

VOLUME 1

BYPRODUCT MATERIAL LICENSE APPLICATION  
AND EXECUTIVE SUMMARY

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License Application

BYPRODUCT MATERIAL LICENSE APPLICATION

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**APPLICATION FOR SOURCE MATERIAL LICENSE**

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, ~~source~~ <sup>by-product</sup> material for the activity or activities described.

<p>1. (Check one)</p> <input checked="" type="checkbox"/> (a) New license <input type="checkbox"/> (b) Amendment to License No. _____ <input type="checkbox"/> (c) Renewal of License No. _____ <input type="checkbox"/> (d) Previous License No. _____		<p>2 NAME OF APPLICANT</p> <p>GULF OIL CORPORATION, Acting by and through its Division, Gulf Mineral Resources Co.</p>																	
<p>3 PRINCIPAL BUSINESS ADDRESS</p> <p>1720 South Bellaire Street Denver, Colorado 80222</p>		<p>4 STATE THE ADDRESS(ES) AT WHICH <del>source</del> <sup>by-product</sup> MATERIAL WILL BE POSSESSED OR USED</p> <p>Section 1, T13N, R8W, McKinley County, New Mexico; Sections 10, 11, 14 &amp; 15, T14N, R8W, McKinley County, New Mexico; Corridor of land north from Section 1, T13N, R8W, to Section 14, T14N, R8W.</p>																	
<p>5 NAME OF PERSON TO BE CONTACTED CONCERNING THIS APPLICATION</p> <p>W. L. Rogers, Manager, Environmental Affairs</p>		<p>6 TELEPHONE NO. OF INDIVIDUAL NAMED IN ITEM 5</p> <p>303/758-1700</p>																	
<p>7 DESCRIBE PURPOSE FOR WHICH <del>source</del> <sup>by-product</sup> MATERIAL WILL BE USED</p> <p>Tailings are a by-product of uranium milling operation, and therefore will not be utilized, but rather will be disposed of in an environmentally acceptable manner, as described in Section 3.4, Vol. 3 of the Environmental Report.</p>																			
<p>8 STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF <del>source</del> <sup>by-product</sup> MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:20%;">(a) TYPE</th> <th style="width:25%;">(b) CHEMICAL FORM</th> <th style="width:25%;">(c) PHYSICAL FORM (Including % U or Th.)</th> <th style="width:30%;">(d) MAXIMUM AMOUNT AT ANY ONE TIME (kilograms)</th> </tr> </thead> <tbody> <tr> <td>NATURAL URANIUM</td> <td>Various uranium compounds</td> <td>0.016% U in tailings</td> <td>24 MM tons containing approx. 3.5 MM kg Uranium</td> </tr> <tr> <td>URANIUM DEPLETED IN THE U-235 ISOTOPE</td> <td align="center">-</td> <td align="center">-</td> <td align="center">-</td> </tr> <tr> <td>THORIUM (ISOTOPE)</td> <td>Thorium Compounds</td> <td>190 pCi/g (9.4 x 10<sup>-7</sup> % Th)</td> <td>207 kg</td> </tr> </tbody> </table> <p>(e) MAXIMUM TOTAL QUANTITY OF <del>source</del> <sup>by-product</sup> MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (kilograms)</p> <p>24 MM tons tailings, equivalent to 21,800 MM kg</p>				(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (Including % U or Th.)	(d) MAXIMUM AMOUNT AT ANY ONE TIME (kilograms)	NATURAL URANIUM	Various uranium compounds	0.016% U in tailings	24 MM tons containing approx. 3.5 MM kg Uranium	URANIUM DEPLETED IN THE U-235 ISOTOPE	-	-	-	THORIUM (ISOTOPE)	Thorium Compounds	190 pCi/g (9.4 x 10 <sup>-7</sup> % Th)	207 kg
(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (Including % U or Th.)	(d) MAXIMUM AMOUNT AT ANY ONE TIME (kilograms)																
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THORIUM (ISOTOPE)	Thorium Compounds	190 pCi/g (9.4 x 10 <sup>-7</sup> % Th)	207 kg																
<p>9 DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE <del>source</del> <sup>by-product</sup> MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF <del>source</del> <sup>by-product</sup> MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES</p> <p>See Section 3.4, Vol. 3.</p>																			
<p>10 LIST THE NAMES AND ATTACH A RESUME OF THE TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE OF APPLICANT'S SUPERVISORY PERSONNEL AND THE PERSON RESPONSIBLE FOR THE RADIATION SAFETY PROGRAM (OR OF APPLICANT IF AN INDIVIDUAL)</p> <p>Radiation Safety Officer - Philip W. Morton (Resume attached)          Operations Manager ) Individuals to fill these positions not yet selected.          Mill Superintendent ) Names and training will be forwarded as available.          Laboratory Superintendent)</p>																			
<p>11 DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate. The description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument).</p> <p>See Section 4.0, Vol. 4.</p>																			
<p>(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier).</p> <p>Semi-annual calibration using sources traceable to National Bureau of Standards.          Pre-use checks using vendor furnished check sources. Check sources will include alpha, beta and gamma sources.</p>																			

POOR ORIGINAL

11(c). VENTILATION EQUIPMENT WHICH WILL BE USED IN OPERATIONS WHICH PRODUCE DUST, FUMES, MISTS, OR GASES, INCLUDING PLAN VIEW SHOWING TYPE AND LOCATION OF HOOD AND FILTERS, MINIMUM VELOCITIES MAINTAINED AT HOOD OPENINGS AND PROCEDURES FOR TESTING SUCH EQUIPMENT

Not applicable to tailings management or by-product materials licensing

12. DESCRIBE PROPOSED PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND RELATE THESE PROCEDURES TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE (a) SAFETY FEATURES AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSION, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREAS

See Sections 3.4 and 6.2, Vol. 3.

(a) No potential for non-nuclear accidents within tailings management system.

by-product

(b) EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE ~~SOURCE~~ MATERIAL

See Section 7.0, Vol. 3

(c) DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES

See Section 4.0, Vol. 4

13. WASTE PRODUCTS: If none will be generated, state "None" opposite (a), below. If waste products will be generated, check here  and explain on a supplemental sheet:

(a) Quantity and type of radioactive waste that will be generated.

None, other than the tailings or by-product material itself.

(b) Detailed procedures for waste disposal.

14. IF PRODUCTS FOR DISTRIBUTION TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:

NOT APPLICABLE

(a) PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.

(b) PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.

(c) BETA AND BETA PLUS GAMMA RADIATION LEVELS (Specify instrument used, date of calibration and calibration technique used) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.

(d) METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

CERTIFICATE

(This item must be completed by applicant)

15. The applicant, and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

BY: F. S. Mooney  
(Signature)

Dated July 23, 1979

F. S. Mooney  
(Print or type name)

Senior Vice-President, Uranium Operations & Marketing  
(Title of certifying official authorized to act on behalf of the applicant)

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

POOR ORIGINAL

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APPLICATION REGISTRATION  
FORMAT FROM ITEMS 8 & 9, RPS FORM 16

8. TRAINING

<u>NAME, TITLE, DEGREE</u>	<u>WHERE TRAINED</u>	<u>LENGTH OF ACADEMIC TRAINING</u>	<u>LENGTH OF ON-THE-JOB TRAINING</u>
Orton, Philip, W. MSO BS Nuclear Engineering	Kansas State University	4 years A B C D *	2 years A B C D *
	University of Maryland Graduate School	1 year A B C D	
	Walter Reed Army Medical Center	2 weeks A D	3.5 years A B C D
	Thailand		2 years B C
	Viet Nam		1 year C
	Fort Meade, MD	12 weeks A B C D	3 years A B C D
	Okinawa, Japan	2 weeks A B C D	4 years A B C D
	Environmental Hygiene Agency	2 weeks A B C D	1 year A B C D
	Gulf Oil Corporation	2 weeks A B C D	9 months A B C D
	Mine Safety & Health Administration	4 weeks A B C D	

