ENVIRONMENTAL IMPACT APPRAISAL/SAFETY ANALYSIS
FOR THE KERR-MCGEE NUCLEAR CORPORATION
ION EXCHANGE PLANT FOR
URANIUM RECOVERY FROM MINEWATER
AT SOUTH POWER RIVER BASIN,
CONVERSE COUNTY, WYOMING
DOCKET NO. 40-8727

Dated: APR 8 1980

TABLE OF CONTENTS

		Page
List of Figures		ii
List of Tables		iii
Summary		iv
1.0	Description of Proposed Action	1
	1.1 Proposed Action	1
	1.2 Background	1
	1.3 Minewater Uranium Recovery	1
	1.4 Alternatives	8
	1.5 Bases for Staff Appraisal	8
2.0	Description of Site Environment	8
	2.1 Site Location and Land Use	8
	2.2 Demography, Meteorology, Hydrology, Seismology	9
3.0	Control of Effluents	13
	3.1 Existing Discharge System	13
	3.2 Proposed Plant Operations and Waste Streams	20
4.0	Radiological Considerations	21
	4.1 Environmental Monitoring	21
	4.2 Occupational and In-Plant Safety	24
	4.3 Accident Potential	25
5.0	Reclamation and Restoration	26
6.0	Bases for the Conclusion of a Negative Declaration	26

LIST OF FIGURES

		Page
1.	Regional Location of the Kerr-McGee Permit Area.....	2
2.	Location of Proposed Mine Water Recovery Facilities.....	3
3.	Bill Smith Mine Water Recovery.....	4
4.	Ion Exchange Columns.....	6
5.	Mine Water Ion Exchange Flow Diagram.....	7
6.	Major Streams and Gaging Stations.....	12
7.	Water Quality Sampling Locations.....	18
8.	Leak Detection System.....	23

LIST OF TABLES

		Page
1.	Major Constituents, Water Quality Analyses.....	14
2.	Radioactive Trace Elements, Water Quality Analyses.....	16
3.	Bill Smith Mine Effluent Limitations and Monitoring Requirements.....	19

SUMMARY

This Environmental Impact Appraisal was prepared by the staff of the U.S. Nuclear Regulatory Commission (NRC) and issued by the Commission's Office of Nuclear Material Safety and Safeguards.

1. This action is administrative.

2. The proposed action is the issuance of Source Material License to Kerr-McGee Nuclear Corporation for implementation of the South Powder River Basin site Ion Exchange project, Docket No. 40-8727, in accordance with the Corporation's statements in its application and supporting documents.

   The proposed project consists of ion exchange operations involving minewater currently being discharged from the Kerr-McGee Nuclear Corporation's uranium mine within the Corporation's South Powder River Basin site in Converse County, Wyoming. The ion exchange operations will include three ion exchange facilities and an elution facility to be located adjacent to the existing, operating mines. The project has an estimated lifetime of sixteen years with a production capacity of 130 pounds of yellowcake produced per day.

3. Summary of environmental impacts:

   a. The area is mostly used for agricultural purposes such as grazing. There are some industrial development at the site such as ore mining for uranium. Initiation of the ion exchange project would result in the temporary removal of a few acres of land from other uses. All disturbed surface areas will be reclaimed and returned to a condition suitable for their original potential use.

   b. Atmospheric effluents from the ion exchange project are expected to be within acceptable effluent release limits, and the effects will be insignificant. The only liquid effluents from the project is the discharge of the processed minewater following extraction of uranium. Such minewater is currently being discharged from the uranium mine without removal of uranium. Consequently, the project is expected to have a positive impact on the environment by removing a potential contaminant.

   c. The long-term effects of the ion exchange project on groundwater use are expected to be negligible, since the ion exchange process does not utilize any significant quantities of water other than the minewater itself. Currently minewater is being discharged to surface waters pursuant to National Polutant Discharge Elimination System permits. Since no contaminants are added to the minewater streams during the ion exchange process, discharge of the processed minewater is not expected to have any significant impacts on surface waters.

4. The only viable alternative to the proposed project is that of not developing it at all. This would result in the loss of the uranium, which is a valuable natural resource needed for nuclear power plant operations.

5. From the analysis and evaluation made in this Assessment, it is proposed that the source material license contain the following conditions;

   a. The radioactive wastes from the ion exchange project and the wastes from the solar evaporation pond and minewater settling ponds shall be disposed of at a licensed mill tailings impoundment as described in Sections 3.2 and 5.

   b. The applicant shall implement and maintain a monitoring and sampling program (consistent with the requirements of the National Pollutant Discharge Elimination System permits) of the discharge processed minewater and of the accumulated solids in the minewater settling ponds as specified in Sections 3.2 and 4.1.

   c. The applicant shall maintain an in-plant radon monitoring program as specified in Section 4.1, and shall be prepared to install extra plant ventilation equipment and establish an off-site air monitoring program. if it is found that radon buildup inside the plant is occurring.

   d. The applicant shall establish an in-plant radiation safety program as specified in Section 4.2.

   e. The applicant shall establish a leak detection system beneath the solar evaporation pond, as specified in Section 4.1.

6. The position of the NRC is that, after weighing the environmental, economic, technical, and other benefits of the Kerr-McGee Nuclear Corporation's South Powder River Basin site Ion Exchange project against environmental considerations and considering the available alternative, the action called for under the National Environmental Policy Act of 1969 (NEPA) and 10 CFR Part 51 is the issuance of a Source Material License to the applicant, subject to conditions 6a through e above.

1.0 DESCRIPTION OF PROPOSED ACTION

1.1 PROPOSED ACTION

By letter dated June 6, 1979, Kerr-McGee Nuclear Corporation (KMNC) requested a license to receive, possess, use, and transfer source material in the course of recovering uranium from the minewater discharge streams that are generated in uranium mining activities at their South Powder River Basin (SPRB) mine in Converse County, Wyoming.

The purpose of this proposal is to provide added uranium production capability to meet the source material requirements in the U.S. for nuclear power plant operations.

This impact appraisal discusses the environmental and safety aspects of the proposed application. The proposed action is to grant a license to Kerr-McGee Nuclear Corporation.

1.2 BACKGROUND

Kerr-McGee Nuclear Corporation is currently conducting uranium mining operations within their mining permit area located in the South Powder River Basin in Converse County, Wyoming (Fig. 1). Mining is performed at one underground mine and several surface mines (Fig. 2). The mined ore is currently being shipped to uranium mills off-site. During mining operations, the water pumped from the mines contains small quantities of uranium, approximately 2 mg/l on the average, in the form of a complex uranyl bicarbonate anion. Water from each mine site is pumped to existing minewater settling ponds adjacent to each mine. Following treatment and settlement, this uranium bearing minewater is discharged to surface waters, pursuant to National Pollutant Discharge Elimination Systems (NPDES) permits, in the area without recovery of uranium values.

KMNC proposes to install an Ion Exchange (IX) Plant at the mines to recover the uranium from the minewater discharge streams. The IX Plant will consist of three ion exchange facilities, each with associated minewater settling ponds, and a central elution facility. One IX facility will be at the underground mine (Bill Smith Mine), one will be at a surface mine designated as the 28-33 Pit, and one will be at a surface mine designated as the 3-10 Pit (Fig. 2). The elution facility will be located between the three IX facilities and will be the only recovery circuit for the elution of resins from all three IX facilities. The resins will be transported between the IX facilities and the elution facility via an enclosed trailer.

1.3 MINEWATER URANIUM RECOVERY

1.3.1 Ion Exchange Facilities

At each IX facility, the minewater will be pumped from the mine to a settling pond located next to the IX structure (Fig. 3 shows an example

