and, adverse conditions for either water supply or sewage disposal.

- Potentially Impacted - Adverse conditions for population only for either the 1970-1974 or the 1974-1977 period, adverse conditions for either water supply or sewage disposal, or adverse conditions for both water supply and sewage disposal.

Data on population, but not for the other factors described above, were available for 48 additional communities. These communities were classified as significantly impacted if adverse conditions were reported for both periods, as moderately impacted if for only one period, and potentially impacted if for neither period.

In addition to using the criteria for identifying adverse conditions indicated in Table 1, the communities also were classified by criteria based upon weighted variables, as indicated in Table 2. Aggregated scores were developed for each community using the same combinations of factors employed for the unweighted variables. More communities were classified as significantly impacted by employing the weighted variable, and this procedure probably is more sensitive than that which considers the factors as equally significant.

Classification of Communities

The communities classified by any of the methods used are listed in Appendix B. These data are summarized in Table 3. It will be noted that the data were insufficient for classifying 92, about 43 percent, of the 212 communities available for study. These 92 communities were, however, designated as potentially impacted since any community identified for inclusion in this study may be presumed, at the least, to be potentially impacted by energy developments.

Reliability of Procedures

The data in Appendix B and Table 3 do not reflect the relative efficiency of procedures for classifying communities as to the relative extent of health impacts. As indicated previously, the communities for which data were available concerning all factors were classified first; next to be classified were the communities for which data were available on population, water supply, and sewage disposal; then the communities for which only population data were available; and, finally, the communities for which data were inadequate were designated as potentially impacted. Sufficient data were not available for valid, comparative evaluation of the various procedures. Furthermore, there are no objective means for determining the accuracy of these, or of any other, procedures for evaluating the extent of health impacts.

Needs for Additional Data

A significant result of these initial efforts was the identification of additional data requirements that should be considered in designing future

Table 2. Weights assigned to factors for measuring extent of health impacts resulting from development of energy resources.

Population

1. Ratio of 1974:1970 population.
2. Ratio of 1977:1974 population.

(Available population data were used for comparison with 1970 Census)

≤ 1.00	0	3.01 - 3.50	14
1.01 - 1.25	2	3.51 - 4.00	16
1.26 - 1.50	4	4.01 - 4.50	18
1.51 - 1.75	6	4.51 - 5.00	20
1.76 - 2.00	8	5.01 - 5.50	22
2.01 - 2.50	10	5.51 - 6.00	24
2.51 - 3.00	12	> 6.00	26

Housing

1. Ratio of 1974 population to number of dwelling units in community in 1974.
2. Ratio of 1977 projected population to number of dwelling units in community in 1974.

1.00 - 3.00	0
3.01 - 4.00	1
4.01 - 5.00	2
5.01 - 6.00	3
6.01 - 7.00	4
> 7.00	5

Water Treatment System

Percent of capacity used:	0 - 25	0
	26 - 50	1
	51 - 75	2
	76 - 90	3
	91 - 100	4
	No system	5

Sewage Treatment System

Percent of capacity used:	0 - 25	0
	26 - 50	1
	51 - 75	2
	76 - 90	3
	91 - 100	4
	No system	5

Distance to Physician

In community	0
< 15 miles	1
15 - 50 miles	2
> 50 miles	3

Distance to Hospital

In community	0
< 15 miles	1
15 - 50 miles	2
> 50 miles	3

Distance to City of 25,000 Population

0 - 14 miles	0
15 - 49 miles	1
50 - 99 miles	2
100 - 200 miles	3
> 200 miles	4

Availability of Planner

Community, county, or regional	0
State only	1
None	2

Availability of Plan

Adopted since 1972	0
Adopted before 1972	1
No plan	2

Table 3. Number of communities, by state, identified as significantly impacted, moderately impacted, or potentially impacted as a result of adverse effects attributable to energy developments in Region VIII. Type of data used in evaluating extent of impact is indicated.

State	Number of Communities Identified with Indicated Extent of Health Impact by Using Data on the Factors Noted									
	Significantly Impacted			Moderately Impacted			Potentially Impacted			
	All Factors	Population Water Sewage	Population	All Factors	Population Water Sewage	Population	All Factors	Population Water Sewage	Population	Data Inadequate or not available
Colorado	9	9	8	2	3	0	1	0	0	13
Montana	1	0	2	2	2	1	0	0	1	7
North Dakota	0	0	0	3	1	1	3	0	10	7
South Dakota	1	0	1	2	1	1	0	0	2	1
Utah	0	8	1	0	0	7	0	0	5	54
Wyoming	11	6	3	4	3	5	0	0	0	10
All States	22	23	15	13	10	15	4	0	18	92
All Combination of Factors	60			38			114			
Total Communities*	212									

* Includes 14 Utah counties.

evaluations of health effects associated with energy activities. Data requirements and procedures for collection are discussed in subsequent sections of this summary.

ADEQUACY OF AVAILABLE HEALTH INFORMATION

An adequate data base is essential for tenable assessment of health effects associated with energy developments. In order to determine the availability and adequacy of pertinent data and information, an evaluation was made of the accessibility and usefulness of material in state and other repositories of health information. An initial step was the identfication of specific data needed for evaluating current and potential health problems, for developing preventive and remedial programs, and for evaluating the results of such programs. The attributes that should be evaluated in this connection include: (1) health status of the population, (2) trends in population changes, (3) community environmental services, (4) environmental quality, and (5) health services. The specific factor that should be considered and the items of data needed for evaluating them are indicated in Table 4.

Availability of Data and Information

The requisite data and potential sources are of three general types:

- Vital statistics and other demographic data compiled by state repositories of health information.
- Information and data concerning community environmental facilities -- e.g., water supplies, sewage disposal facilities, solid waste disposal -- usually available from local or state agencies responsible for environmental sanitation.
- Information relating to public and personal health services, including systems for organization and delivery of services, developed by health planning agencies, local and state departments of health services, and organizations of providers of health services.

No single state or regional agency obtains all types or every item of data needed for the comprehensive analyses and planning required to deal with health effects resulting from development of energy resources. Most of the states in Region VIII develop and maintain data at the state level relating

Table 4. Considerations in evaluating health status and environmental conditions.