9. EXPERIENCE WITH

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>LOCATION</u>	<u>DURATION</u>	<u>TYPE OF USE</u>
92% enriched Uranyl Sulfate solution and Fission Products		Walter Reed Research Reactor	2-1/2 years	Senior Reactor Operator (AEC Licensed); 50 KW, liquid fuel, North Carolina State Water boiler type reactor used for medical research.
41A	Kilocurie amounts	Walter Reed Research Reactor	2-1/2 years	Daily waste generated
60Co	Kilocurie amounts	Walter Reed Army Institute of Research	2-1/2 years	Supervisor of AECL Cammace11 220 and Budd Co. Small Animal Irradiator operations including source reloading
226Ra	Approximately 800 mg in various sized medical applicators	Walter Reed General Hospital	1 year	Health Physics tech; leak testing and assisting on human therapy implants
137Cs	Up to 1 kilocurie	Walter Reed AMC	1 year	HP tech; leak testing sealed and unsealed sources.
		Okinawa, Japan	4 years	Calibration and lead testing.
Standard Military Alpha, Beta & Gamma Sources	Multicurie	All of the above and Fort Meade, MD	10-1/2 years	Calibration and leak testing.
Enriched Uranium & Fission Products		Harry Diamond Labs	2-1/2 years	Alternate Member Reactor Safetuards Committee, 250 KW TRIGA MARK IV with stainless steel clad fuel.
Enriched Uranium & Fission Products		Kansas State University	2 years	Reactor Startup Crew and student user, 100 KW TRIGA MARK II with aluminum clad fuel.
Depleted Uranium		Kansas State University	4 years	Student user KSU Subcritical pile.
Ra - Be Pu - Be	Neutron sources	Kansas State University	4 years	Reactor startup sources, student user and leak testing.
Pu - Be		Walter Reed AMC Okinawa, Japan	2-1/2 years 4 years	Reactor startup sources and leak testing. Moisture density gauge & leak testing.
Atomic Numbers 3-B3 and 3H	Up to 1 curie at a time.	Walter Reed AMC	1 year	HP tech on numerous human patient procedures; receiving and shipping waste.
Neutron Activated Materials		Walter Reed Research Reactor KSU Harry Diamond Labs	2-1/2 years 2 years	Numerous materials, medicines and live animals (mice, rats, pigs, dogs, etc.).
X-Ray Units	300	Walter Reed Army Institute of Research	7 years	Supervisor, Irradiation Facilities for the Army Anti-Radiation Drug Program.
Radiation Protection Surveys	Certified by the U. S. Army Surgeon General to perform Radiation Protection Surveys (including human use), medical x-ray protection and Subchapter J certification surveys, micro-wave oven surveys and acceptance testing Instructor qualified in Nuclear, Biological and Chemical Sciences, U.S. Army Medical Field Services School. Conducted numerous radiation protection surveys over a 9 year period throughout the Continental U. S., Asia and the near East for the Army, Navy, Marine Corps and the Foreign Service, Department of State.			

- A) Nuclear physics, atomic structure, and interaction of radiation with matter
- B) Radiation detection instrumentation, calibration, and standardization
- C) Radiation protection, waste disposal, and survey and dosimetric procedures
- D) Radiobiology, including effects of radiation on the human body

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**Executive Summary**

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EXECUTIVE SUMMARY

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## PROPOSED ACTIVITIES

Gulf Mineral Resources Co., a division of Gulf Oil Corporation, proposes to construct and operate a tailings disposal system for the Mt. Taylor Uranium Mill Project. This project is located in northwestern New Mexico approximately 60 miles west northwest of Albuquerque, and 30 miles northeast of Grants. The mill facility will be located in Lower San Lucas Canyon, Section 1, T13N, R8W, McKinley County, New Mexico, approximately 3.5 miles north of the town of San Mateo. The tailings impoundment will be located in La Polvadera Canyon, Sections 10, 11, 14 and 15, T14N, R8W, McKinley County, New Mexico, approximately six miles north of the mill. Uranium ore will be supplied from the Gulf Mt. Taylor mine currently under development in Section 24, T13N, R8W, Valencia County. The mine, which lies approximately 0.5 mile northeast of the town of San Mateo is approximately three miles south of the mill.

The proposed mill will process blended ore assaying between 0.05 and 0.5 percent uranium ( $U_3O_8$ ) to a finished yellowcake product at a design rate of 4200 dry tons of ore per day. This throughput rate will produce an average 8.6 million pounds of yellowcake per year. Final yellowcake quality should assay greater than 85 percent  $U_3O_8$ . Based on current ore reserves and market assessments, the productive life of the mill will be 20 years.

Detailed design of the mill commenced in the second half of 1978, with site preparation and constructing expected to begin the first half

839 120

of 1980. Construction of the tailings dam and pond is also scheduled to commence the first half of 1980. Both the mill and tailings facility are targeted to be in operation in the last half of 1981.

Mill tailings, excepting that fraction of sands to be separated out and returned to the mine for use as backfill, will be pumped to the La Polvadera tailings impoundment. The tailings pipeline is described in Section 3.4.1 of the Environmental Report. The impoundment is sized to contain all wastes derived over the mill's 20 year operating life. The dam, which is a zoned earth and rockfill structure designed as a water-reservoir type of dam, will be constructed in four stages over the life of the project. Details on the design of the impoundment, control of fugitive dust emanating from the impoundment, and seepage evaluation can be found in Section 3.4.2 of the Environmental Report. The reclamation plan for the tailings impoundment area presently calls for placement of ten feet of earth and clay cover on top of the deactivated tailings pond. Reclamation of the tailings impoundment area is more fully discussed in Section 9.1 of the Environmental Report.

Evaluations of alternative sites for below grade burial are being developed for tailings disposal. Target completion date for this work is September 1, 1979.

---

## 2.1 GEOGRAPHY AND DEMOGRAPHY

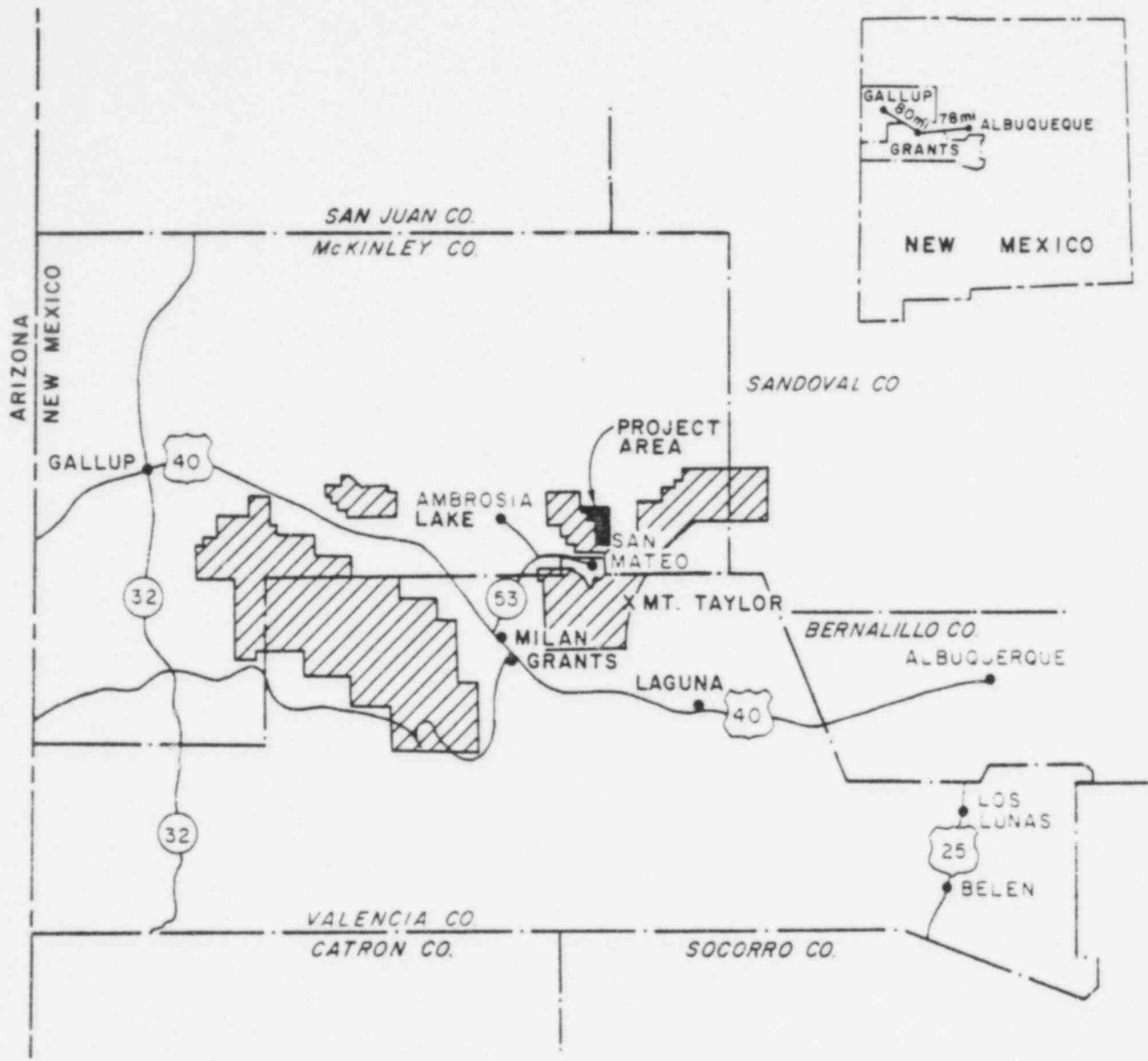
### 2.1.1 Geography

The Mt. Taylor Uranium Mill Project is located in northwestern New Mexico on the McKinley-Valencia County border, near the town of San Mateo. San Mateo lies about 30 miles northeast of Grants along Highway 53 (Figure 2.1-1). The project area lies in the eastern part of the Ambrosia Lake mining district, one of New Mexico's major uranium-producing areas. The location of the proposed mill and tailings impoundment, as well as the fenced boundaries of land used for the project, is shown in Figure 2.1-2.

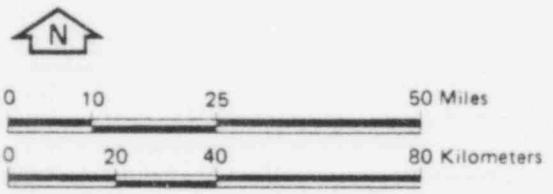
The status of land owned and leased by Gulf in the project area, and the ownership of surrounding property, is shown on Figure 2.1-3. Provisions have been made and will continue to be made for Gulf, or any assignee, to enter the premises after operations are terminated for the purpose of monitoring or maintenance in accordance with federal and/or state law.