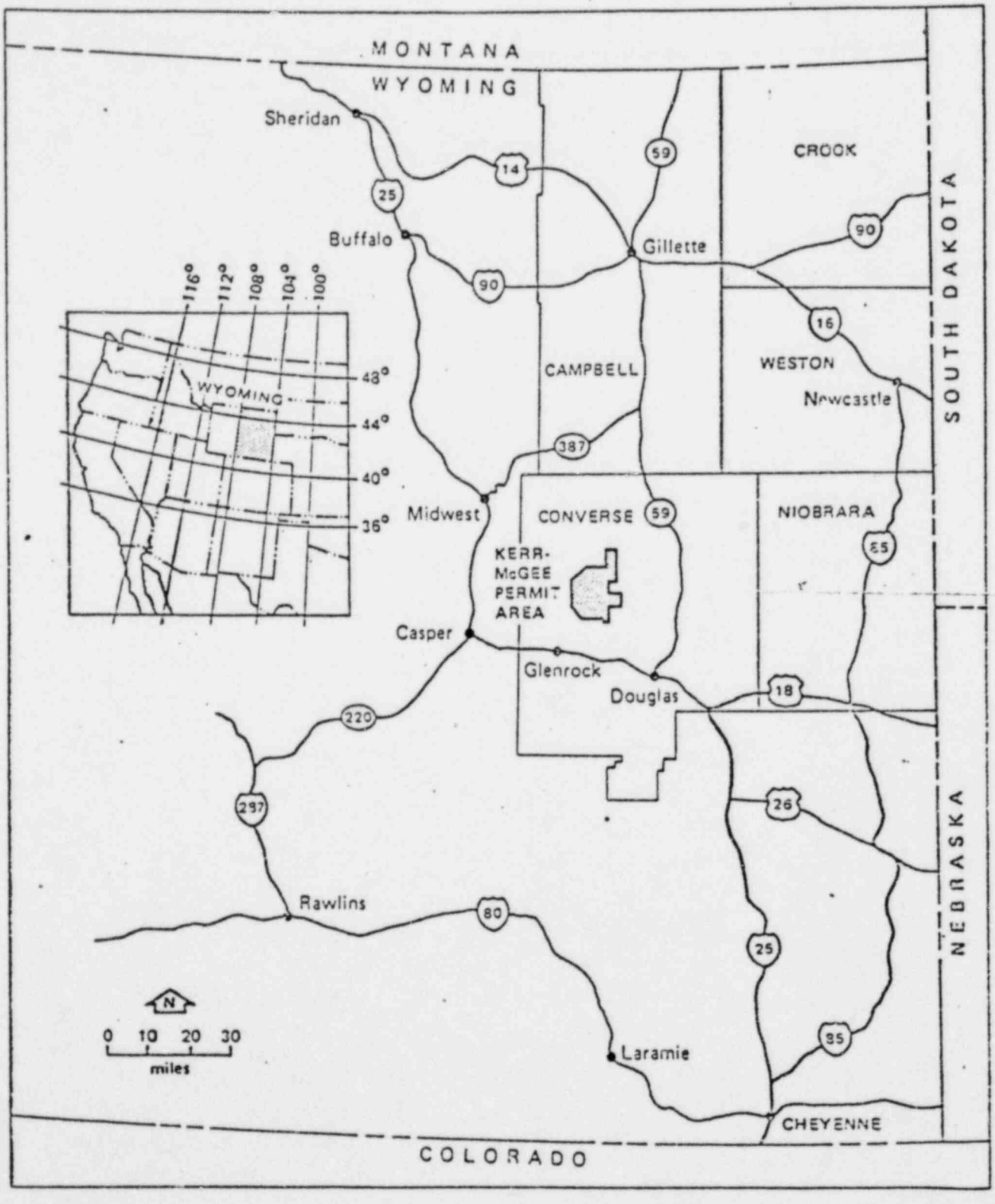
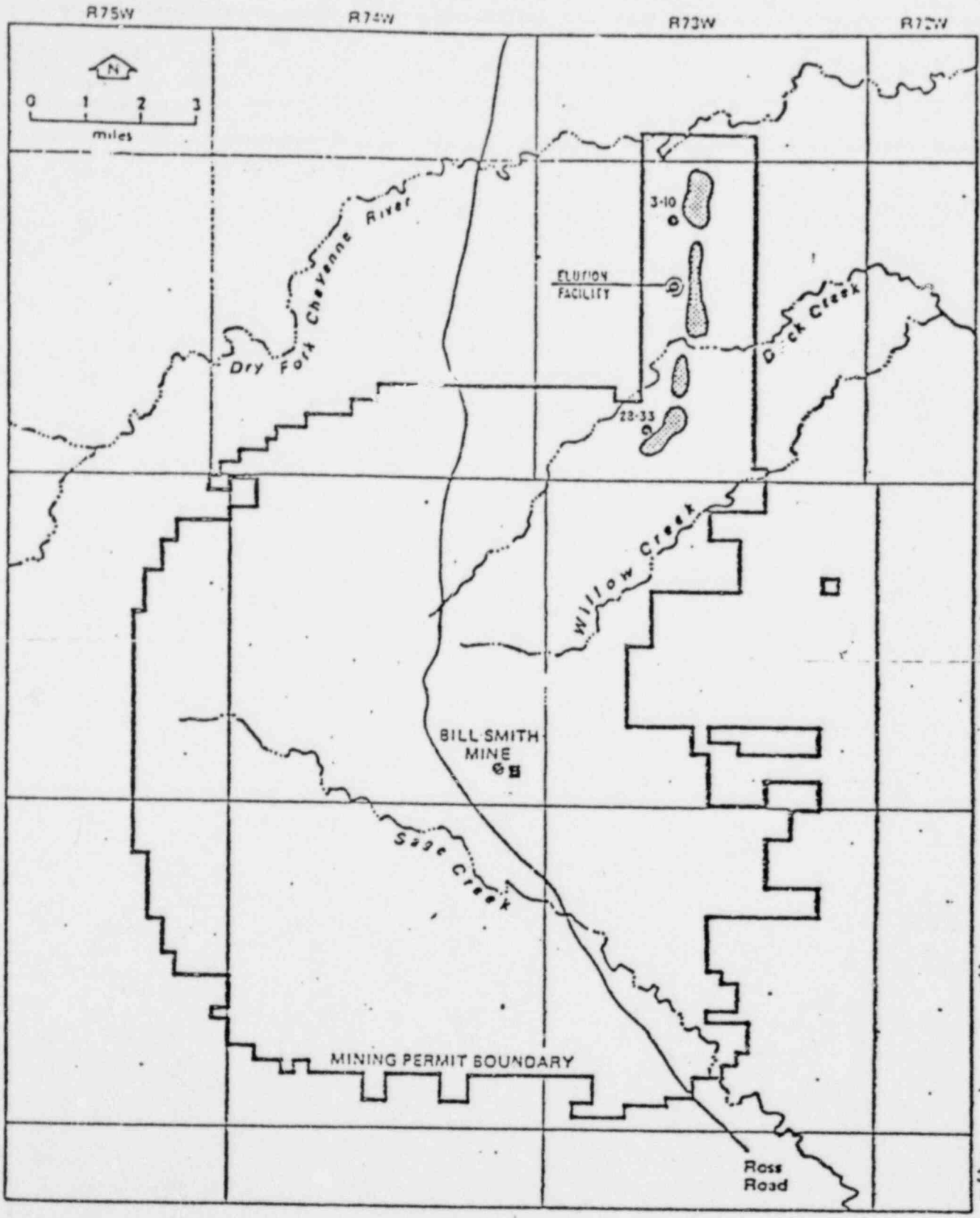