Attribute to be Evaluated	Factors That Should be Considered	Data Required
Health status of population	Causes of mortality	Crude rates of mortality Age and cause specific rates of mortality Comparative rates of mortality, age and cause specific, for comparable local, county, or state jurisdictions Comparative rates of mortality, state and national Relative significance of leading causes of death
	Causes of morbidity	Same as for mortality data Annual and seasonal rates of communicable diseases
	Current health problems	Annual trends in occurrence of deaths and disease, age and cause specific Recent and current outbreaks of infectious diseases Trends in use of treatment facilities for specific causes
Trends in population	Annual rates of population change	Rates of births Rates of natural population change Annual estimates of population Project population: short-range annually for next five years; long-range at five-year intervals
	Age composition of population	Age specific estimates and projections as above
Community environmental services	Water supply	Type(s) of source(s) and capacity Type and capacity of treatment facilities Type and capacity of water storage facility Geographic extent and capacity of distribution system Proportion of dwelling units served by system Percent of system capacity used, by system components
	Sewage disposal	Type and capacity of treatment facility Geographic distribution and capacity of collecting system Type and capacity of effluent and solids disposal systems Proportion of dwelling units served by system Percent of system capacity used, by system components
	Solid waste disposal	Type and capacity of disposal system Type and capacity of collecting system Geographic coverage of collecting system Proportion of residences and businesses served by system Percent of system capacity used, by system components
Environmental quality	Food sanitation	Recent and current outbreaks of food-borne toxins and pathogens Result of inspections of food processing and food handling establishments
	Environmental sanitation	Recent and current occurrence of rodent and arthropod-borne pathogens Condition of premises hygiene
	Air quality	Air quality data
	Noise	Noise intensity measurements
Health services	Public health services	Recent, current, and long range trends in occurrence of communicable diseases Rates of fetal and infant mortality Rates of childhood diseases and deaths Rates of maternal deaths Rates of immunization for communicable diseases
	Personal health services	Rates and trends in morbidity and mortality compared with state and national statistics Type, number, capacity, and accessibility of facilities for health services Type, number, and location of personnel to provide health services
	Health service area	Delineation of primary, district, and regional health service area

to vital statistics, certain health facilities, environmental quality, and other factors depending on priorities in the various states. Each state also has an energy office that is responsible for developing information and policy concerning energy activities, but these offices are not appropriate sources for the specialized data related to health effects. Some types of data, e.g., vital statistics, are maintained by counties, but the detailed information needed for evaluation and planning for local communities usually has been developed through local efforts. Only in the last few years have programs been organized to determine data requirements and to collect or compile the material specifically applicable to local needs. Effective arrangements still have not been made in many areas.

All of the states in Region VIII are participating in the Cooperative Health Statistics System developed by the National Center for Health Statistics. The status of development for the components of this system in the various states is shown in Table 5. Full implementation obviously is years in the future.

Limitations of Available Data

The data readily available from repositories and agencies responsible for their collection were not adequate to provide reliable indications of health effects resulting from development of energy resources. Analyses must necessarily be made for individual communities but little useful information on specific health effects had been collected at this level. Other needs apparent from this review were as follows:

- Information is needed concerning the schedule for developing the energy resources affecting communities. It is necessary, for example, to know the anticipated magnitude and dates when population increases are expected. This information is needed as far in advance as possible in order that communities can make arrangements to accommodate increases in population. Similarly, advance notice is needed when reductions will occur.

- Population estimates are needed on an annual basis to enable accurate projection of needs for rapidly changing population. Age-specific projections are essential for effective planning of health services.

- Morbidity and mortality data should be developed for local communities. The usual processes for collecting these data do not provide timely information for planning or detection of association between health indicators and energy development activities.

Table 5. Status of implementing components of the Cooperative Health Statistics System in states of Region VIII.*

State	Status of Component Development						
	Vital Statistics	Manpower Statistics	Health Facilities Statistics	Hospital Care Statistics	Health Interview Statistics	Ambulatory Care Statistics	Long-Term Care Statistics
Colorado	Operating	Approved	Operating				
Montana	Operating	May be approved 1977					
North Dakota	May be approved 1977						
South Dakota	May be approved 1977 or 1978	May be approved 1977 or 1978					
Utah	May soon be approved						
Wyoming	May soon be approved	May soon by approved		Operating			

*Source of information: DHEW - Region VIII

- Information is needed on the capacity and scope of services available from all types of health facilities. These include public health offices and clinics, mental health centers, diagnostic and treatment centers, extended care facilities, nursing homes, and hospitals.

- Data are needed concerning all types of personnel available to provide health services. Included are physicians, dentists, public health nurses, nurse practitioners, physicians' assistants, and emergency medical technicians.

- Data should be obtained concerning all components of water supply systems. These should include type and capacity of water source, treatment facilities, and storage. The geographic coverage of the distribution system, number and percent of residences served also should be determined.

- Similar data are needed concerning facilities for sewage disposal. Additionally, the method and capacity of effluent discharge should be determined.

The means for securing these and other data indicated in Table 4 are considered in a later section.

Sources of Future Data and Information

Responsibilities for compiling or developing data and information pertinent to local communities is vested in various state agencies and regional planning organizations. These organizations are identified in Appendix C. The primary focal point for health information probably will be the Health Systems Agencies organized under the National Health Planning and Resources Development Act of 1974 (P.L. 93-641). This law provides for designation of State Health Planning and Development Agencies. In Region VIII, the agencies designated will presumably be the same agencies selected under previous health planning legislation (P.L. 89-749). Provision also is made for delineation of Health Service Areas and for appointment of Health Systems Agencies. The boundaries of proposed and designated agencies are shown in Figure 3 and the names of these agencies are indicated in Appendix C.

Responsibilities of the Health System Agencies include collection and analyses of data to provide information concerning:

- The status and determinants of health of residents in the health service area.

- The status of the health care delivery system in the area and the use of the system by residents of the area.