The two water bodies in the project area, San Mateo Reservoir and Laguna Polvadera, are also noted on Figure 2.1-3. It should be pointed out that the presence of the "lake" at Laguna Polvadera is due principally to the discharge of treated mine water from the Gulf Mt. Taylor Mine.

839 122



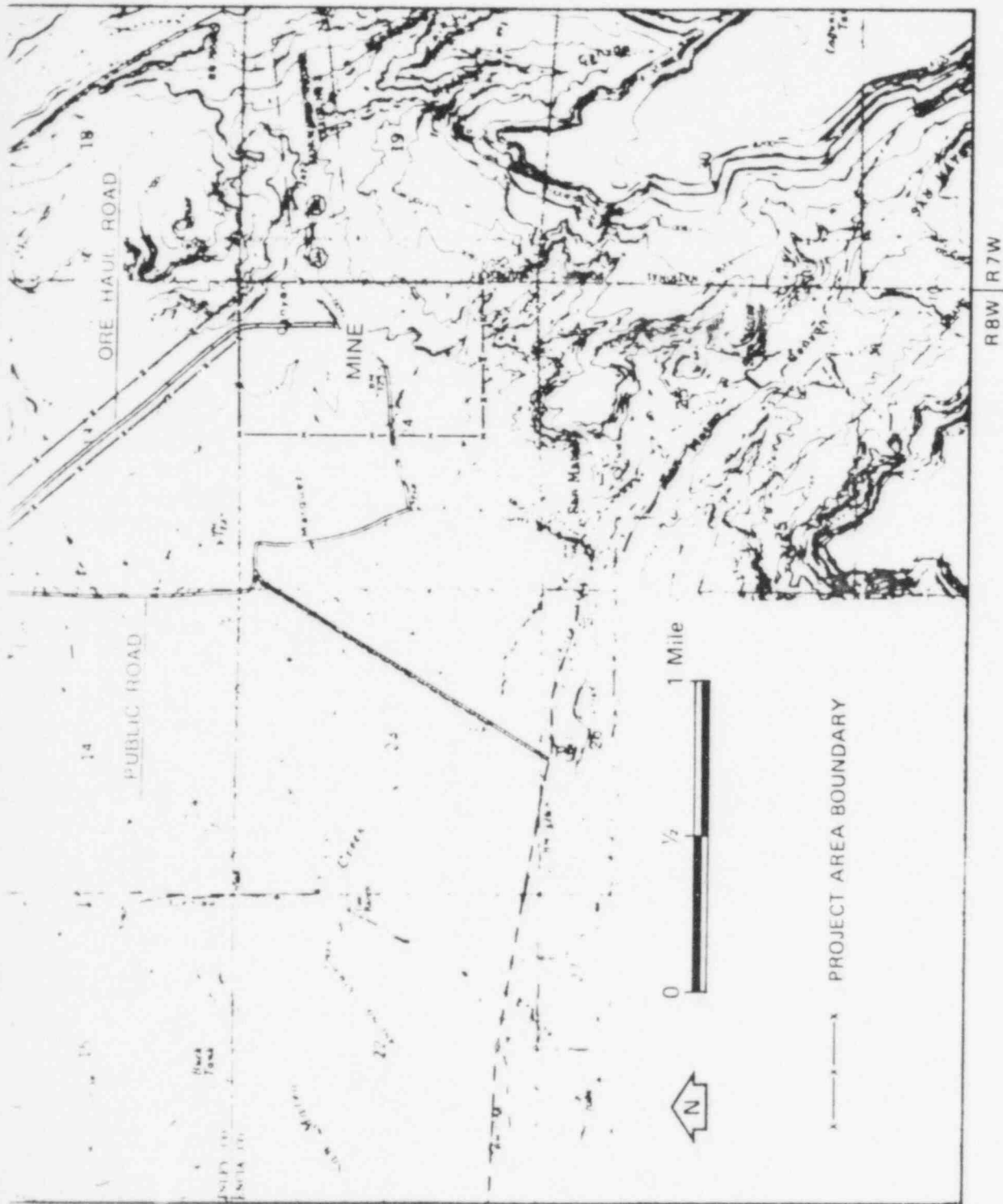
 CIBOLA NATIONAL FOREST



Source: Woodward-Clyde Consultants 1977

839 123

Figure 2.1-1.  
PROJECT LOCATION  
1-9

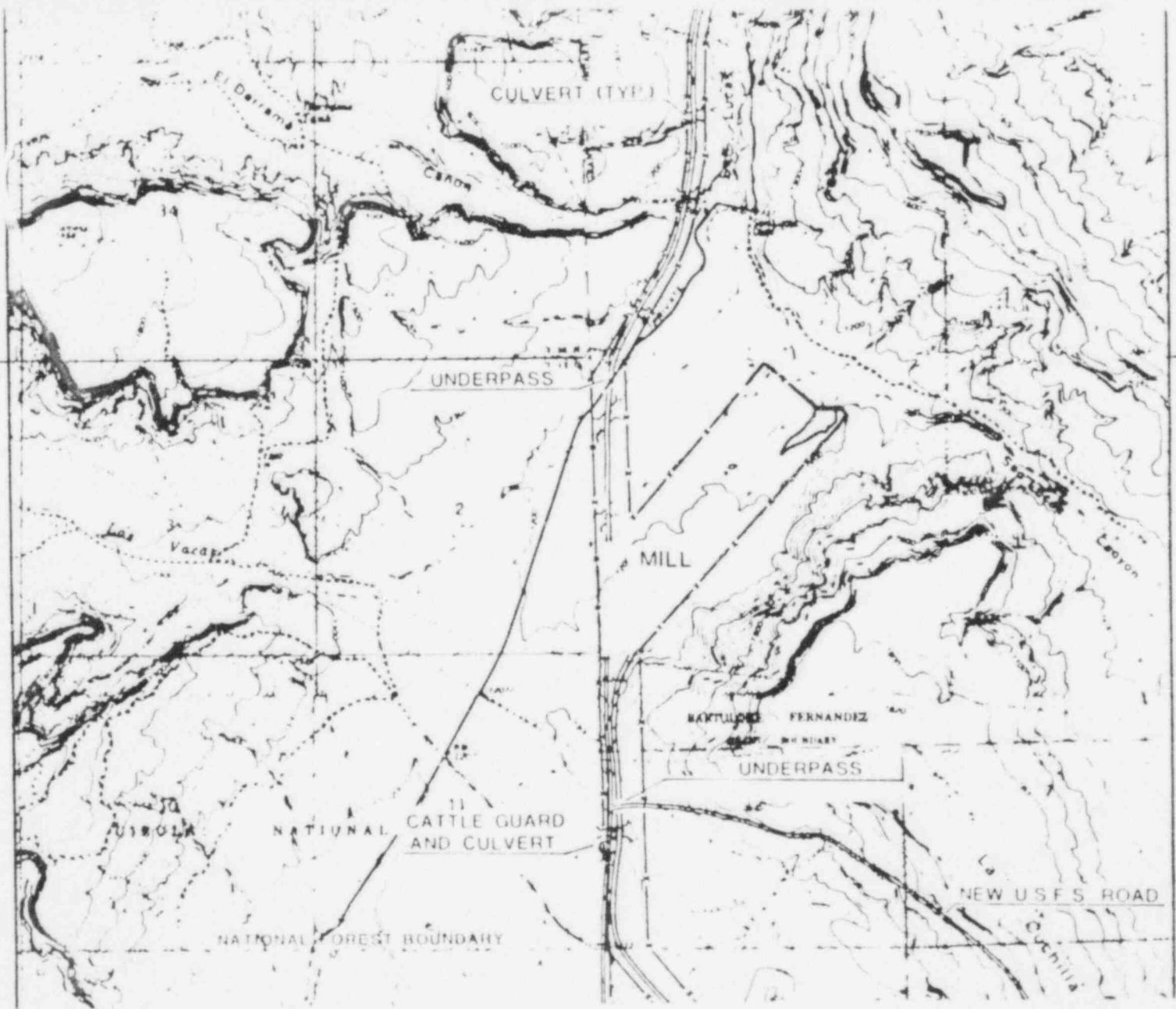


R8W R7W

POOR ORIGINAL

Figure 2.1-2.  
PROJECT LAYOUT  
1-10'