Figure 1. REGIONAL LOCATION OF THE KERR-McGEE PERMIT AREA



• IX Facilities ⊕ Elution Facility

Figure 2. LOCATION OF PROPOSED MINE WATER RECOVERY FACILITIES

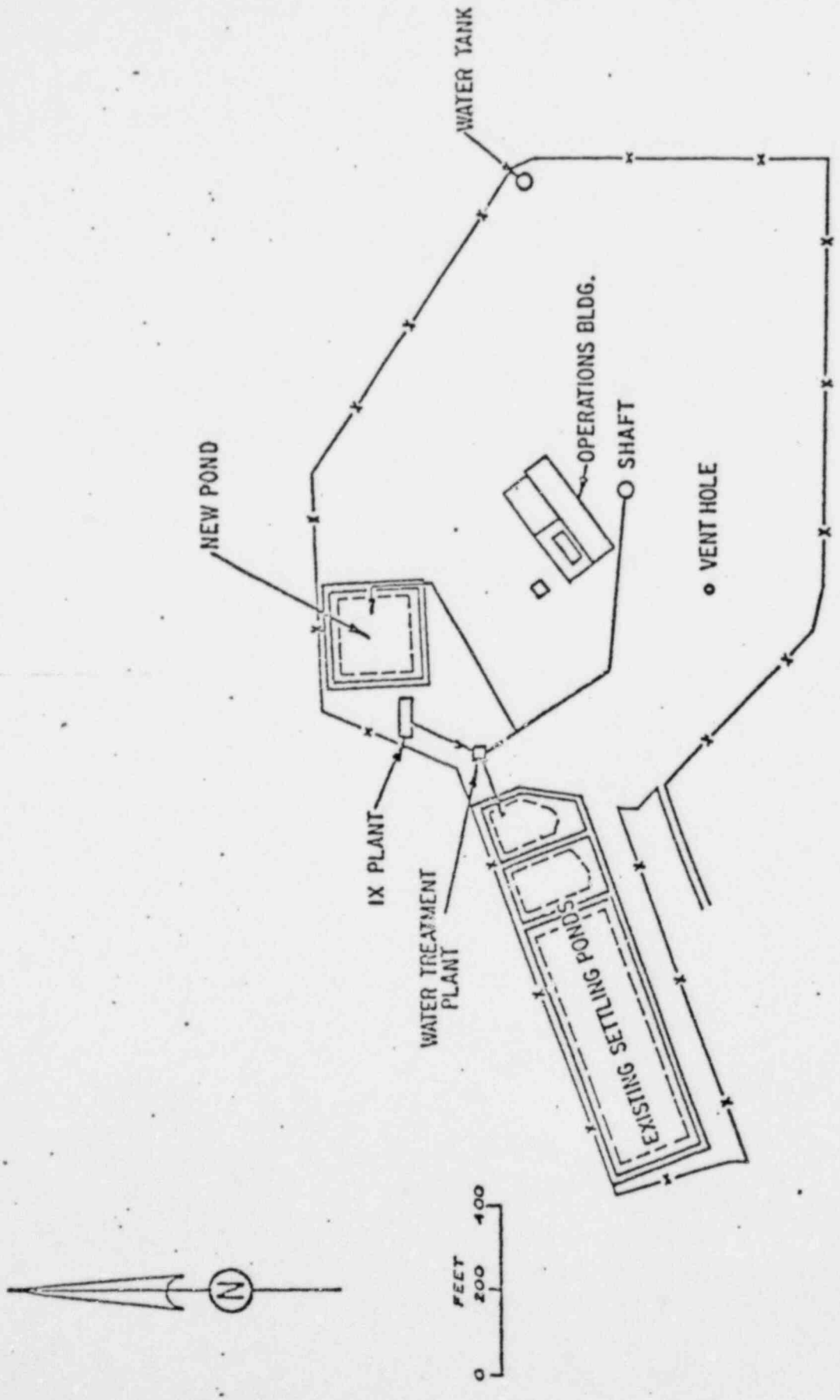


Figure 3. BILL SMITH MINE WATER RECOVERY

of the facility at the Bill Smith Mine). After the suspended solids have settled, the minewater is pumped through the IX columns. Each facility contains two IX columns. The columns are identical cylinders with a conical bottom (Fig. 4). Each column contains 100-cubic feet of ion exchange resins. A perforated plate, located above the cone, supports the resin bed and distributes the water flow. The minewater enters through a central downcomer to deaerate the feed, and flows upward through the resin bed. The two columns are operated in series so the flow from the first column flows by gravity through the second. The maximum flow rate of mirewater through each column is 600 gpm. A DSM screen is provided at the discharge point of the second column to recover any resin that is carried out from the columns. The resin is recovered manually from the screen and returned to the columns. All equipment will be located over a foundation designed with curbs to contain any potential spill. When the resin in the first column is loaded with uranium, at about 3.5 pounds of $_3O_8$ per cubic foot of resin, the flow is stopped and the resin is removed from the column, loaded into a transport trailer, and shipped to the elution facility. Resin from column two, which is only partly loaded with uranium, is transferred to column one. Freshly eluted resin from the elution facility is returned to column two, and the minewater flow is restarted. All resin transfer is performed hydraulically. The processed minewater will be routed to the existing settling ponds for treatment and settling prior to discharge. A process flow chart is shown in Figure 5.

1.3.2 Elution Facility

Elution of the resin is accomplished by the use of a brine solution. Each bed volume of loaded resin requires elution by six bed volumes of brine. The first stream of three volumes is rich eluate, with about 15 g/l of U_3O_8, and is transferred to the precipitation circuit for recovery of uranium. The second stream of three volumes contain less uranium; therefore this stream is held in the eluate recycle tank and used for elution of the next batch of eluted resin.

Recovery of uranium is done by precipitation with ammonia. The precipitate is filtered and washed, and the wet ammonium diuranate (wet yellowcake) is held in a storage tank as the final product and will be shipped off-site. The production capacity of the plant is estimated at approximately 130 pounds of yellowcake per day. Roughly half of the filtrate and wash water will be returned as makeup solution for elution; the other half will be discharged as waste to an evaporation pond. The characteristics of this waste is given in Section 3.2.

The IX resins become gradually coated with carbonate slimes with continued use, which will reduce the uranium loading capacity. Therefore it will be necessary to periodically wash the resin with dilute hydrochloric acid to remove the slimes; frequency of wash may vary from two to four times per year. The resin wash solution will be discharged as waste to the evaporation pond. These resin wash wastes and the filtrate and wash wastes from the precipitation circuit are the only wastes expected under normal operating conditions.

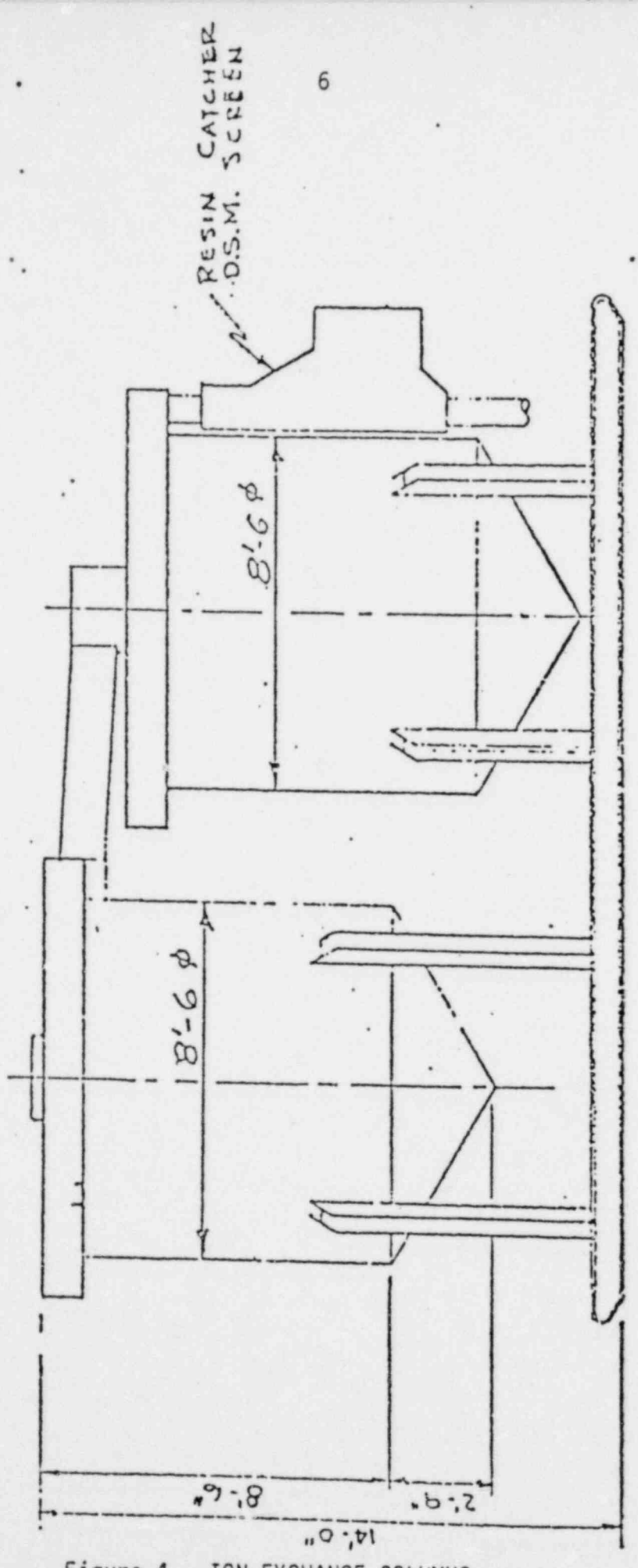


Figure 4. ION EXCHANGE COLUMNS

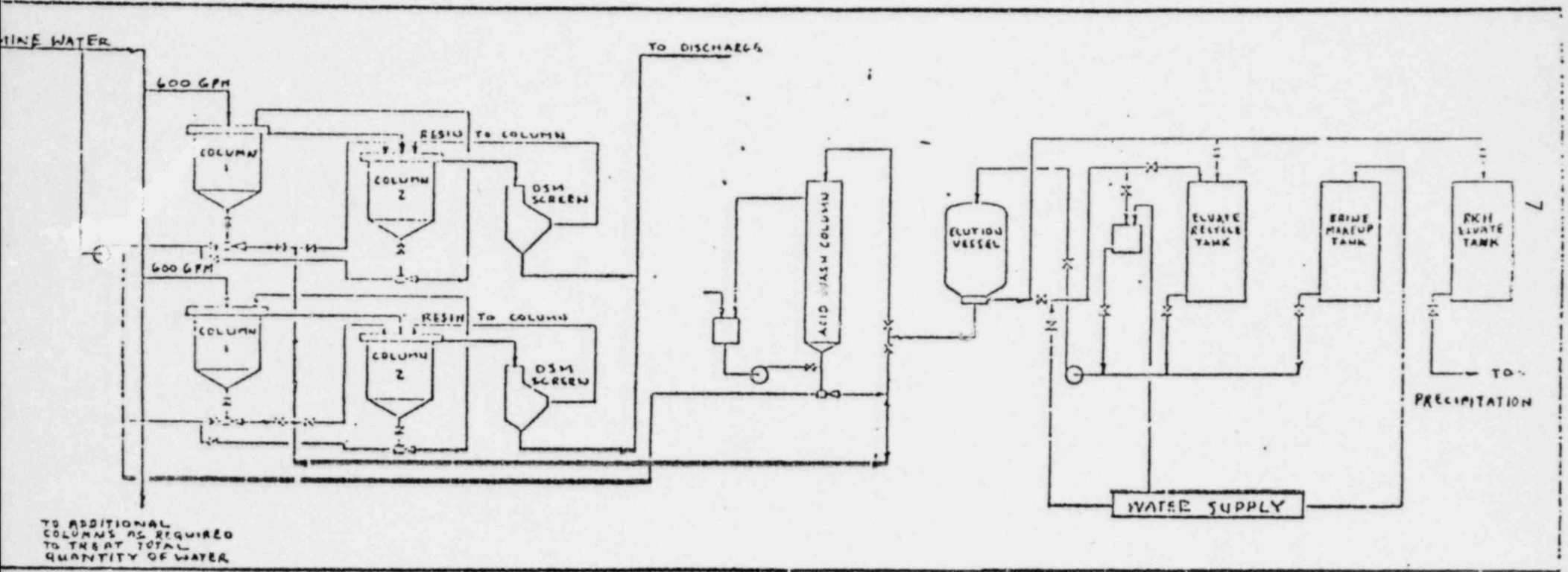


Figure 5. MINE WATER ION EXCHANGE FLOW DIAGRAM

1.4 ALTERNATIVES

The only viable alternative to the proposed project is that of not developing it at all; this would result in the loss of the uranium, which is a valuable natural resource needed for nuclear power plant operations. The uranium produced by this project will be used to supply fuel for nuclear reactors which produce electric power for sale to consumers. Loss of this uranium would therefore result in a decrease of fuel supplies, and will lead to a reduction in energy output from reactors that are short of fuel.