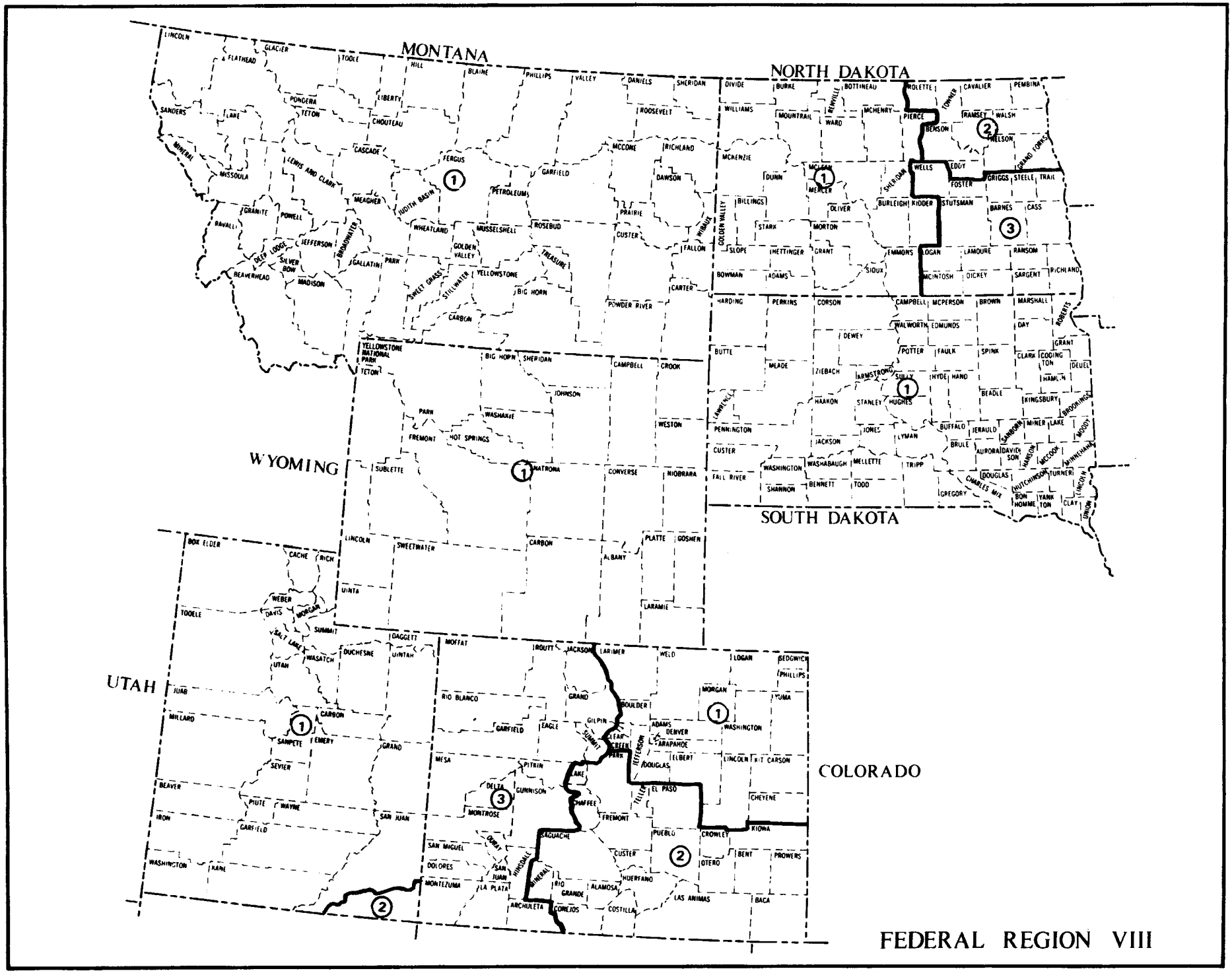

Fig. 3 Health Service Areas

- The effect the area's health care delivery system has on the residents' health.

- The number, type, and location of the area's health resources, including health services, manpower, and facilities.

- The pattern of utilization of the area's health resources.

- The environmental and occupational exposure factors affecting immediate and long-term health conditions.

When they become fully operational, the health planning agencies will be effective resources to provide technical assistance in health planning for communities impacted by energy developments. In the interim, individual communities, counties, and planning areas have necessarily undertaken health planning with local resources. This matter, including procedures for obtaining and processing needed data, is considered further in a later section of this summary.

Full-time, adequately staffed, health planning organizations have been unavailable to the majority of communities involved in this study. The many reasons for this situation include: lack of resources, priorities imposed at Federal and state levels that precluded adequate attention to substate areas, inadequate guidelines because of the newness of health planning organizations, recently emerged necessity for health and other types of planning in the impacted communities, and many other factors. The typical pattern has been for communities to acquire the services of a planner, either a generalist or a specialist, who undertook to organize planning for the community in all functional areas. As staff requirements were defined, additional specialists were secured and organizational processes were developed for categorical and comprehensive planning. Orderly, objective approaches to establishing priorities were undertaken only after emergencies or the most urgent situations were handled. In some instances adequate guidelines, planning procedures, and technical or financial assistance were not available from higher levels of government. The health planning that has been done was accomplished in this context.

Effective health planning obviously cannot be done in isolation, independent of planning for other community services. The health problems of a population are inextricably interwoven with considerations of other functional areas, such as education, law enforcement, recreation, transportation, and many others. The planners in all specialities must relate to complementary efforts of others to assure maximum benefit from use of community resources. Such coordination is potentially best provided through the district or regional planning agencies for substate areas. The boundaries of designated

areas for five states in Region VIII are shown in Figure 4. Substate planning areas have not been designated for Wyoming, but city and county agencies have been organized for some jurisdictions. The planning agencies concerned with communities involved in this study are listed in Appendix C.