T14N  
T13N

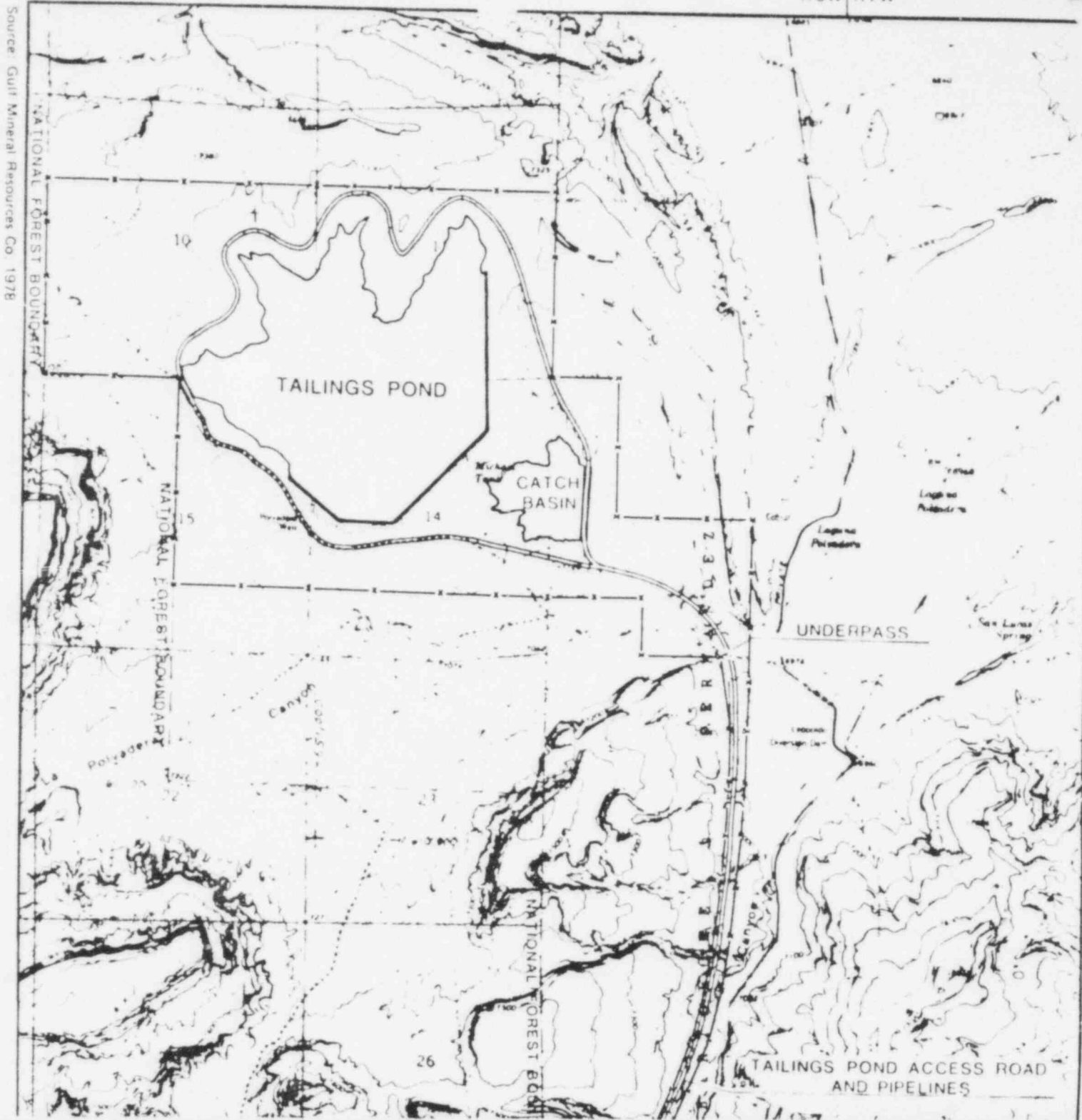


T14N  
T13N

125  
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POOR ORIGINAL

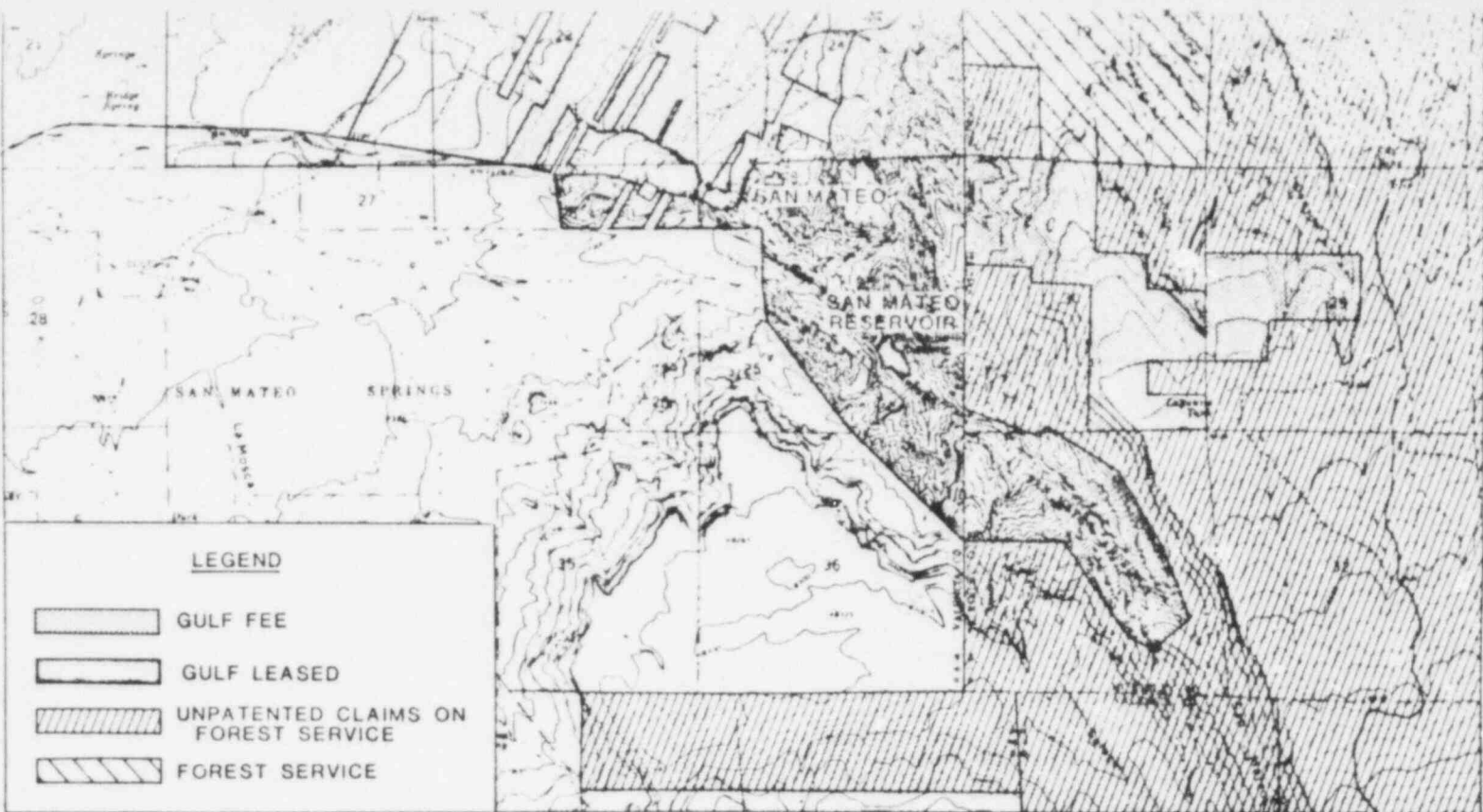




Source: Gulf Mineral Resources Co. 1978

POOR ORIGINAL

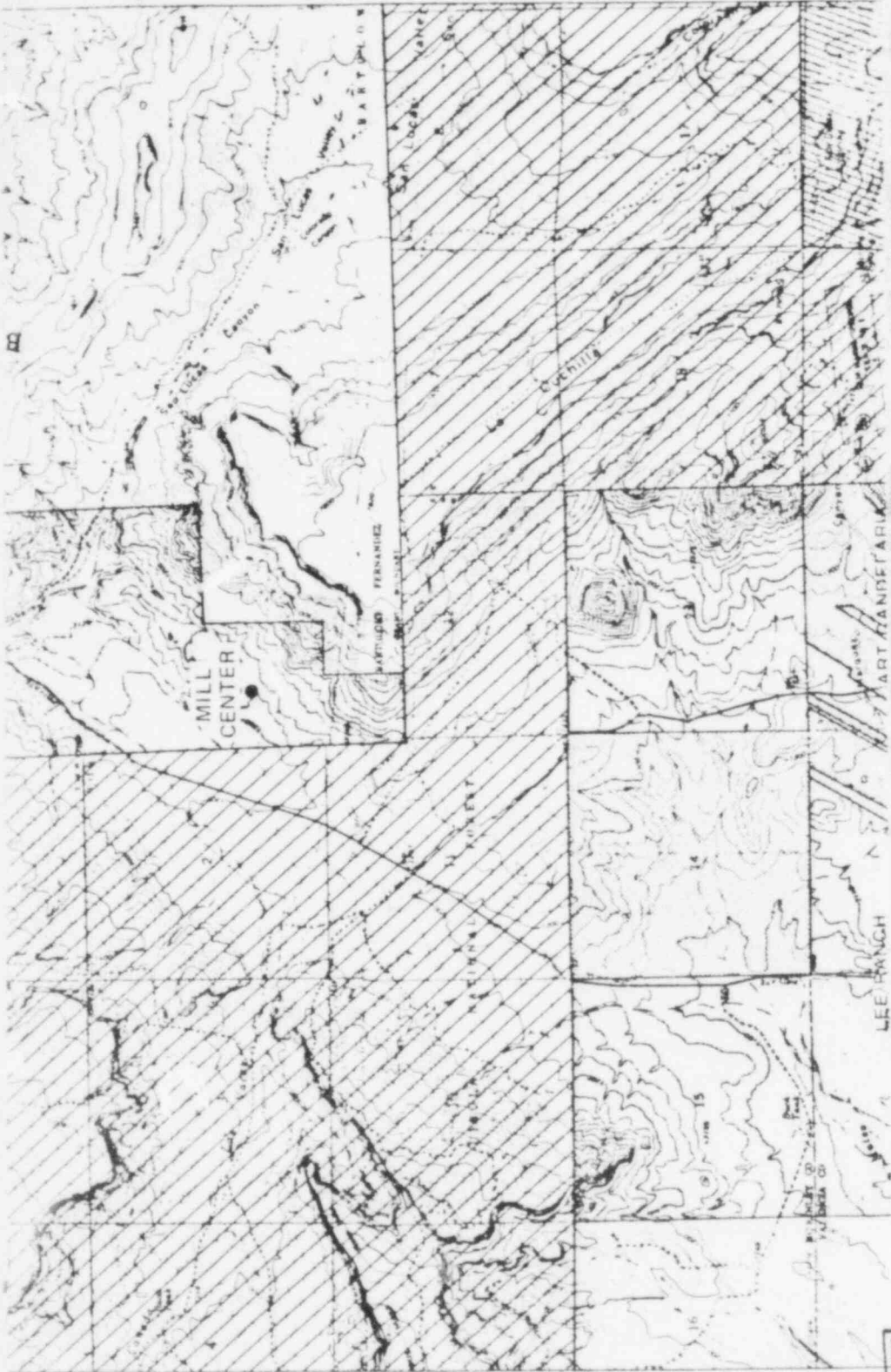
839 126



POOR ORIGINAL

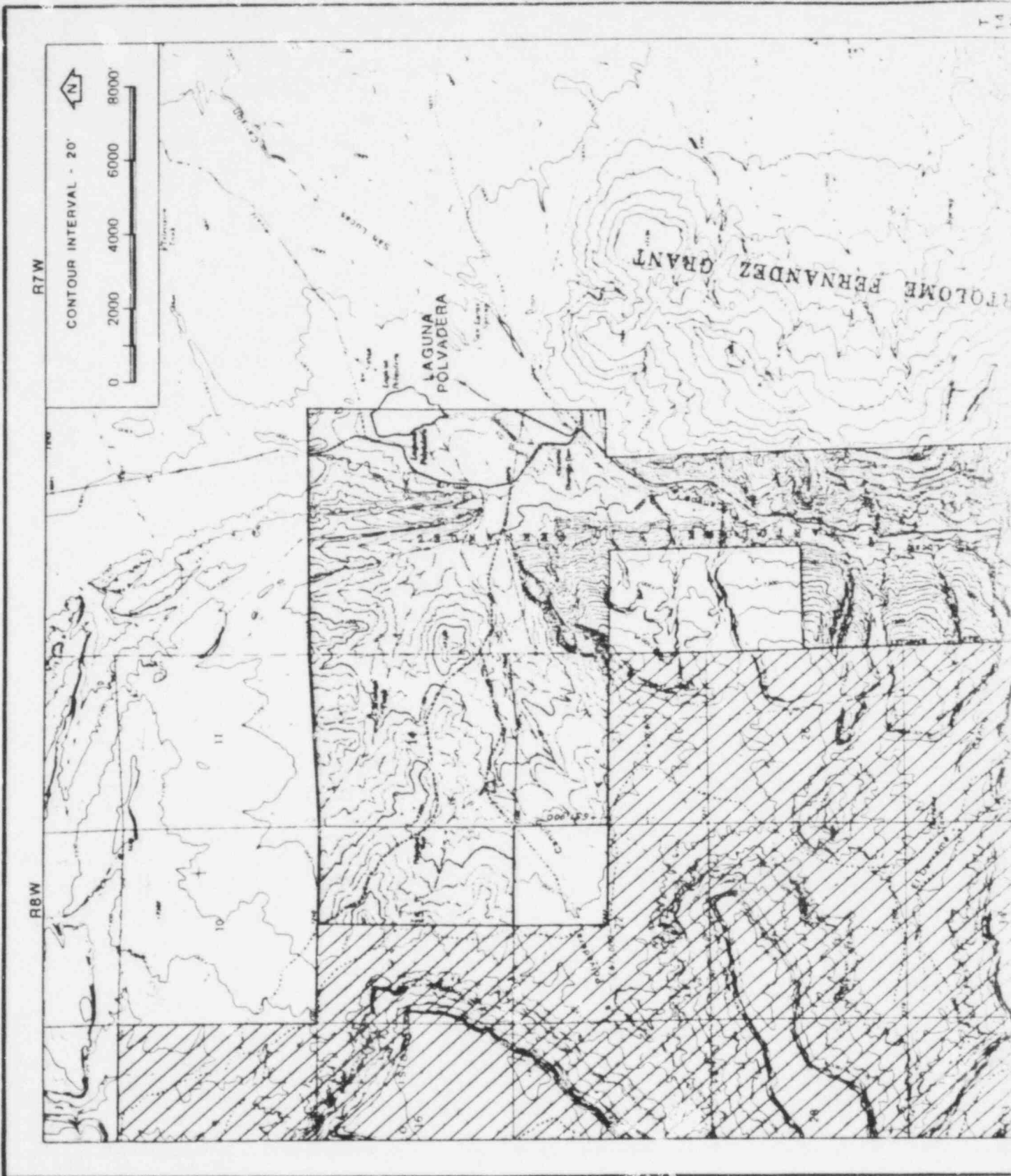
Figure 2.1-3.  
 MT. TAYLOR LAND STATUS FOR MC KINLEY  
 AND VALENCIA COUNTIES, NEW MEXICO  
 1-11

T  
13  
N



POOR ORIGINAL

839 128



Source: Gulf Mineral Resources Co.

POOR ORIGINAL

839 129

1 The most prominent topographic feature in the region is Mt. Taylor,  
2 a Miocene volcano surrounded by basalt-capped plateaus. The broad  