1.5 BASES FOR STAFF APPRAISAL

An impact appraisal for the licensing action has been performed by the Division of Waste Management, Uranium Recovery Licensing Branch (WMUR or the staff) of the Nuclear Regulatory Commission (NRC). This report documents that appraisal.

The staff has performed the appraisal on environmental and safety considerations associated with the proposed license in accordance with Title 10, Code of Federal Regulations (10 CFR), Part 40, Licensing of Source Material, and 10 CFR Part 51, Licensing and Regulatory Policy and Procedures for Environmental Protection, while implementing the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). Because the subject application is not regarded as a major action that could significantly affect the quality of the human environment, an environmental impact statement will not be prepared.

In conducting this appraisal, the staff considered the following:

- Information and supplements submitted (June 6 and November 7 of 1979, and January 31 of 1980) by the applicant to support the application for a license.

- Environmental information about the site contained in another submittal (July 1977) from the applicant supporting an application for a uranium mill proposed by the applicant at the same general location as the Ion Exchange Plant. The same environmental information supplied with that uranium mill application (Docket No. 40-8647) is applicable to the Ion Exchange Plant since both are in the same area.

2.0 DESCRIPTION OF SITE ENVIRONMENT

2.1 SITE LOCATION AND LAND USE

2.1.1 Site Location

The proposed project site is located in the South Powder River Basin, Converse County, Wyoming. Figure 1 illustrates the location of the site on a regional scale. The plant will be located inside the KMNC mining permit

area, at approximately eight miles north-northeast of Glenrock and 16 miles northwest of Douglas. The facilities will be at the following locations: IX facility at the Bill Smith Mine (NE 1/4, NW 1/4, Sec. 36, T36N, R74W); IX facility at the 28-33 Pit (SE 1/4, SW 1/4, Sec. 28, T37N, R73W); IX facility at the 3-10 Pit (SE 1/4, SE 1/4, Sec. 4, T37N, R73W); central elution facility at (E 1/2, NW 1/4, NE 1/4, Sec. 16, T37N, R73W). The locations of the facilities are illustrated on Figure 2. Access to the site is by Ross Road, a paved county road running northward from Interstate 25 via State Highway 93.

2.1.2 Land Use

Converse County contains more than 2.7 million acres of land. Agricultural uses amount to roughly 98 percent of the total surface area, and unirrigated grazing is the dominant use among these. Urban areas consitute less than 2 percent of the total, while transportation systems account for 4.5 percent.

Historically, agriculture has dominated the Converse County economy and land use. However, the development and exploitation of energy-related minerals have influenced these traditional land uses. For example, the Dave Johnston Power Plant and Exxon's Highland uranium mill represent two major industrial complexes in the area. Industrial land use continues to displace agriculture as coal and uranium developments proceed.

Ranching is the predominant land use within the permit area. Cattle, sheep, and horses are pastured throughout the area. There are seven active residences within the permit area boundaries, but none within two miles of the plant site. Alfalfa hay and some grains are grown in the vicinity of one of these residences. Within one section of the permit area there are seven producing oil and gas wells. In addition, oil, gas, and coal production are carried out in the immediate vicinity around the permit area. Uranium mining/milling and limited dryland farming takes place east of the area.

There are several uranium development projects located within 50 miles of the IX Plant. KMNC is also currently proposing to construct a conventional uranium milling project at the same general location as the IX Plant (Docket No. 8647).

2.2 DEMOGRAPHY, METEOROLOGY, HYDROLOGY, SEISMOLOGY

2.2.1 Demography

The population of Converse County has gone through significant variations between 1940 and 1970. Between 1970 and June 1976 the estimated population increased by approximately 53 percent to 9100. The towns of Douglas and Glenrock, the two larger population centers in the region, have shown essentially the same fluctuations as the county. The population for Douglas increased 98 percent between 1970 and June 1976 to 5300. The Glenrock population grew by 58 percent to 2400 over the same period. This growth was contributed mainly to the increasing mineral development in the region.

Population density of Converse County was about 1.4 persons per square mile, according to the 1970 census, as compared to a state average of 3.4. The unincorporated areas of the county (excluding Douglas and Glenrock) contains an average population density of about 0.4. For the permit area and its vicinities, population density has been estimated at less than 0.2 permanent residents per square mile. As of July 1977, there were an anticipated 22 permanent residents, with about 9 temporary residents, within the permit area boundaries. All of the permanent residents live within 10 miles of the proposed project site.

Population projections made by the Converse Area Planning Office (CAPO) in July 1976 estimate the population of Converse County as increasing to about 24,000 in 1980, 300 percent over that in 1970. This expectation of a high increase in population was due apparently to the increased activities in mineral development.

Similarly, population in Douglas was expected to grow to about 17,000 by 1980, an increase of 634 percent over that in 1970, and for Glenrock the estimate was for a 370 percent increase to 5600 over the same period.

2.2.2 Meteorology

The KMNC permit area is located in eastern Wyoming where climate is generally semiarid and cool. The mountain ranges in the west-central portion of the state are oriented in a general north-south direction. These ranges tend to restrict the passage of storms from the west and thus restrict precipitation in eastern Wyoming.

The closest meteorological station is located in Casper, Natrona County, to the immediate west of Converse County. The monthly mean temperatures recorded there for the region vary from 23°F in January to 71°F in July, although the highest recorded temperature was 104°F and lowest was -40°F. Average annual precipitation is roughly 11 inches, with the lowest at about 7 inches and highest at 16 inches. The wettest month is May while the driest month is December. However, these statistics vary considerably from year to year.

Thunderstorms are common, occuring mostly in spring and summer. Several thunderstorms can produce up to 50 percent of the total annual precipitation. Annual snowfall in the area averaged roughly 74 inches, with a high of about 117 inches and a low of approximately 34 inches. The highest monthly total snowfall was about 56 inches.

Prevailing winds in the area are from the west-southwesterly direction with a mean annual speed of roughly 17 mph. Monthly averages around December and January, however, can be as high as 21 mph. Strong winds can occur in the project area, usually with associated thunderstorm activity; winds of 50 mph or more have been reported in the region throughout the year. There is a recorded history of tornadoes in this area, with a mean annual frequency of occurrence at 0.4.

2.2.3 Hydrology

The permit area is relatively large and includes portions of two major drainage basins (Fig. 6), the Platte River Basin on the south of the Sage Creek Divide and the Cheyenne River Basine on the north. The area comprises portions of the upper drainages of Phillips, Brown Springs, Brush, Duck, Willow, and Cowell Creeks, which are tributaries of the Dry Fork of the Cheyenne River, and Sage Creek, which is a tributary of the North Platte River.

Surface water flow in the permit area is intermittent, resulting mainly from the precipitation in the region and from groundwater sources recharged from the runoff from the precipitation. The average annual runoff in the region is approximately 0.5 inches; the rest of the precipitation either evaporates or infiltrates into the soil. Some surface runoff are occasionally collected in stock ponds or natural ponds in the area.

Wells are distributed throughout the permit area, although only a few are located near (within one mile of) the mines, and these are used for industrial purposes such as mine dewatering. Minewater is currently being pumped, at rates up to several hundred gallons per minute, from the operating KMNC mines and discharged into a tributary of Sage Creek. The movement of the flow front from this discharge infiltrating the sandy stream bed has progressed roughly 15 miles downstream. At this point, through a combination of infiltration and evaporation, surface water flow vanishes.

The hydrologic units beneath the permit area include the following: an alluvial deposit, the Wasatch Formation, the Fort Union Formation, and the Lance and Fox Hills Formations.

The most shallow unit, a near surface alluvial aquifer, consists of thin, unconsolidated, poorly stratified clays, silts, sands, and gravels. This deposit can extend down to 30 feet below the surface at some points. Wells penetrating into this aquifer generally are low-yielding and have little industrial use potential.

The Wasatch Formation underlies the alluvium and varies up to 500 feet in depth. This aquifer consists of typically sandstones with interbedded claystones and siltstones. Wells penetrating this aquifer generally yield up to 15 gpm.

The Fort Union Formation underlies the Wasatch Formation and can be as thick as 3000 feet. It typically comprises of sandstones with interbedded claystones, siltstones, and coal. This is the most important aquifer in the area for industrial use. Wells in this aquifer can yield over 500 gpm.