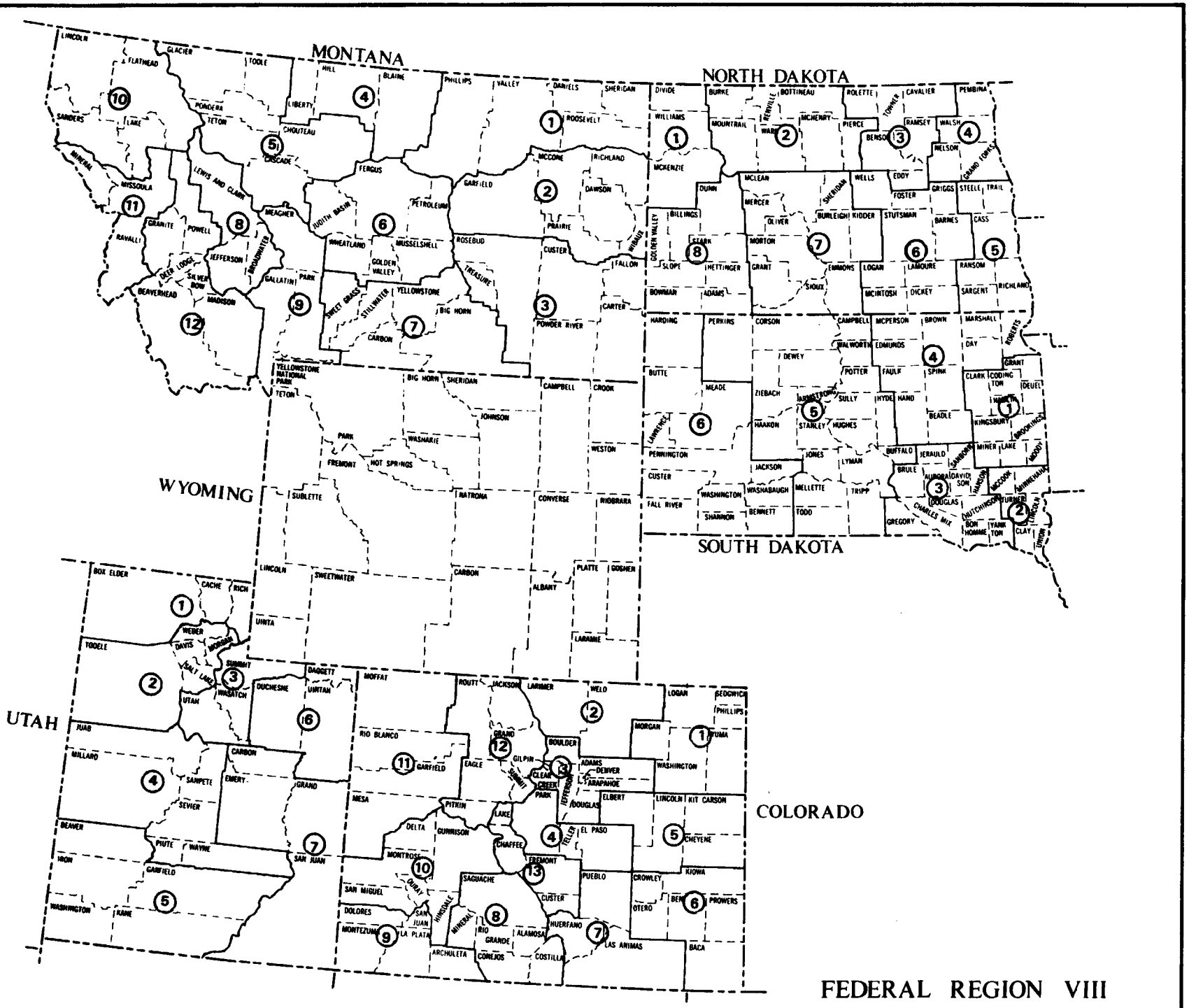

Fig. 4 District and Regional Planning Areas

HEALTH EFFECTS RESULTING FROM DEVELOPMENT OF ENERGY RESOURCES

Readily available data were analyzed to identify the specific health impacts that were occurring or could be anticipated in the study areas. As indicated in the previous section, data relating to individual communities were lacking in most instances and were meager at best. Some generalizations are possible, however, from antecedent experiences and inferences from the literature.

Types of Health Effects

Two general groups of health effects were considered in evaluating the causal influences of energy developments: (1) the possible etiologic significance of processes used in the various industrial activities, and (2) the effects attributable to conditions resulting from rapid increases in population with consequent crowding and need for health services that exceed the capacity of existing agencies and resources.

Health Effects Associated with Industrial Processes. The study of health effects related to industrial activities was confined to impacts experienced in the residential environments of communities, in contrast to the industrial environment of workers. An evaluation was made of potential health effects from the toxins and irritants that could be produced by energy development activities in Region VIII. Available information indicates that no widespread adverse health effects are likely under existing conditions. Current programs for monitoring air quality and controlling pollution from new industrial sources appear adequate to minimize risks to human health. Similar procedures for dealing with water pollution are being implemented.

Health Effects Associated with Rapid Growth of Communities. The greatest potential impacts on health attributed to energy developments result from boomtown conditions as a consequence of rapid population growth. The adverse effects are of two types: (1) those that impact community environmental services such as water supplies, sewage disposal, and solid waste disposal and, (2) those that have direct adverse effects on people. When community environmental services become inadequate, contamination of the environment may occur. Depending on the kind of contamination, the possibility of occurrence of various communicable diseases is enhanced. For example, overuse of sewage disposal systems, or inadequate arrangements

for sewage disposal, may result in contamination of the ground surface or water supplies with fecal material. This may result in dissemination of enteric pathogens capable of producing disease such as typhoid and infant diarrhea. The latter is associated with a high death rate among children under one year of age, and is an indication of the general sanitation of the environment. Inadequate disposal of solid wastes may result in creating harborage for rodents or insect vectors of various pathogens capable of producing disease in humans. Inadequate water supply is detrimental to maintenance of personal hygiene which, in turn, is conducive to transfer of pathogens between persons. Many types of intestinal pathogens are transmitted by person-to-person contact.

Those impacts that have a direct effect on people include the diseases associated with crowding and deprivation of health services. Crowding, for example, favors the spread of airborne pathogens such as the agents causing influenza and the common cold, as well as childhood diseases such as mumps, measles, poliomyelitis, and others. Crowding, in common with other conditions, has a more insidious effect in producing stress that results in mental illness, child abuse, alcoholism, and other behavioral disorders. Another manifestation of rapid population growth may be the inability to obtain health services because of increased demands for a limited supply. This may result in a smaller proportion of children being immunized against preventable diseases, fewer screening tests for tuberculosis and other diseases, and less follow-up on active cases of tuberculosis and venereal diseases. In addition, prevention of serious manifestation of diseases may be reduced because of inability of the population to secure early treatment.