3 valleys of the project area are separated from the mesa tops by steep  
4 slopes abruptly dissected by arroyos. The uplands of the Mt. Taylor  
5 volcanic plateau and San Mateo mesa are part of the Cibola National  
6 Forest, which crosses the center of the project area.

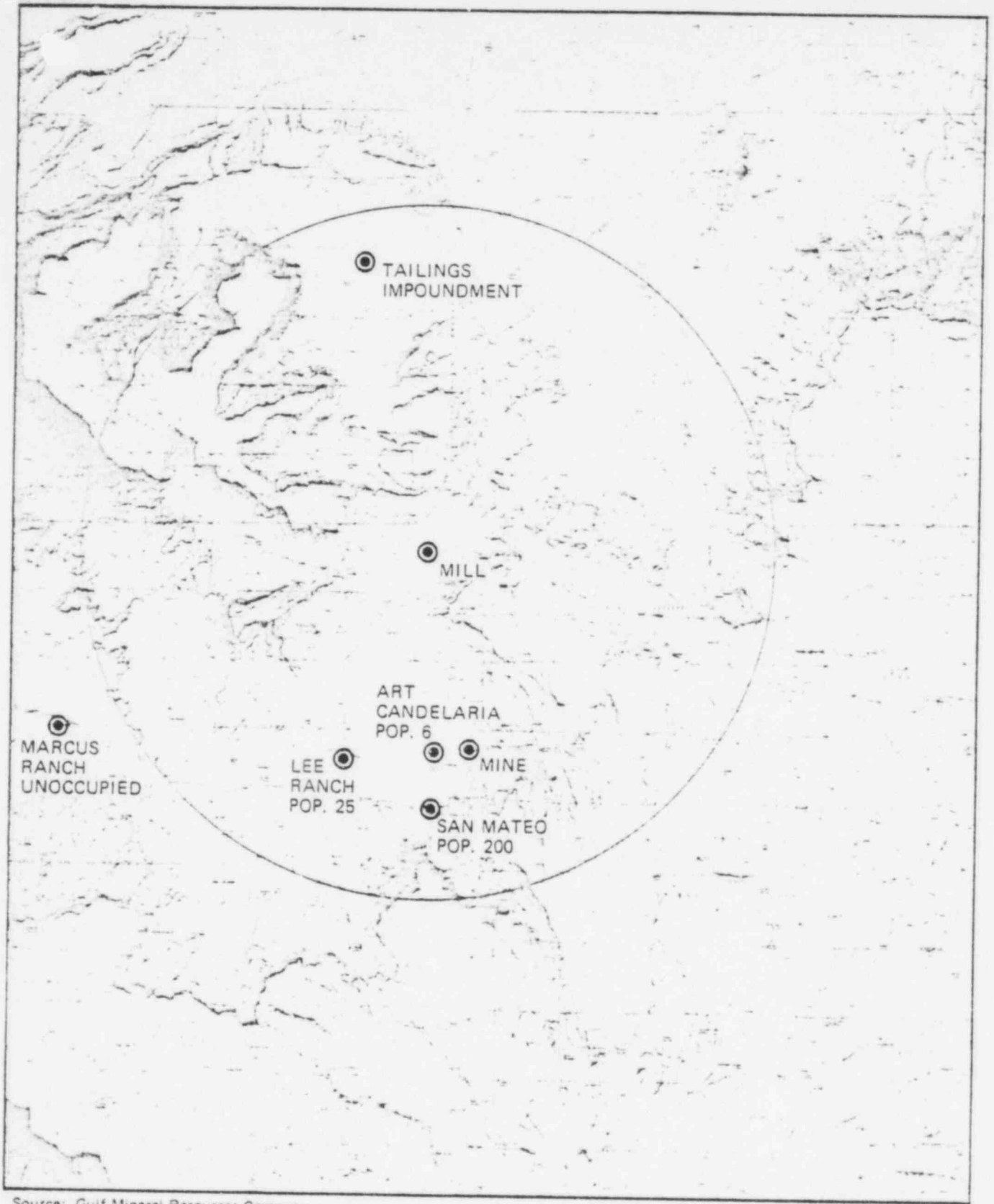
### 7 2.1.2 Demography

8 Figure 2.1-4 notes the location of those residences and population  
9 centers within a five mile radius of the mill for which radiological dose  
10 assessments were calculated in Section 5.2 of the Environmental Report.  
11 It should be noted that Gulf has learned that the Marcus Ranch, for  
12 which dose calculations were also given in Section 5.2, has been abandoned  
13 for some time.  
14