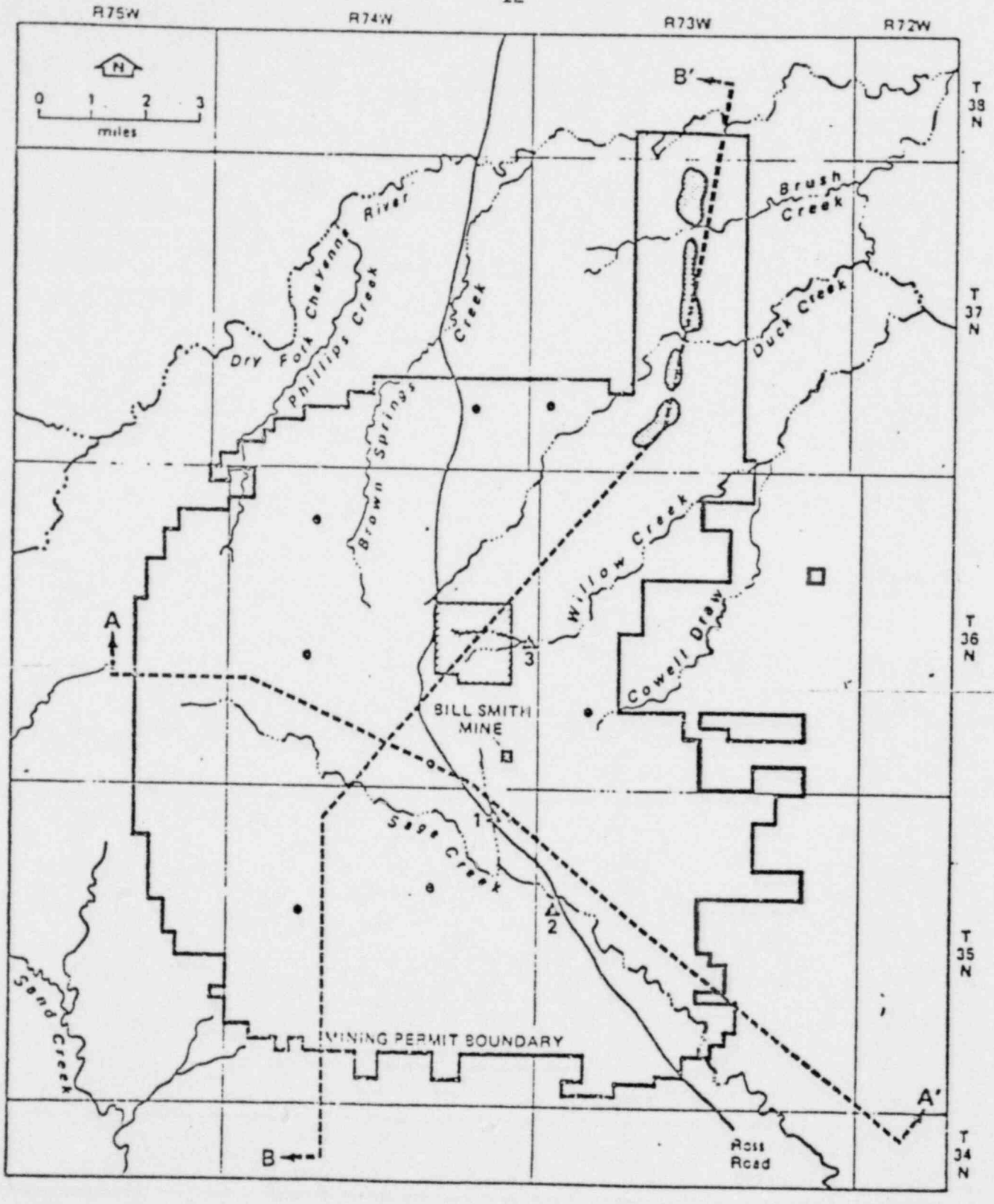


Figure 6. MAJOR STREAMS AND GAGING STATIONS

The Lance and Fox Hills Formations under the Fort Union Formation are sandstones with interbedded shales and claystones. Information on these formations' hydrologic characteristics is not well known; however, information on these units is not significant to this project due to their depths of greater than 3500 feet.

Recharge of the aquifers is mainly by infiltration throughout the area of precipitation. Recharge to the shallow aquifers may also be due to upward movement of the water in deeper aquifers.

Only the Fort Union Formation appears to be under artesian pressure. The Wasatch aquifers generally are unconfined. Water drawn from the wells in the area have generally been found to be of a fairly high quality, as denoted in Table 1 for the major constituents, although waters in the shallow aquifers have been found to contain relatively high concentrations of uranium and radium, as listed in Table 2. The locations of the sampling wells are illustrated on Fig. 7.

2.2.4 Seismology

Although not noted for seismic activity, Wyoming and its surrounding regions has had a large number of moderate-intensity earthquakes over the period of record of about 100 years. Most of the significant earthquakes in the region encompassing Wyoming fall in a relatively narrow envelope that has four zones radiating from a common center in the vicinity of Granite Mountains, approximately 100 miles southwest of the site. One of these zones runs roughly northeastward from the Granite Mountains. The Kerr-McGee permit area lies roughly in the center of this zone. However, no earthquakes have been recorded at the permit area. The earthquake recorded nearest the permit area is presumed to be an earthquake that occurred in 1897 at Casper (35 miles from the site), with a probable maximum intensity of VII.

3.0 CONTROL OF EFFLUENTS

3.1 EXISTING DISCHARGE SYSTEM

Minewater extracted during the mining process is currently treated and discharged from the site via local drainage systems. The discharge from the Bill Smith Mine can range up to 1700 gpm, whereas the surface mines (28-33 Pit and 3-[illegible] Pit) each discharge roughly 50 gpm. The minewater discharge is authorized under NPDES permits valid to 1983. Table 3 lists, for example, the effluent limitations and monitoring requirements specified in the NPDES permit for the discharge from the Bill Smith Mine.

The quality of minewater prior to treatment is relatively high compared to the EPA drinking water standards, with the exception of radioactivity level, as given under "Mine Discharge" in Tables 1 and 2 for the major constitutents and radioactive trace elements. After treatment, which mainly involves radium precipitation with barium chloride and removal of other constituents as necessary to meet the NPDES permit standards, and settlement of suspended solids in the settling ponds, the minewater is released to the local drainage, which ultimately leads to a surface water in the region.

Table 1. MAJOR CONSTITUENTS, WATER QUALITY ANALYSES

Wyoming Well Number	Kerr-McGee Source Numeration	pH (units)	Spec. Cond. (μmhos/cη)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	HCO_3 (mg/l)	SO_4 (mg/l)	Cl (mg/l)
Surface Stations									
35-74-18ba	CR-403	7.8	850	78	38	36	190	280	9
36-73-7ac	SPR-201	7.2	560	59	25	10	210	120	6
36-73-3cb2	CR-401	7.6	-	94	19	22	240	110	<4
37-73-9da	Pit #1	7.1	600	75	24	11	200	140	7
37-73-10ba2	SPR-203	7.6	490	57	20	8	210	55	6
37-73-22aa	SPR-202	7.6	-	103	27	35	290	170	4
37-73-33dc	SPR-204	6.8	-	20	5	2	86	13	<5
38-73-34ab	CR-402	7.0	2400	240	160	130	210	1200	29
Shallow Wells (0-200 ft deep)									
34-74-2dd		8.0	-	142	17	28	30	178	24
35-74-1ad	WW-105	7.5	430	51	16	6	230	44	<5
36-73-27ab		7.7	-	69	15	53	260	136	4
36-73-30aaa	WW-111	7.6	-	44	18	12	170	46	20
36-73-30ad	WW-112	7.7	1100	100	44	56	380	220	57
36-74-13bb	WW-116	7.4	520	61	21	8	250	70	9
36-74-18ca		7.8	-	82	21	21	236	98	13
36-74-20da	WW-107	7.4	210	28	10	5	86	28	<5
36-74-24ca	WW-105	-	-	37	21	10	220	110	9
36-74-26ba	WW-109	7.6	690	84	26	12	300	110	16
37-73-19dc	WW-119	-	-	120	28	7	366	109	4
37-73-32cc	WW-108	-	-	31	16	7	240	54	<5
37-74-14ab		-	-	50	8	21	195	41	3
37-74-35dc	WW-121	7.4	960	100	41	16	280	300	43
37-74-36ad	WW-117	-	-	80	16	5	299	37	1
38-73-33cc2	FW-303S	7.5	480	30	5	71	270	47	<5
38-74-13db		7.9	-	343	81	62	352	980	14

Table 1. (Continued)

Wyoming Well Number	Kerr-McGee Source Numeration	pH (units)	Spec. Cond. (µmhos/cn)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	HCO_3 (mg/l)	SO_4 (mg/l)	Cl (mg/l)
Deep Wells (>200 ft deep)									
35-74-7aa	WW-101	-	-	97	16	37	193	220	8
35-74-12ac	WW-102	-	-	91	13	27	264	115	10
36-72-9dd		7.7	-	36	9	146	184	278	5
36-72-29ba		6.6	-	45	7	94	220	160	4
36-74-25cc	TW-2	7.5	790	83	28	29	220	210	<5
36-74-25dd	TW-1	7.2	770	81	25	30	230	180	<5
36-74-27cd	WW-110	7.5	-	75	23	4	280	44	<4
36-74-36ab	WW-103	7.3	440	46	15	13	200	63	<5
36-75-9cc		6.9	-	40	11	6	94	75	2
37-73-8ac	WW-115	7.2	400	25	8	38	100	90	<5
37-73-10ba	WW-114	8.1	-	16	4	100	200	65	4
38-73-17ab		-	-	13	4	79	226	33	2
38-73-27cd	FW-302	7.8	-	34	7	60	220	82	5
38-73-33cc2	FW-303D	7.4	600	52	13	48	200	150	<5
Mine Discharge									
36-74-36ab4	Pond #3	-	-	54	19	28	-	190	-
36-74-36ba	D-0	6.9	770	77	25	28	220	220	<5
36-74-35db	D-4	7.2	690	75	24	27	160	200	<5
35-74-2d	D-5	7.3	710	67	25	28	180	200	<5