Rapid and significant population growth also enhances the possibility of adverse health effects of air pollution by increasing the amount of vehicular emissions. The rate of automotive and other accidents also is known to increase disproportionately to population growth in boomtown situations.

Occurrence of Adverse Environmental Conditions and Health Effects. Although precise quantitative data are lacking, some largely subjective reports reflect the occurrences postulated above. Overt contamination of the ground surface with sewage was reported for several communities but there was no evidence of associated occurrence of disease. Increases in rates of venereal diseases were reported among temporary construction workers and among residents of a nearby Indian reservation. Increases in attendance at mental health clinics were reported in several communities; some were on the order of ten-fold increases. Similarly, unquantitated increases in alcoholism, child abuse, and crime have been observed.

The available data and testimony of officials did not, however, reflect any epidemics or notable outbreaks of disease as a direct result of energy

development, nor was there evidence of sustained or widespread environmental contamination resulting from inadequate sewage or solid waste disposal or from inadequate water supplies. This is not to imply that potentially dangerous conditions have not occurred, but existing laws, ordinances, and regulations were adequate to effect preventive or remedial action by diligent public health and other officials. Water supplies -- especially distribution systems for trailer parks, mobile home areas, and expanding construction of permanent housing -- often could not be developed rapidly enough to keep up with demands. The capacity of existing sewage collecting and disposal systems also were exceeded in some communities. Other community services, such as solid waste disposal, lagged behind increasing demands in some instances. Many acute situations developed that were solved or are being solved without catastrophic or sustained detrimental effect on human health or community sanitation.

CONSIDERATIONS IN PROVIDING HEALTH SERVICES

The most commonly expressed concern about health impacts was the actual or perceived inadequacy of medical services. The degree of accessibility of a physician and a hospital desired by many residents was not possible in many communities. The reaction has been to attempt recruitment of physicians and to undertake other measures in an effort to sustain the prevailing, traditional means for providing therapeutic medical care. These efforts have not been effective in most communities and considerable dissatisfaction was evident. It is obvious that available alternatives for providing personal health services have not been considered in many communities. Also, in some states and substate areas, an adequate framework for planning health services does not exist. For example, health service areas have not been defined and guidelines for regional health services have not been developed for many areas.

Economic Aspects of Providing Adequate Health Services

Plans for providing personal health services and community environmental services must take into account the incremental requirements for specific services. These are determined by the magnitude and rates of population growth and the duration of need for services. In many of the affected communities, transitory increases of population occurred followed by a decline. This resulted in only slight net expansion of the population in the community prior to the beginning of energy development activities. In many instances, in the absence of adequate opportunity and resources for advance planning and arrangements for needed services, reactions seem to have resulted in costly investments in long-lived facilities. Needs often could adequately have been met apparently at less cost and with greater efficiency.

Because of population size, geographic location, and other factors, many communities probably will not be able to recruit and retain physicians and operate hospitals where an extensive scope of services is provided. With appropriate system organization, several options are available for delivering the health services necessary to meet the needs of the communities. Such services may be provided through local clinics, which can be organized in a variety of ways, with established arrangements for communication and transportation to secure the types of services that are not readily available. The cost of operating such clinics in communities of Region VIII is estimated

at $100,000 - $150,000 for a one-physician facility, and between $190,000 - $225,000 for a two-physician facility. Physicians and other professional personnel may be provided by arrangements made with established federations or health service corporations. Where the size of population does not warrant the full-time services of a physician, primary care can be provided by a physicians' assistant or nurse practitioners who work under remote supervision of a physician.

If permanent facilities are not required for a sustained population increase, temporary arrangements may be made to provide less costly community environmental services. Basic to such arrangements are accurate estimates of anticipated magnitude and duration of population growth. Community planning must also be adequate to define the needs for services and to determine constraints of topography for storm drainage, soil types for waste disposal, sources of water, and availability of land for disposal of solid waste.

PROCEDURES FOR EVALUATING HEALTH EFFECTS

As indicated in the foregoing sections, the extent of adverse health effects has been inversely related to the ability of communities to evaluate potentially detrimental situations and promptly to initiate preventive actions. One of the conspicuous detriments to effective planning has been the lack of appropriate guidelines and procedures. Formats are needed in order that pertinent, available data and information can be consolidated in a form applicable to needs of local communities. Methods that may be adapted for use in communities for conducting surveys and for developing data by other means also are required. Planning models specifically designed for use in communities of Region VIII are needed in order that all appropriate options for meeting local requirements can be considered. Too often, important, costly decisions have been made intuitively or to conform with traditional practices because of inadequate data or the lack of awareness of more effective alternatives.

For example, as mentioned in the preceding section, many small communities have expended large sums of money and energy in attempting to recruit physicians without success. Scant attention was given to defining specific needs for health services and considering the various alternatives for meeting the needs defined. The facts are that small communities cannot be self-sufficient in providing the extensive scope of modern health services available today. A generation ago, or even 15 years ago, technology was much less developed and the orientation and supportive needs of medical graduates was vastly different from now. Many communities, where physicians trained a generation ago have been practicing, probably will be unable to recruit a replacement. Planning for health services must take into account such realities. Consideration must be given to the alternatives for meeting health needs on a regional basis and for using alternative providers, such as nurse practitioners and physicians' assistants, where circumstances are not favorable for continuing traditional methods of delivering health services.

Need for Guidelines and Procedures

Experience gained during the course of this work indicated that guidelines or procedures were needed for accomplishing the following planning activities related to health impacts:

- Identifying data required to define and quantitate health problems.
- Developing procedures for compiling or for developing the required data.
- Outlining formats for recording and displaying data.
- Devising methods of analysis and interpretation.
- Selecting means for converting the data compiled or developed into information useful as guides in developing programs.

Development of Procedures Manual

To this end, a set of procedures and guidelines were devised as suggestions and indications of approaches. These guidelines can be used in communities where personnel are locally available or readily accessible from participants in responsible regional or state agencies. The procedures were provided as a separate report entitled "Procedures for Evaluating Health Impacts Resulting from Development of Energy Resources."