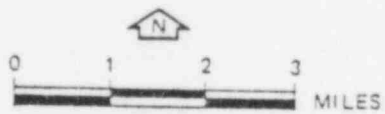
15 The two residences nearest the mill are the Candelaria residence with  
16 an associated population of six persons, and the Lee Ranch with an  
17 associated yearly average population of 25 persons.  
18

19 The population center nearest to the project area is the unincorporated  
20 town of San Mateo. It is located within one mile of the Gulf Mt. Taylor  
21 mine and within four miles of the proposed mill site. The number of  
22 families living in San Mateo has been estimated at 75, with a total  
23 population of about 200 persons. The employment and economic base in  
24 the community has been primarily ranching and farming, although a shift  
25 to employment in uranium mining and milling operations has occurred over  
26 the last 15 years. Since the city of Grants is located only 30 miles  
27 from the project, it is anticipated that population growth resulting  
28 from the Mt. Taylor Project will occur there rather than in San Mateo.  
29

30 Grants, the principal city in Valencia County, and its close neighbor  
31 Milan, represented 27 percent of the total county population in 1970. The  
32



Source: Gulf Mineral Resources Company.



POOR ORIGINAL

839 131  
 Figure 2.1-4.  
 POPULATION DISTRIBUTION  
 WITHIN 5 MILE RADIUS OF MILL  
 1-13

1 population characteristics of the Grants/Milan community have been greatly  
2 influenced by mineral extraction and beneficiation activities in the  
3 Grants Uranium Belt. Whereas the advent of mining and milling activities  
4 in the 1950's brought over 8000 additional persons to the area, the  
5 reduction in areawide mineral extraction activities in the late 1960's  
6 caused a significant decrease in population which stabilized at approxi-  
7 mately 40 percent of what it had been in pre-mining days. Recent mineral  
8 industry development in the region has begun to draw residents to Grants  
9 once again. A 1976 population estimate indicates that the Grants/Milan  
10 community has grown to 18,800 persons. A detailed discussion of population  
11 characteristics and projections are provided in Section 2.2 of Volumes 2  
12 and 3 (hereafter referred to as the Environmental Report) of this mill  
13 license application.

14  
15 There are no significant transient or seasonal population variations  
16 near the project area. The Lee Ranch does experience some seasonal  
17 flux due to ranching operations, but this variation has been taken  
18 into account in the population estimate for that residence. There are  
19 no other ranching or farming units in the project area whose size would  
20 warrant transient or seasonal help.

## 2.2 METEOROLOGY

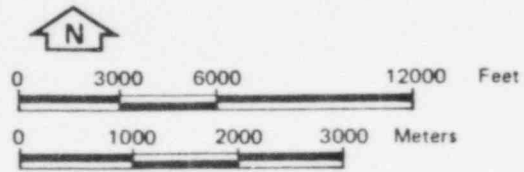
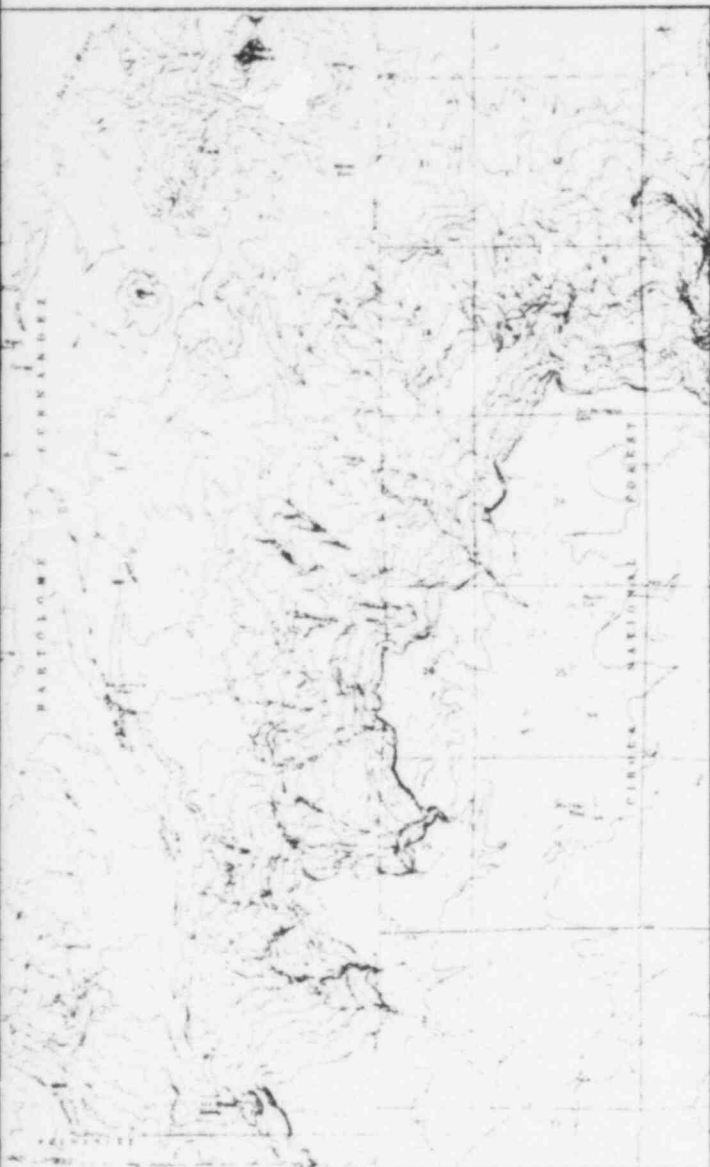
Meteorological monitoring stations were established at five locations in the general Mt. Taylor Uranium Mill vicinity (Figure 2.2-1) to provide data for comparison with surrounding local and regional long-term stations. The information on local climate presented here consists of a synthesis of the available project area data and the long-term regional data. More detailed information on this subject can be found in Section 2.7 of the Environmental Report.

The site area exhibits a large diurnal range in temperature. Project area data, including monthly and annual mean ranges and extremes, are shown in Table 2.2-1. Relative humidity in the area over the long term is estimated to range from an average of 65 percent at sunrise to near 30 percent in midafternoon. Data collected at Monitoring Station #1 over a 12-month period indicate the same relative humidity pattern as Albuquerque with a mean annual relative humidity approximately three percent higher at the project area.

Wind speed and wind direction were monitored at four locations in the project area (Figure 2.2-1). Diurnal distributions of winds for Site #3 indicate the overriding diurnal influences resulting from drainage from San Mateo Mesa and La Polvadera Canyon during the nighttime-evening hours and the upslope effects during the midday periods. The patterns are both consistent and identifiable with respect to controlling wind circulation influences and can be considered to be most representative of the project area. The wind rose for Site #3 is shown in Figure 2.2-2.

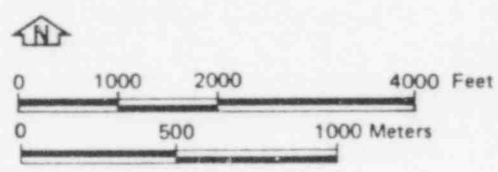
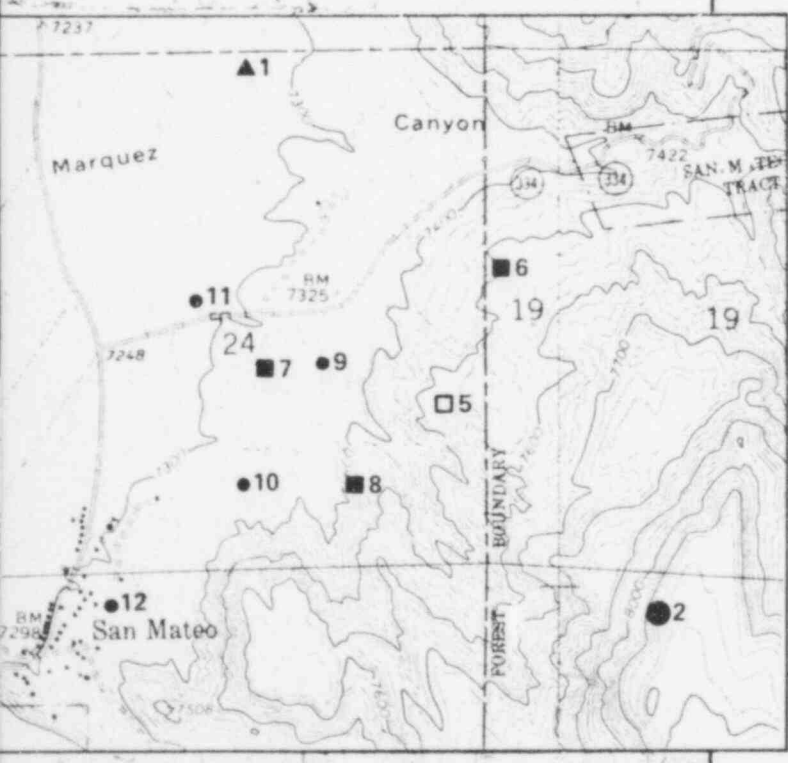
Using temperature differences ( $\Delta T$ 's) obtained from the two-tower network (Monitoring Sites #1 and #2), stability classifications for each hour of the day were determined over a 12-month period. The resulting stability class distributions closely match the long-term Albuquerque regional