Table 2. RADIOACTIVE TRACE ELEMENTS, WATER QUALITY ANALYSES

Wyoming Well Number	Kerr-McGee Source Numeration	Uranium (mg/l)	Radium-226 (pCi/l)	pA (See Note)	Gross Alpha (pCi/l)	Gross Beta (pCi/l)
Surface Stations						
35-74-18ba	CR-403	0.031[a]	1.37	2.71	44	<18
36-73-7ac	SPR-201	0.078[a]	2.33	3.10	61	31
36-73-3cb2	CR-401	0.021	0.94	2.70	-	-
37-73-9da	Pit #1	6.5[a]	22.04	5.28	4200	540
37-73-10ba2	SPR-203	0.20[a]	1.27	3.96	160	<18
37-73-22aa	SPR-202	0.085	0.66	4.45	-	-
37-73-33dc	SPR-204	0.103[a]	0.010	9.07	115	35
38-73-34ab	CR-402	0.065	1.71	3.23	55	<18
Shallow Wells (0-20 ft deep)						
34-73-2dd		-	-	-	-	-
35-74-1ad	WW-105	0.030	0.643	3.44	34	23
36-73-27ab		-	-	-	-	-
36-73-30aaa	WW-111	0.140	1.97	3.86	-	-
36-73-30ad	WW-112	2.3	3.68	6.03	1600	730
36-73-13bb	WW-116	0.071[a]	0.79	4.09	83	36
36-74-18ca		-	-	-	-	-
36-74-20da	WW-107	0.016[a]	0.28	3.64	19	26
36-74-24ca	WW-106	0.034	0.88	3.25	-	-
36-74-26ba	WW-109	0.089[a]	0.40	5.0	84	51
37-73-19dc	WW-119	0.080	1.28	3.73	-	-
37-73-32cc	WW-108	0.036	3.73	1.86	-	-
37-74-14ab		-	-	-	-	-
37-74-35dc	W-121	0.180[a]	1.81	4.19	170	74
37-74-36ad	WW-117	0.14	5.18	2.89	-	-
38-73-33c:2	FW-303S	<0.002[a]	0.41	1.18	<9	18
38-74-13db		-	-	-	-	-
Deep Wells (>200 ft deep)						
35-74-7aa	WW-101	0.014	-	-	-	-
35-74-12ac	WW-102	0.029	0.6	3.47	-	-
36-72-9dd		-	-	-	-	-
36-72-29ba		-	-	-	-	-
36-74-25cc	TW-2	0.016	28.71	+0.99	100	<18
36-74-25dd	TW-1	0.014	22.52	+0.88	70	<18
36-74-27cd	WW-110	0.086	1.30	3.79	-	-
36-74-36ab	WW-103	0.028[a]	0.99	2.94	50	18
36-75-9cc		-	-	-	-	-
37-73-8ac	WW-115	<0.002	0.14	2.25	<9	28
37-73-10ba	WW-114	<0.002	0.81	0.50	-	-
38-73-17ab		-	-	-	-	-
38-73-27cd	FW-302	<0.002	0.61	0.78	-	-
38-73-33c2	FW-303D	<0.002[a]	0.761	0.56	<9	<18

Table 2. (Continued)

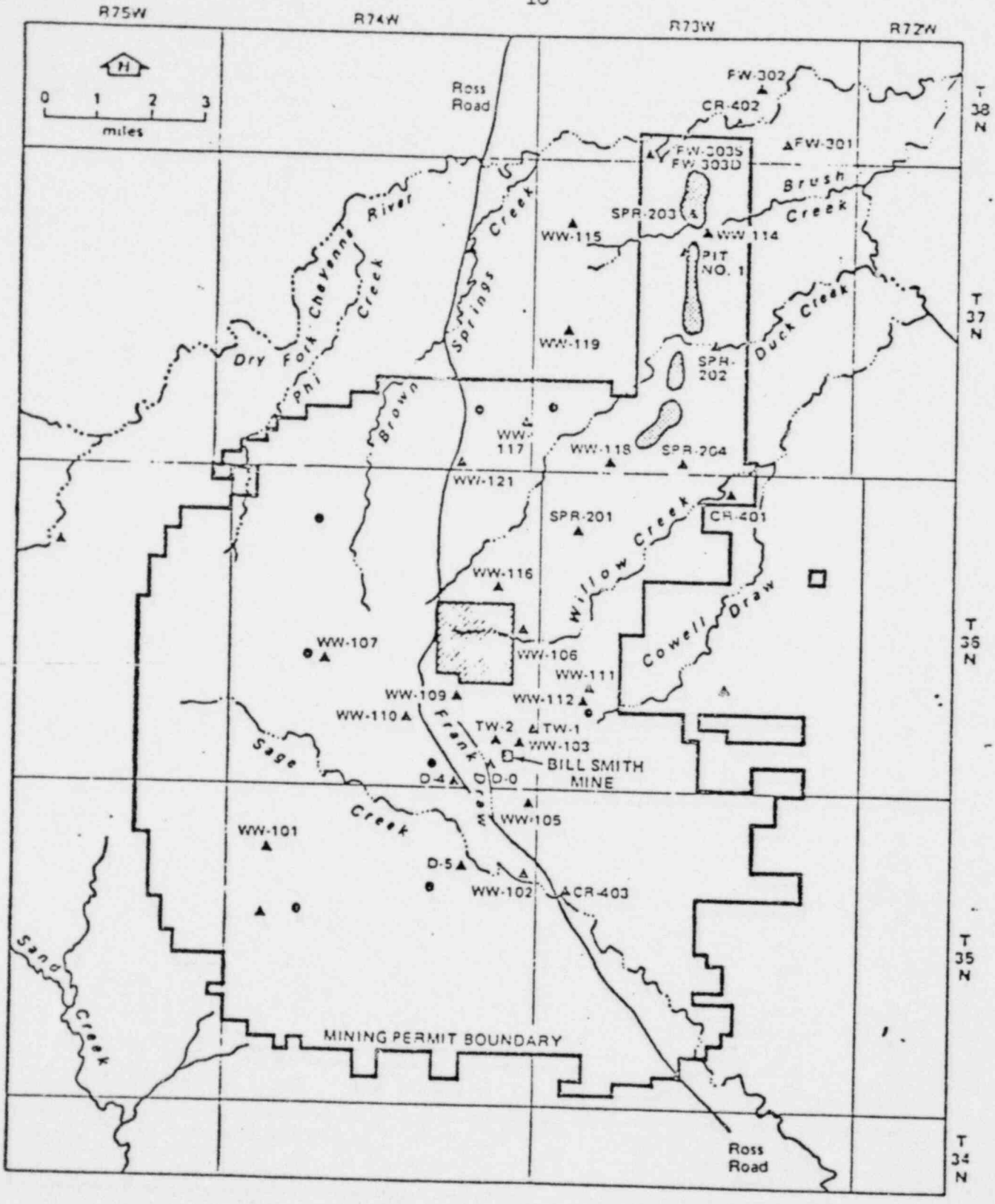
Wyoming Well Number	Kerr-McGee Source Numeration	Uranium (mg/l)	Radium-226 (pCi/l)	pA (See Note)	Gross Alpha (pCi/l)	Gross Beta (pCi/l)
Mine Discharge						
36-74-36ba4	Pond #3	0.014	1.92	1.58	-	-
36-74-36ba	D-0[b]	0.027	1.92	2.24	62	<18
36-74-35db	D-4[b]	0.034	5.86	1.37	59	<18
35-74-2d	D-5[b]	0.037	1.78	2.63	53	<18

Note: $pA = -\ln \frac{Ra}{U}$

Dash indicates no data available.

[a]Water samples in which thorium-230 was detected at levels approximately twice the analytical error.

[b]Sampling sites D-0, D-4, and D-5 are downstream from Pond #3.



▲ Water quality sampling location. When indicated, number is Kerr-McGee sampling location.

Figure 7. WATER QUALITY SAMPLING LOCATIONS (June 1969 to September 1976)

Table 3. Bill Smith Mine Effluent Limitations and Monitoring Requirements

1. During the period beginning immediately and lasting through March 31, 1983, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations* kg/day (lbs/day)		Concentration mg/l		Monitoring Requirements	
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow - MGD	N/A	N/A	N/A	N/A	Continuous	Daily Total
Total Suspended Solids	N/A	N/A	20	30	Monthly	Composite
Total Zinc	N/A	N/A	.5	1.0	Quarterly	Grab
Dissolved Radium 226**	N/A	N/A	3(pc/1)	10(pc/1)	Monthly	Composite
Total Radium 226	N/A	N/A	10(pc/1)	30(pc/1)	(Monitoring of this parameter not req	
Dissolved Alpha Emitting Radium Isotopes**	N/A	N/A	5(pc/1)	15(pc/1)	Monthly	Composite
Total Uranium(as U)***	N/A	N/A	2.0	4.0	Monthly	Composite
COD	N/A	N/A	100	200	(Monitoring of this parameter not requi	

The oil and grease concentration shall not exceed 10 mg/1 in any single grab sample and shall be monitored visually.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored quarterly with a grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): At the outfall from the final treatment unit and prior to admixture with dilutent water or the receiving stream.

In addition to the above daily maximum concentration limitation, the analysis of any single properly preserved grab sample, shall not exceed 150 percent of the daily maximum concentration(1.5 times the limitation) for the parameter(s) Total Suspended Solids, Dissolved Radium 226, Total Radium 226, Total Alpha Emitting Radium Isotopes and Total Uranium(as U).

untreated overflow from facilities designed, constructed and operated to treat the mine drainage and runoff at the treatment facility resulting from the 10 year - 24 hour precipitation event(2.5 inches) ll not be subject to these limitations.

permittee must monitor at least one of these parameters. He need not monitor both.