The methods described are flexible and may easily be adapted to local situations. Data requirements and methods for meeting them within the constraints of local resources are outlined. The methods described were designed to use currently available data to the fullest extent possible, and formats are provided that indicate ways of consolidating these data. The Procedures Manual provides a means of systematically assembling existing or easily available data in a useful and readily accessible form. The manual also outlines methods for collecting data when they are not available.

The following is a brief summary of the types of information and applications considered in the manual:

General Information Concerning Energy Development. Information on the type(s) and location(s) of energy development activities is needed to anticipate possible health effects. Especially important are accurate data, obtained as far in advance as possible, concerning the number of persons that will be employed each year that the activity will be in progress. It is not anticipated that such information would be developed by a survey questionnaire or telephone interview. The procedures were designed so that the process of gathering the needed information would be a means of establishing or strengthening rapport between industry and community representatives.

Physical and Demographic Profile. Information is needed concerning historical background, physical characteristics, climate, land use, economy, cultural and social characteristics, population, and health in order to develop the bases for occurrence of present and anticipated health problems. Data are required for trends in population, by age, for five or more years before the energy development commenced, and for a projection of the annual population for at least five years after the development is initiated. Data also are needed concerning the trends in numbers and causes of deaths and illnesses.

The information developed from these and other data is required to define the health problems indigenous to the areas and to anticipate those that may occur as a result of energy developments. Also, the antecedent data on disease and deaths provide valuable indications of the general health status of the population, the effectiveness of health services, and the economy of the community.

Community Environmental Conditions. Procedures are provided for conducting a block-by-block or area-by-area environmental survey to identify and quantitate the various types of land use; type, number, and condition of dwelling units; type and adequacy of water supply, sewage disposal, and solid waste disposal; and premises sanitation. These data preferably should be obtained before impacts occur in order to assess prevalent conditions in the community and to anticipate where new problems may occur or where old ones may be intensified. Surveys conducted after impacts begin are invaluable in quantitating adverse conditions. These surveys aid in precisely locating the area and determining the relative intensity of occurrence.

Current Status of Health. The procedures for gathering subjective impressions and obtaining objective data about health status are necessarily the most extensive in the manual. In some ways, these data are the most difficult to obtain and to interpret. Provisions are made for obtaining data on a few hundred items, although it is unlikely that any single community would wish to include all of these in a survey. The survey instruments are designed so that the factors pertinent for the community can be selected and used in a format that meets the needs of the individual community. Provisions are made in the survey instruments for collecting data concerning the following:

- Awareness and opinions concerning community health services.
- Awareness and preferences concerning selected public health and welfare services.
- Characteristics of residency, dwelling units, and premises.
- Household health profiles and patterns of health services.

- Current and potential health status and sources of services.
- Household income.

Procedures are outlined as follows: how to select the sample of population from which to obtain data, how to secure the items of data deemed pertinent, how to consolidate and interpret the data, and how to display and present the information developed.

Resources for Health Services. Gathering information concerning the personnel and physical facilities for providing health services is essential for every community. Not only do expenditures for health services and facilities account for a large proportion of individual and community expenses, but planning for health services that are adequate but not excessive for community needs is one of the most arduous and often controversial tasks faced by the community. Formats for health planning, conceptual plans for delivering health services, and objective data all are required. The procedures provide for inventories of all types of personnel and facilities concerned with providing health services, for determining the capacity and extent to which facilities are used, and for defining the various types of health service areas.

Applications of Information. Methods are provided for consolidating and interpreting the information resulting from the various compilations and surveys in order to provide a coherent, documented account of existing conditions and available resources. Means also are suggested for identifying specific problems and for defining alternative solutions.

RECOMMENDATIONS

In accordance with the specifications for this study the following recommendations are proposed to improve data collection at the community level and to improve public understanding of the relationships bewteen energy developments and health impacts.

Recommendation 1

The manual "Procedures for Evaluating Health Impacts Resulting from Development of Energy Resources," with appropriate revisions to conform to EPA formats, should be distributed to energy-development impacted communities, both those currently identified and those which later may be affected.

Recommendation 2

The appropriate Federal agencies, the Western Governors' Regional Energy Policy Office, and the individual states should solicit the assistance of the Health Resources Administration of DHEW in giving priority attention to developing and supporting Health Planning and Resources Development activities and the Cooperative Health Statistics System in Region VIII.

Recommendation 3

The format for periodic collection of data from energy-development impacted communities by the Mountain Plains Federal Regional Council should be expanded to obtain additional needed data identified in this report; specifically, annual population projections during construction phases of energy-development projects, dates developments commenced or projected dates of initiation, duration of construction phase and total longevity of project(s), additional information on community environmental facilities, and more detailed information concerning health services.

Recommendation 4

An appropriate Federal office should serve as a clearinghouse for information concerning energy development activities that affect state and local

communities. This office should establish channels for regular dissemination and exchange of information to all governmental jurisdictions that potentially may be affected.

Recommendation 5

Each state should designate an agency, preferably the state planning office, to develop annual population projections for at least five years in advance for counties and individual communities affected by energy developments. These projections should take into account alternative developments of energy resources and other recognized demographic variables.

Recommendation 1 is submitted as a means for both improving the development of information and enhancing public understanding of health problems associated with development of energy resources. Adapting the survey procedures outlined for use in local communities and assembling available data in the formats so devised, along with the new data developed by these procedures, would go far toward achieving the data required to develop plans to cope with health impacts. Citizen participation, as envisioned in the survey procedures, is an effective means for stimulating awareness and interest in the problems faced by the communities. Public distribution of appropriate information obtained by conducting the suggested procedures would reach a wider audience.

The intention of Recommendation 2 is to further enhance the scope, quality, and application of information developed for the communities. Effective encouragement for health and other functional planning at the state level is essential for developing efficient community programs.

Recommendations 3 and 4 are proposed to assure consolidation of pertinent available information from the states and communities and accesibility of such information to the states and communities.

Recommendation 5 identifies a basic, essential function that should be initiated or extended immediately.