**MONITORING SITE**

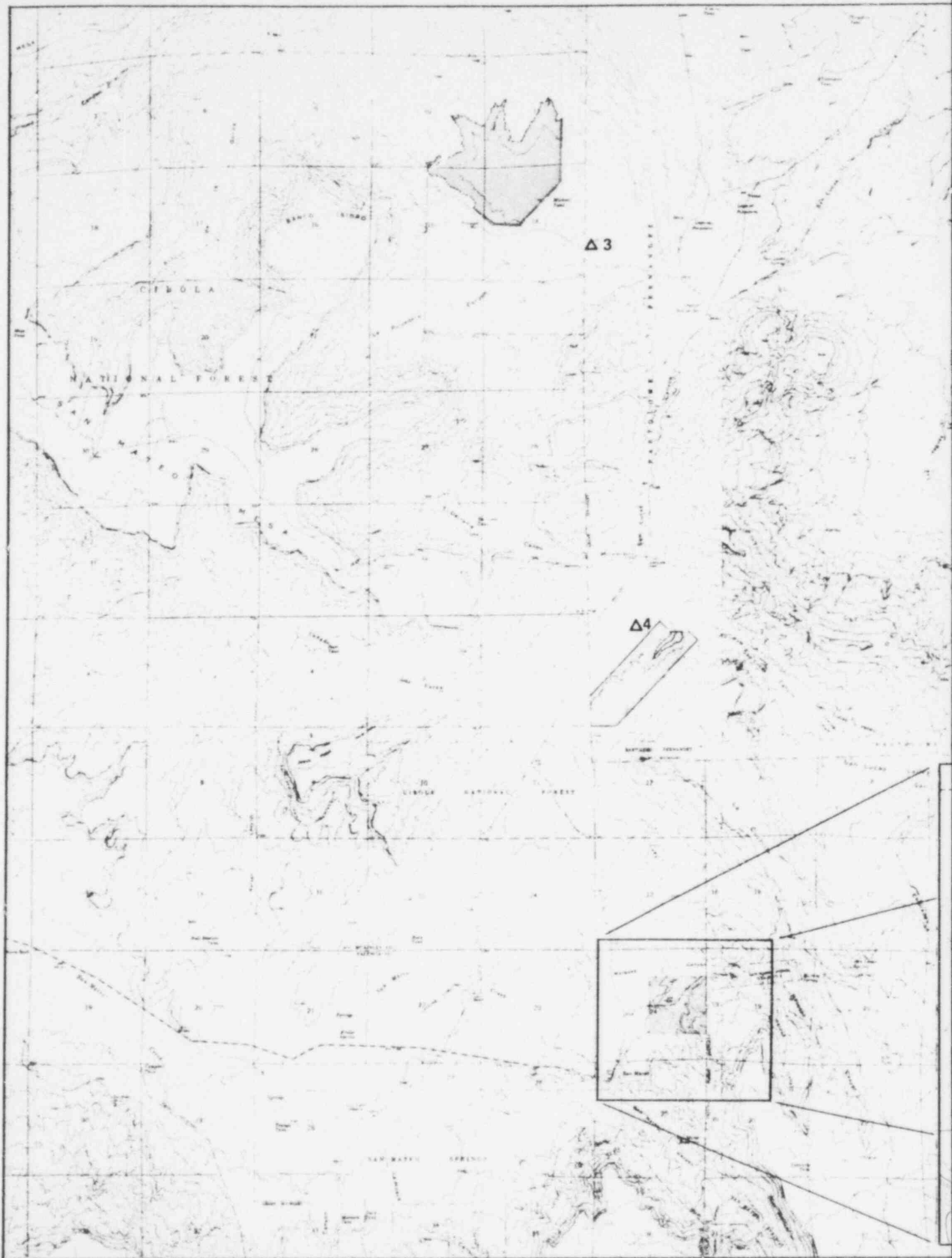
- ▲ TEMPERATURE, WIND DIRECTION AND SPEED, RELATIVE HUMIDITY, SULFATION PLATES
- TEMPERATURE, WIND DIRECTION, AND SPEED, SULFATION PLATES
- △ TEMPERATURE, WIND DIRECTION AND SPEED
- HI VOL SAMPLER, PRECIPITATION, EVAPORATION, SULFATION PLATES
- SULFATION PLATES
- NOISE SAMPLING



POOR ORIGINAL

Figure 2.2-1.  
METEOROLOGICAL AIR QUALITY  
MONITORING STATIONS

839 134 1-16

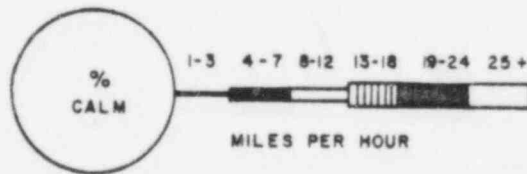
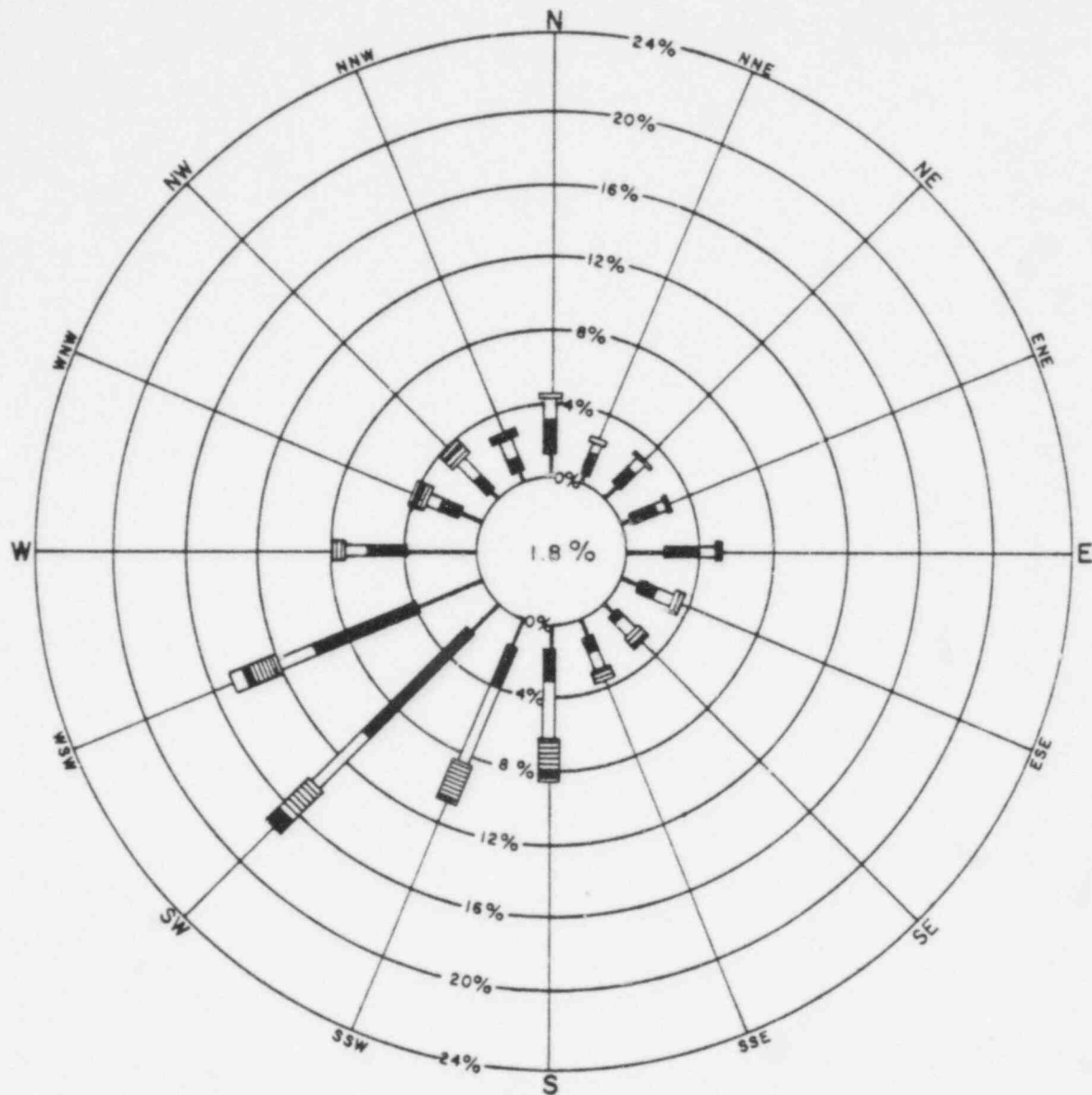


Source: Woodward-Clyde Consultants 1977

POOR ORIGINAL 839 135

Table 2.2-1. MONTHLY AND ANNUAL MEANS AND EXTREMES OF TEMPERATURE (°F)  
 RECORDED AT THE MT. TAYLOR URANIUM MILL PROJECT MONITORING  
 SITE #1 ELEVATION, 7280 FEET MSL