3.2 PROPOSED PLANT OPERATIONS AND WASTE STREAMS

Each of the three IX units will be independently operated with the anticipated minewater flows for each location as follows: Bill Smith Mine, approximately 1700 gpm; 28-33 Pit, approximately 50 gpm; 3-10 Pit, approximately 50 gpm. Upon loading of the resin for a particular column, that resin will be transported via an enclosed trailer to the central elution facility. The resin will be eluted, the uranium precipitated, and the wet product stored in the shipping unit until a full shipment is ready for transportation off-site.

Waste solutions will be generated at the central elution facility and will consist of filtrate and wash water from the uranium precipitation process and the occasional wash of the resin. These waste streams will be piped, at an average discharge rate of 2 gallons per minute, to a solar evaporation pond. The average volume of liquid wastes in the pond during normal operations will be approximately 17 acre-foot.

The waste streams to the evaporation pond will contain contaminants at the following approximate levels:

Parameter	Level
CL	3,000 - 5,000 ppm
Na	2,000 - 4,000 ppm
SO_4	500 - 1,000 ppm
NH_4	200 - 700 ppm
Ra-226	100 - 300 pCi/l
U	1 - 5 ppm
Th-230	10 - 30 pCi/l

These figures are esimates based on calculations using the concentrations of the process constituents, that is, based on actual chemical content of the process streams. From these levels of contaminants, it is estimated that roughly 500 tons of residue salts may accumulate in the evaporation pond over the 16 years of the project, consisting of approximately 80% sodium chloride, 14% sodium sulfate, 4% ammonium chloride and ammonium sulfate; the remainder will be calcium, magnesium, iron, uranium. Based on these calculated values, it is estimated that the activity levels of the residues will be approximately 75 pCi/gm (total activity, primarily radium).

The processed minewater will be treated with $BaCl_2$ to remove radium to meet the discharge limits, pumped to the existing settling ponds and, after settlement, will be discharged as originally done pursuant to the NPDES permits. Figure 3 shows, for example, the arrangement of the facilities at the Bill Smith Mine. It is estimated that the resulting Ba(Ra) SO_4 precipitated from the $BaCl_2$ treatment will accumulate in the settling ponds as follows for each of the three IX sites:

Site	Tons
3 10 Pit	30
28 - 33 Pit	30
Bill Smith Mine	900

Although contaminant levels of these solids in the evaporation and settling ponds have not been assessed, concentrations of contaminants would not be above those which would exist without the ion exchange project, since the ion exchange process does not add any radionuclides or other chemicals to the minewater. Nonetheless, the staff is requiring, as a part of its licensing conditions, that KMNC maintain a monitoring and periodic sampling program to determine what the constituents and the activity levels of the accumulated solids are. At a minimum, the following constituents of the settling ponds shall be monitored on a yearly basis: radium, thorium, uranium, total alpha activity, and total beta/gamma activity. In addition, the accumulated solids of the evaporation pond shall be analyzed on a yearly basis for the following: chloride, sodium, sulfate, ammonium, radium, uranium, thorium, gross alpha, and gross beta. The results of this monitoring program shall be recorded and reported to the NRC on a yearly basis.

It is apparent from the preceding that the proposed operation will result in a further purification of the waste streams currently released to the surface waters. Removal of uranium from minewater prevents any further dispersal of this nuclide into the surroundings. This results in a positive impact on the surrounding populations and the environment.

Since the proposed project involves liquid streams in hydrometallurgical processes and the final product is packaged wet, there should be no atmospheric releases of any significant magnitude. Consequently, no impacts are expected from gaseous contaminants such as radon, which will be at levels no greater than without the project.

The liquid and solid wastes collected in the evaporation pond and the settling ponds will be retained until termination of operations, at which time the wastes will be dried and the remaining solids will be permanently disposed in a licensed permanent tailings disposal site or other licensed burial grounds. The amounts of these solid wastes as described above are relatively small. Therefore, the staff considers that impact resulting from the permanent disposal of such wastes in a large, conventional tailings disposal area will be negligible. This mode of disposal will also avoid proliferation of hazardous waste sites. The staff is requiring this through license conditions.

The resins will be transported in an enclosed trailer, which will be towed by a truck, between the elution facility and the IX facilities. No wastes are expected to be generated from this step other than normal vehicle exhausts. Spent resins will also be disposed of at an existing licensed disposal site.

The wet cake (ammonium diuranate) product will be stored on site in a storage tank until a full load is ready for shipment. The product will be shipped to the KMNC uranium conversion plant near Gore, Oklahoma.

4.0 RADIOLOGICAL CONSIDERATIONS

4.1 ENVIRONMENTAL MONITORING

Since all processes are hydrometallurigical and the final product is packaged wet, there should be minimal airborne particulate radioactive material. Consequently, no off-site air monitoring is necessary. It is expected that

normal ventilation will be sufficient to prevent any buildup inside the buildings. Because any vented releases of radon off-site are expected to be small, and the nearest residence is at least two miles from the site, there will be no significant radiological impacts off-site. Radon measurements will be taken routinely during normal ventilation conditions. The staff is requiring as part of its licensing conditions that, if there is any radon buildup, extra ventilation equipment must be installed and an off-site air monitoring program be established by KMNC. Records of the radon measurements shall be maintained and reported to NRC on a quarterly basis.

Since the project does not use or discharge aqueous effluents other than the minewater in the original mining operations, the project is not expected to cause any significant changes or impacts on water quality or other hydrologic characteristics in the area. Consequently, no hydrological monitoring beyond those already specified in the NPDES permits will be necessary. However, the staff is imposing a license condition that all discharges of processed minewater from the IX operations must be verified, through quarterly reports to the NRC, to meet the standards as specified in the NPDES permits.

The solar evaporation pond will be equipped with an impervions liner (30 mil reinforced hypalon) to minimize seepage. As an additional measure for safety, the staff is requiring through license conditions that the evaporation pond be redesigned to consist of two cells separated by a dividing dam. This will provide for added degree of safety in that independent storage by one cell is possible if the other fails to contain the wastes. In addition, the staff is requiring, through license conditions, that KMNC install an independent leak detection system beneath each of the cells of the evaporation pond to monitor for any leaks through the liner. The system shall consist of a network (at roughly 50 ft. intervals) of 2-inch, slotted PVC pipes imbedded in the sand below the liner and a stand pipe from which water samples will be collected. The bottom of the cells will be sloped with a gradient of 3° or more toward the collection pipes, so that any leakage will be directed to flow toward the pipes and collected. The pipes shall be laid down in depressed trenches located at the lowest points of the slopes (see Figure 8). Samples shall be taken from this leak detection system at two week intervals to insure the pond is not leaking (Some water may be collected at times by the leak detection system due to seepage of moisture, for example, from rainwater infiltration, etc.). The following constituents shall be analyzed: chloride, sodium, sulfate, ammonium, radium, gross alpha, and gross beta. The NRC will be notified immediately if the concentrations of any of these constituents in the water are found to be approaching or above drinking water standards, as recommended by the National Academy of Science for sodium and ammonium, and by EPA for the other constituents. KMNC shall take corrective action in the case of a leak; KMNC must file a report to the NRC describing the corrective action and the results of that action within one month of first notifying the NRC. If KMNC does not believe there is need to take any action (e.g., there is no leak or no significant environmental hazard), KMNC shall submit a report to NRC, within two weeks of first notifying the NRC, to discuss and support its decision.