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This project was conducted under the direction of Melvin H. Goodwin, Jr., Ph.D., Epidemiologist, Director of Health Studies, Copley International Corporation. Others who participated substantially included the following:

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APPENDIX A

List of energy-development impacted communities.

ENERGY DEVELOPMENT IMPACTED COMMUNITIES

COLORADO

Planning Region	County	Community
Northeastern Colorado Council of Governments	Morgan	Brush
Denver Regional Council of Governments	Adams	Bennett Strasburg
	Arapahoe	Byers Deertrail
Huerfano-Las Animas Area Council of Governments	Las Animas	Aguilar Cokedale Starkville
San Juan Basin Regional Planning Commission	Dolores	Dove Creek
District 10 Regional Planning Commission	Delta	Bowie Cedaredge Crawford Delta Hotchkiss Lazear Orchard City Paonia Redland Mesa Rogers Mesa
	Gunnison	Somerset

Planning Region	County	Community
	San Miguel	Egnar
		Slick Rock
Colorado West Area Council of Governments	Garfield	Carbondale
		Glenwood Springs
		Grand Valley
		New Castle
		Rifle
		Silt
	Mesa	Collbran
		DeBeque
		Fruita
		Gateway
		Grand Junction
		Palisade
	Moffat	Craig
		Dinosaur
		Maybell
	Rio Blanco	Meeker
		Rangely
Northwest Colorado Council of Governments	Jackson	Walden
	Pitkin	Redstone
	Routt	Hayden
		Oak Creek
		Phippsburg
		Yampa

MONTANA

Planning Region	County	Community
High Plains Provisional Council for District One	Daniels	Scobey
Not in organized planning districts	Big Horn	Crow Agency
		Decker
		Hardin
		Lodge Grass
		Wyola
	Custer	Miles City
	McCone	Circle
	Powder River	Broadus
	Rosebud	Ashland
		Birney
		Colstrip
		Forsyth
		Lame Deer
		Rosebud
	Treasure	Hysham

NORTH DAKOTA

Planning Region	County	Community
Lewis and Clark 1805 Regional Council for Development	Burleigh	Bismarck
	McLean	Coleharbor
		Garrison
		Mercer
		Turtle Lake
		Underwood
		Washburn
		Wilton
	Mercer	Beulah
		Golden Valley
		Hazen
		Pick City
		Stanton
		Zap
	Morton	Glenn Ullin
		Hebron
		Mandan
		New Salem
	Oliver	Center
Roosevelt-Custer Regional Council	Dunn	Dodge
		Dunn Center
		Halliday
		Killdeer
		Manning
	Stark	Dickinson

SOUTH DAKOTA

Planning Region	County	Community
Sixth District Council of Local Governments	Butte	Belle Fourche
	Fall River	Edgemont
		Hot Springs
	Harding	Buffalo
		Camp Crook
	Lawrence	Spearfish
		Whitewood
	Meade	Sturgis
	Pennington	Rapid City

UTAH

Planning Region	County	Community
Five County Association of Governments	Beaver	Beaver
		Milford
		Minersville
	Garfield	Antimony
		Boulder
		Cannonville
		Escalante
		Panguitch
		Tropic
	Iron	Cedar City
		Paragonah
		Parowan
	Kane	Glendale
		Helt Marina
		Kanab
		Orderville
	Washington	Enterprise
		Hilldale
		Hurricane
		La Verkin
		Santa Clara
		St. George
		Snow Canyon
		Washington
Six County Commissioners Organization	Sevier	Annabella
		Aurora
		Elsinore
		Glenwood
		Koosharem
		Monroe
		Redmond
		Richfield
		Salina
		Sigurd
	Wayne	Bicknell
		Capital Reef
		Loa

Planning Region	County	Community
Uintah Basin Association of Governments	Daggett	Manila
	Duchesne	Altamont
		Duchesne
		Myton
		Roosevelt
		Tabiona
	Uintah	Tridell
		Vernal
Mountainlands Association of Governments	Summit	Coalville
Southeastern Utah Association of Governments	Carbon	East Carbon City
		Helper
		Hiawatha
		Price
		Sunnyside
		Wellington
	Emery	Castle Dale
		Cleveland
		Elmo
		Ferron
		Green River
		Huntington
		Orangeville
	San Juan	Blanding
		Monticello

WYOMING

Planning Region	County	Community
Gillette-Campbell County Planning Office	Campbell	Gillette
Rawlins-Carbon County Planning Office	Carbon	Elk Mountain Elmo Hanna Hanna/Elmo Medicine Bow Rawlins
Douglas-Converse County Planning Office	Converse	Douglas Glenrock
Northeast Wyoming Three County Joint Power Board	Crook	Moorcroft
	Weston	Newcastle
Fremont County	Fremont	Jeffrey City Riverton
City of Lander		Lander
Buffalo-Johnson County Planning Office	Johnson	Buffalo Kaycee
Regional Planning Office	Hot Springs	Thermopolis
	Washakie	Worland
Lincoln-Uinta Counties Planning Office	Lincoln	Diamondville Kemmerer
	Uinta	Evanston Fort Bridger Lyman Mountain View
Casper-Natrona County Planning Office	Natrona	Casper Evansville Mills

Planning Agency	County	Community
Platte County Joint Planning Office	Platte	Chugwater Guernsey Wheatland
Sheridan Area Planning Office	Sheridan	Big Horn Dayton Ranchester Sheridan Story
Sweetwater County	Sweetwater	Granger Green River South Superior Wamsutter
Rock Springs Planning Office		Rock Springs
No city/county planning agency	Goshen	Fort Laramie Torrington
	Park	Meeteetse

APPENDIX B

Names of communities listed, by states, in groupings of significantly impacted, moderately impacted, and potentially impacted as a result of adverse health effects attributable to energy developments.

Names of communities listed, by states, in groupings of significantly impacted, moderately impacted, and potentially impacted as a result of adverse health effects attributable to energy developments in Region VIII. Combinations of factors used in classifying communities are indicated.

Significantly Impacted Communities

State, Community	Data Used to Rate Communities		
	All Factors	Population, Water, Sewage	Population
Colorado			
Bennett			x
Carbondale	x		
Cedaredge			x
Cokedale		x	
Collbran			x
Craig		x	
Crawford		x	
De Beque	x		
Deertrail			x
Dinosaur	x		
Fruita		x	
Glenwood Springs		x	
Grand Valley	x		
Hayden	x		
Meeker	x		
New Castle			x
Oak Creek			x
Orchard City		x	
Palisade		x	
Paonia		x	
Rangely		x	
Rifle	x		
Silt	x		
Strasburg			x
Walden	x		
Yampa			x

Significantly Impacted Communities

State, Community	Data Used to Rate Communities		
	All Factors	Population, Water, Sewage	Population
Montana			
Colstrip			x
Forsyth	x		
Lame Deer			x
North Dakota			
No Communities			
South Dakota			
Camp Crook	x		
Edgemont			x
Utah			
Cedar City		x	
Enterprise		x	
Escalante		x	
Hurricane		x	
Kane County			x
Panquitch		x	
Parowan		x	
St. George		x	
Tropic		x	
Wyoming			
Big Horn	x		
Buffalo		x	
Diamondville			x
Douglas			x
Evansville	x		
Fort Bridger		x	
Gillette	x		
Glenrock	x		
Granger	x		
Green River		x	
Hanna			x

Significantly Impacted Communities

State, Community	Data Used to Rate Communities		
	All Factors	Population, Water, Sewage	Population
Wyoming (cont'd)			
Lyman	x		
Medicine Bow	x		
Mountain View	x		
Ranchester	x		
Rock Springs		x	
South Superior	x		
Story		x	
Wamsutter	x		
Wheatland		x	

Moderately Impacted Communities

State, Community	Data Used to Rate Communities		
	All Factors	Population, Water, Sewage	Population
Colorado			
Aguilar	x		
Delta		x	
Grand Junction		x	
Hotchkiss		x	
Starkville	x		
Montana			
Circle			x
Hardin		x	
Hysham		x	
Lodge Grass	x		
Miles City	x		
North Dakota			
Beulah	x		
Bismarck		x	
Halliday	x		
Killdeer	x		
Stanton			x
South Dakota			
Buffalo	x		
Hot Springs		x	
Spearfish	x		
Whitewood			x
Utah			
Beaver			x
Beaver County			x
Daggett County			x
Duchesne County			x
Garfield County			x
Iron County			x
Washington County			x

Moderately Impacted Communities

State, Community	Data Used to Rate Communities		
	All Factors	Population, Water, Sewage	Population
Wyoming			
Casper	x		
Chugwater			x
Dayton			x
Evanston		x	
Fort Laramie			x
Lander	x		
Meeteetse		x	
Moorcroft			x
Newcastle	x		
Rawlins			x
Riverton		x	
Torrington	x		

Potentially Impacted Communities

State, Community	Data Used to Rate Communities			
	All Factors	Population, Water, Sewage	Population	Data Not Available or Inadequate
Colorado				
Bowie				x
Brush	x			
Byers				x
Dove Creek				x
Egnar				x
Gateway				x
Lazear				x
Maybell				x
Phippsburg				x
Redland Mesa				x
Redstone				x
Rogers Mesa				x
Slick Rock				x
Somerset				x
Montana				
Ashland				x
Birney				x
Broadus			x	
Crow Agency				x
Decker				x
Rosebud				x
Scobey				x
Wyola				x
North Dakota				
Center			x	
Coleharbor				x
Dickinson	x			
Dodge			x	
Dunn Center	x			
Garrison				x
Glen Ullin			x	
Golden Valley			x	
Hazen			x	
Hebron				x
Mandan	x			

Potentially Impacted Communities

State, Community	Data Used to Rate Communities			
	All Factors	Population, Water, Sewage	Population	Data Not Available or Inadequate
North Dakota (cont'd)				
Manning			x	
Mercer				x
New Salem			x	
Pick City			x	
Turtle Lake				x
Underwood			x	
Washburn				x
Wilton				x
Zap			x	
South Dakota				
Belle Fourche			x	
Rapid City				x
Sturgis			x	
Utah				
Altamont				x
Annabella				x
Antimony				x
Aurora				x
Bicknell				x
Blanding				x
Boulder				x
Cannonville				x
Capital Reef				x
Carbon County			x	
Castle Dale				x
Cleveland				x
Coalville				x
Duchesne				x
East Carbon City				x
Elmo				x
Elsinore				x
Emery County			x	
Ferron				x
Glendale				x

Potentially Impacted Communities

State, Community	Data Used to Rate Communities			
	All Factors	Population Water, Sewage	Population	Data Not Available or Inadequate
Utah (cont'd)				
Glenwood				x
Green River				x
Helper				x
Helt Marina				x
Hiawatha				x
Hilldale				x
Huntington				x
Kanab				x
Koorsharem				x
La Verkin				x
Loa				x
Manila				x
Milford				x
Minersville				x
Monroe				x
Monticello				x
Myton				x
Orangeville				x
Orderville				x
Paragonah				x
Price				x
Redmond				x
Richfield				x
Roosevelt				x
Salina				x
San Juan County				x
Santa Clara				x
Sevier County			x	
Sigurd				x
Snow Canyon				x
Summit County				x
Sunnyside				x
Tabiona				x
Tridell				x
Uintah County				x
Vernal				x
Washington				x
Wayne County				x
Wellington				x

Potentially Impacted Communities

State, Community	Data Used to Rate Communities			
	All Factors	Population, Water, Sewage	Population	Data Not Available or Inadequate
Wyoming				
Elk Mountain				x
Elmo				x
Guernsey				x
Jeffrey City				x
Kaycee				x
Kemmerer				x
Mills				x
Sheridan				x
Thermopolis				x
Worland				x

APPENDIX C

Offices, agencies, responsible officials, and other sources of data related to health effects associated with development of energy resources.

FEDERAL

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REGIONAL PLANNING COMMISSIONS

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Region 2 - Larimer and Weld Counties

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Region 6 - Crowley, Kiowa, Otero, Bent, Prowers, and Baca Counties

Lower Arkansas Valley Council of Governments
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Region 11 - Garfield, Moffat, Mesa, and Rio Blanco Counties

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