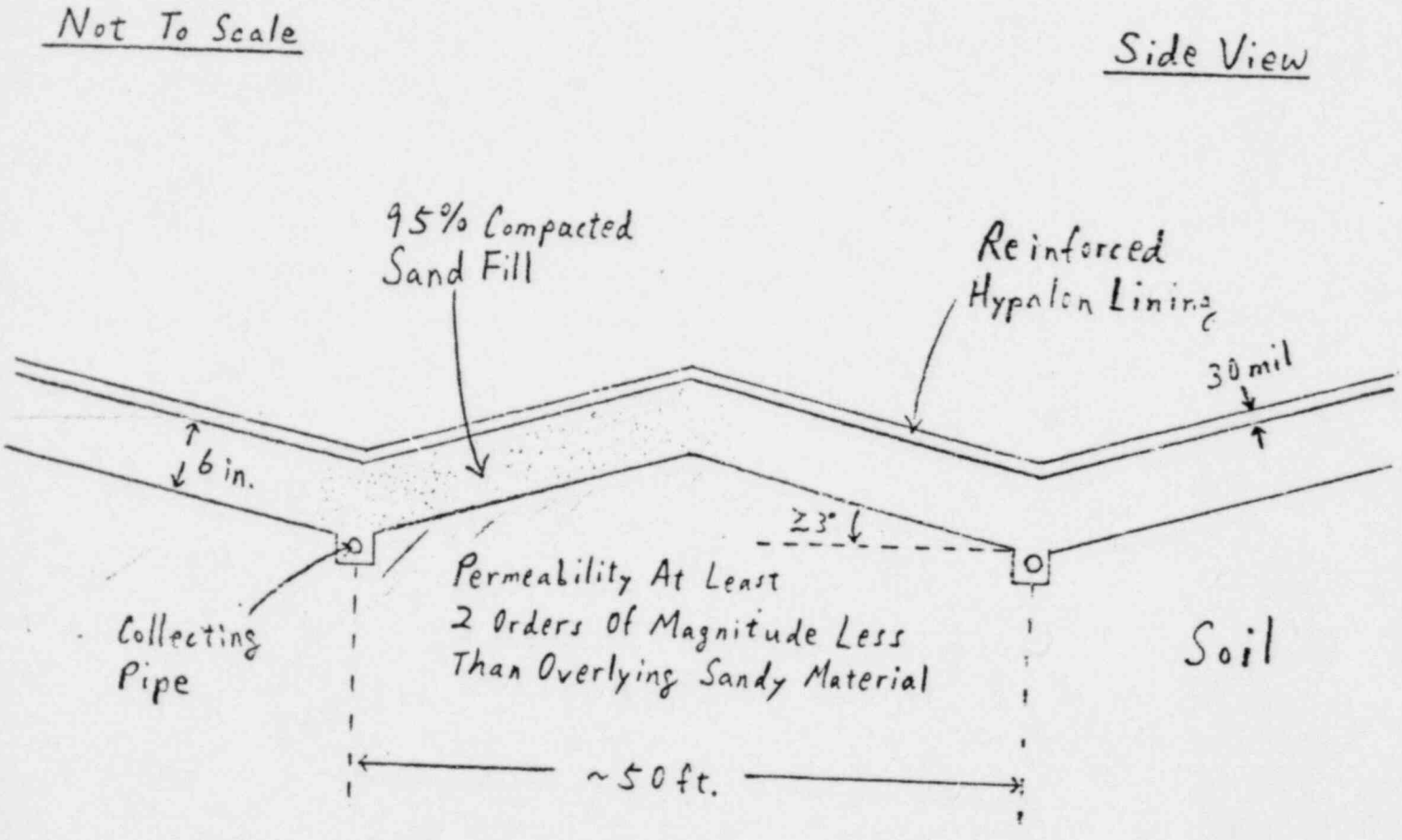


Figure 8. Leak Detection System

The staff is requiring, as a license condition, that KMNC submit to the NRC, prior to discharging any wastes into the evaporation pond, a contingency plan describing the corrective actions to be taken in the case of a major leak from either cell of the pond, or where either cell has been determined to be incapable of effectively containing the wastes. KMNC must obtain written approval of the plan prior to discharging any wastes into the pond.

In addition, the staff is requiring as part of the license conditions, that KMNC submit, prior to construction of the pond, the following information and that KMNC obtain written approval of the final design of the pond prior to initiating pond construction.

- Outside slope and height above grade of the Earth Fill Dike around the pond.
- Description and properties of material used for the Dike, including
  - grain size analysis; Atterberg limits; moisture-density relationship; and
  - compaction criteria to be applied in the field.
- Evaluation of freeboard consistent with Reg. Guide 3.11 requirements.
- Investigation of foundation conditions, including
  - boring data (standard penetration test); and
  - laboratory testing results (shear strength, consolidation properties, and permeability).

4.2 OCCUPATIONAL AND IN-PLANT SAFETY

The staff, through license conditions, is requiring an overall radiation safety program that contains the basic elements required for, and found to be effective at, other source material extraction operations to assure that exposures are kept as low as reasonably achievable (ALARA). The scope of the program has been geared to account for the small size of the proposed R&D project. In general, the program will include the following:

1) airborne and surface contamination sampling and monitoring;
2) personnel exposure monitoring;
3) qualified management of the safety program and training of personnel;
4) written radiation protection procedures; and
5) periodic audits by highly qualified outside parties and frequent inspections to assure the program is being conducted in a manner consistent with the ALARA philosophy.

The staff considers the program of in-plant safety, as required by license conditions, sufficient to protect in-plant personnel by keeping radiation dose as low as reasonably achievable.

All equipment (including columns, tanks, and pumps) will be placed on a concrete base designed with curbs to contain the largest single potential spill and to prevent contamination of the soil. Resin transfer points (e.g., between IX column and trailer) will be situated above the curbed concrete base so that potential spills during transfer will be contained. Any spills that do occur will be cleaned up using floor sumps, and repair and decontamination will be conducted before operations will resume.

Access to the site will be restricted by enclosing the project areas with security fencing. The solar evaporation pond, 3/4 acre in area, will also be posted with radiation warning signs. Entrances into the process buildings will be conspicuously posted with the following warning: "CAUTION: Any area or room within this facility may contain radioactive material." KMNC has requested, in the application for this project, exemption with respect to Section 20.203, 10CFR20, for posting areas within the process facility.

The staff considers the provisions of the above in-plant monitoring and aqueous effluent monitoring (required by NPDES permits) systems, and safety measures as supplemented by license conditions, to be adequate for the proposed project. KMNC is therefore granted exemption with respect to Section 20.203, 10CFR20, for posting areas within the process facility.

4.3 ACCIDENT POTENTIAL

Potential accidents are classified by the staff as: trivial incidents (no release of radioactive material to the environment); small releases to the environment (relative to the annual release from normal operations); and large releases to the environment (relative to the annual releases from normal operations). Spills, tank ruptures, and pipe ruptures are considered to be examples of trivial accidents since these involve relatively small quantities of aqueous contaminants which are easily contained on-site and which can be relatively quickly cleaned up before spreading. A fire and/or explosion in the facilities is considered as a potential accident that may release small amounts of radioactivity to the environment relative to normal annual operational releases. Finally, a tornado strike can be classified as a potential large release event.

The staff considers the probabilities of occurrence of large events at the site as negligibly low. Although small accidents such as fires are possible in the plant, these are also not likely due to the nature of the processes involved. However, dry chemical and CO_2 foam fire extinguishers will be available in the processing areas. Only those events classified as trivial incidents have relatively significant probabilities. For example, spills may occur during resin transfer between tanks and shipping trailers; however, these accidents can be relatively easily contained and cleaned up, as described in Section 4.2. The staff considers the in-plant monitoring systems and safety measures are sufficient to detect and allow operating personnel to cope

with any credible trivial incidents that may occur in the plant. The staff concludes also that any potential release off-site of radionuclides due to these trivial accidents should they occur would result only in negligible impacts to the environment and the surrounding population. Accidents may occur during transportation of resins on site; however, the probabilities of on-site vehicle accidents are relatively minor since the numbers of shipment and distances traveled are limited. The consequences of a vehicular accident would also be relatively insignificant since the resins are contained in an enclosed trailer, and rupture of the trailer tank is unlikely under credible situations.

5.0 RECLAMATION AND RESTORATION

The proposed project will involve approximately three acres of surface disturbance for each of the three IX sites and the elution facility, including the process buildings, perimeter fencing, and associated pond areas. Access to the four facility sites will be by existing roads within the permit area with little road improvement anticipated. Topsoil removed for building or pond construction will be stockpiled and planted with a quick-growing vegetative cover for erosion control. All mine reclamation and restoration will follow the Wyoming Department of Environmental Quality, Land Quality Division, regulations.

Upon completion of the project, the buildings will be removed and the minewater ponds leveled, recontoured, covered with topsoil and reseeded. Perimeter fencing will be removed. The solar waste pond will remain fenced until disposition of the residue solids. The pond will be reclaimed subsequent to disposal of the residues. Depending upon precipitation received, additional time beyond termination of operations may be required before residue solids disposal will be performed and final cover will be placed over the evaporation pond. Reclamation of the evaporation pond will be similar to that for the minewater settling ponds. Final contours of the area following reclamation will approximate the original land contours.

The residue solids from the evaporation pond, along with the solid wastes from the settling ponds, will be disposed of following termination of the IX project and of minewater discharge, estimated for 1996. The solid wastes generated at the KMNC IX site will not be disposed of at the site but at a licensed tailings disposal site, as required by licensing conditions described in Section 3.2.

6.0 BASES FOR THE CONCLUSION OF A NEGATIVE DECLARATION

The environmental impact and radiation safety effects attributable to the proposed incorporation of uranium recovery operation at the existing uranium mine by KMNC under the proposed licensing action, as analyzed by the staff, are summarized as follows:

1) The population density and land use characteristics surrounding the site do not preclude the acceptability of the licensing action since the project will be located remote from population centers and will not impact the land use significantly.

2) The proposed uranium recovery operation will not impact the water resources from a consumptive standpoint since the operation does not draw on or discharge into any hydrologic units (other than the minewater itself). The project will have a positive impact on the quality of water being discharged to the surface waters in the area, due to the removal of the contained uranium.

3) Radiological releases from the uranium extraction operations will be very small (exposures which are small fractions of radiological exposure standards will result) and monitored to detect any problems.

4) Possible (credible) accidents in the facility have low probabilities and would have a negligible impact on the environment and public health and safety should they occur due to the small scale of the project and the relatively innocuous nature of the process streams.

5) All radioactive wastes will not be left on site but will be disposed of at an existing, NRC licensed tailings disposal site. The proposed restoration and reclamation plan should be sufficient to return the land to its pre-project use (or potential use).

The staff concludes that an environmental impact statement is not required under NRC regulations in 10 CFR 51.5(b) in connection with the issuance of a license to Kerr-McGee Nuclear Corporation for the proposed project. As shown in this appraisal, the environmental effects of incorporating a uranium recovery operation at the uranium mine, utilizing the minewater discharge stream as feed, is not significant.

As provided in 10 CFR Part 51.5c(1), a negative declaration has been prepared in accordance with the requirements of 10 CFR Part 51.7.

George Wu 4/8/80

George Wu
Uranium Recovery Licensing Branch
Division of Waste Management

Approved: R. J. Miller 4/8/80

H. J. Miller, Section Leader
Uranium Recovery Licensing Branch
Division of Waste Management