Month	Mean	Mean Daily Maximum	Mean Daily Minimum	Extreme Maximum	Extreme Minimum
1976					
February	37.1	46.2	28.7	58.0	14.0
March	34.6	45.6	22.5	63.0	10.5
April	48.0	57.3	36.9	65.5	19.0
May	55.2	64.7	45.1	76.0	30.0
June	64.5	75.1	52.8	84.0	42.0
July	67.3	78.3	57.1	86.0	52.0
August	66.2	76.5	56.7	83.0	44.5
September	59.8	70.4	49.8	82.0	39.5
October	48.3	57.6	38.9	72.0	29.5
November	38.8	49.8	28.3	62.0	-5.0
December	31.9	43.8	22.4	58.0	10.0
1977					
January	28.5	38.3	20.3	48.0	3.0
Annual	48.4	58.7	40.3	86.0	-5.0



Monitoring Site No. 3  
 Period of Record  
 JULY 7 - SEPT. 3, 1976  
 NOV. 24 - JAN. 20, 1977

839 137

Source: Woodward-Clyde Consultants 1977

Figure 2.2-2.  
 LA POLVADERA VALLEY WIND ROSE  
 1-18

1 data and the SOHIO L-Bar Ranch data with good stability conditions  
2 (Stability Classes A through D) occurring 70 percent of the time. Bound-  
3 ary layer inversion conditions (Stability Classes E, F, and G) occurred  
4 approximately 30 percent of the time, primarily during nighttime and  
5 early morning hours. It is important to note that inversion conditions  
6 at the project site are almost exclusively associated with downslope  
7 drainage from San Mateo Mesa. Consequently, poor dispersion conditions,  
8 which would be associated with highly stable air impacting on the mesa  
9 canyon slopes, are generally avoided.

10  
11 Precipitation in the project area occurs primarily during the thunderstorm  
12 season (July through September), although total annual and monthly rain-  
13 fall amounts vary considerably from year to year. The on-site precipita-  
14 tion data approximated the long-term records for San Mateo with the  
15 exception that somewhat higher rainfall amounts were measured in July,  
16 and lesser amounts were measured in the fall and winter.

17  
18 Thunderstorms are relatively frequent in the area during the summer months.  
19 Due to the elevated levels of precipitation occurring over a short time  
20 period, runoff, both within drainage courses and on the sides of slopes,  
21 is a common result of thunderstorm events. Thunderstorms may also result  
22 in elevated wind speeds.

23  
24 Additional meteorologic monitoring is under way in La Polvadera and San  
25 Lucas Canyons in order to provide a full year of meteorological data  
26 for those sites.  
27  
28  
29  
30  
31  
32

## 2.3 HYDROLOGY

### 2.3.1 Ground Water

The project area is located northwest of the Mt. Taylor volcanic field in the Bluewater and Rio Grande Underground Water basins. The most important hydrogeologic units that occur beneath the project area include the Cretaceous Dakota Sandstone, Jurassic Westwater Canyon member of the Morrison Formation, Permian Glorieta Sandstone, and Permian San Andres Limestone. Hydrogeologic units of less importance as water supply sources include the Quaternary alluvial and volcanic deposits, Cretaceous Point Lookout and Gallup Sandstones of the Mesa Verde Group, Jurassic San Rafael Group, and Triassic Chinle Formation. Discussion of the hydrogeologic characteristics of these aquifers, including flow yields and recharge potential, are given in detail in Section 2.6.1 of the Environmental Report.

The regional aquifers probably are recharged by infiltration of precipitation falling on their outcrop zones south and west of the project area, by infiltration of runoff in stream valleys where the alluvium has hydraulic connection with the aquifers, or by direct percolation where streams transect outcrop areas. There is no evidence of any groundwater recharge within the tailings impoundment area. Natural ground water discharges in several locations in the general project area in stream valleys as springs. Such springs generally flow only a short distance downstream before evaporating or seeping back into the aquifer.

With the exception of water wells and exploration boreholes drilled by Gulf, wells and springs in the region are few and widely scattered. Aquifers into which wells are completed include the alluvial deposits, Menefee Formation, Point Lookout Sandstone, Gallup Sandstone, Dakota Sandstone, and Westwater Canyon Member. Most water derived from area wells

is used for livestock purposes; only San Mateo has wells drilled for domestic supply purposes in the project area. As the direction of groundwater flow in the area is easterly and, due to the isolated nature of the area north and east of the mill and tailings impoundment site, the water supplies of downstream users, if any, should not be affected. Tables 2.6-2 and 2.6-3 of the Environmental Report tabulate existing private users within the region, their locations and the physical characteristics of the water wells.

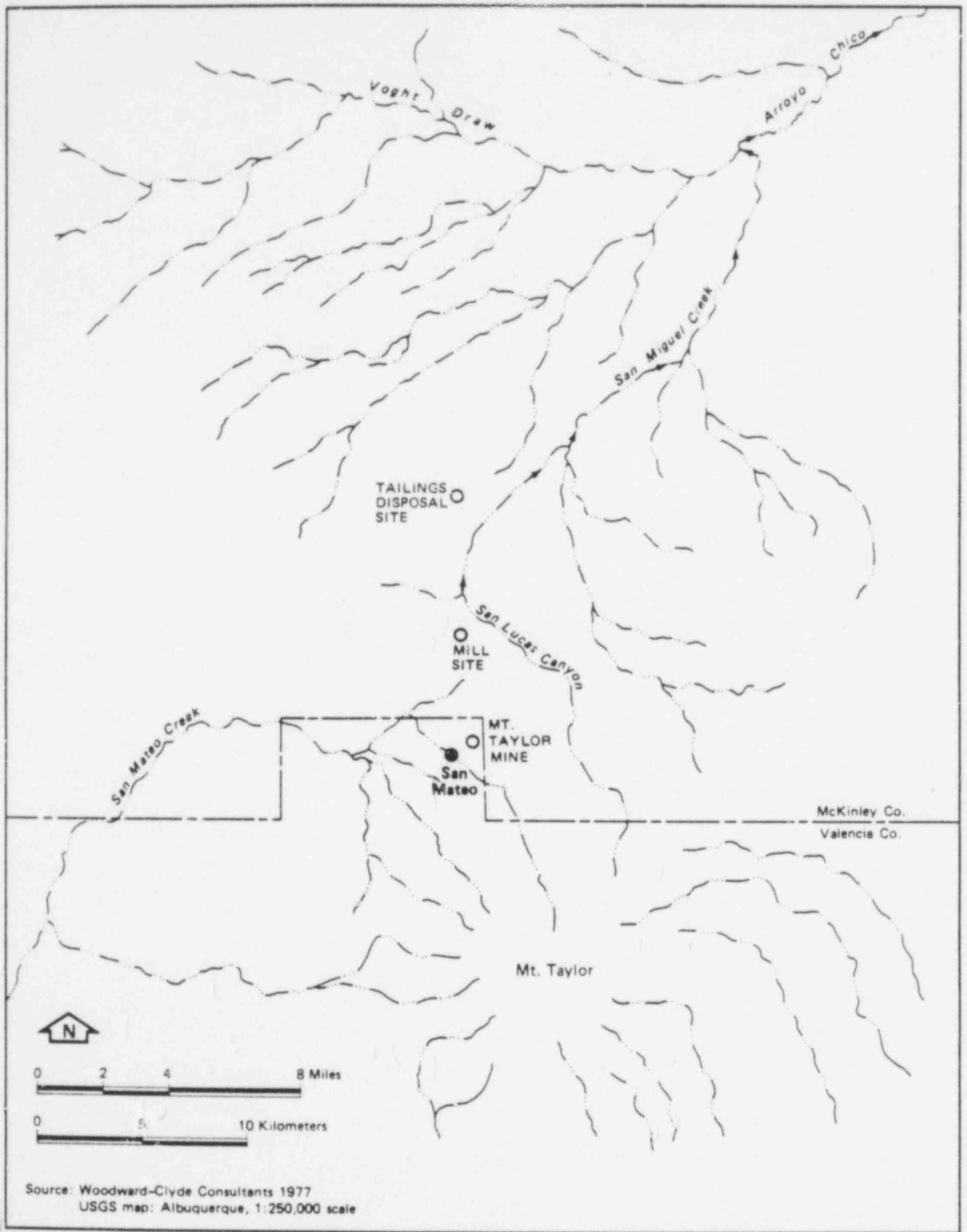
Extensive testing for reliable field permeability data was performed in La Polvadera Canyon for the purposes of estimating pond seepage. From test results, weighted average permeability values were computed to be:

<u>Geologic Unit</u>	<u>Permeability</u> <u>(feet per year)</u>
Dilco	4.4
• Gallup	8.8
• Mancos	0.05

It is believed that the field permeabilities reflect near-horizontal or bedding plane directions, but these values most probably reflect vertical permeabilities as well.

### 2.3.2 Surface Water

Surface water drainage from the mill and tailings impoundment sites flows overland in an easterly direction into San Lucas Canyon, a tributary of San Miguel Creek. From here the drainage trends generally in a northeast direction to Arroyo Chico which eventually merges with the Rio Puerco. The Rio Puerco joins the Rio Grande near Bernardo, approximately 45 miles south of Albuquerque. These drainage patterns are shown on Figures 2.3-1 and 2.3-2.

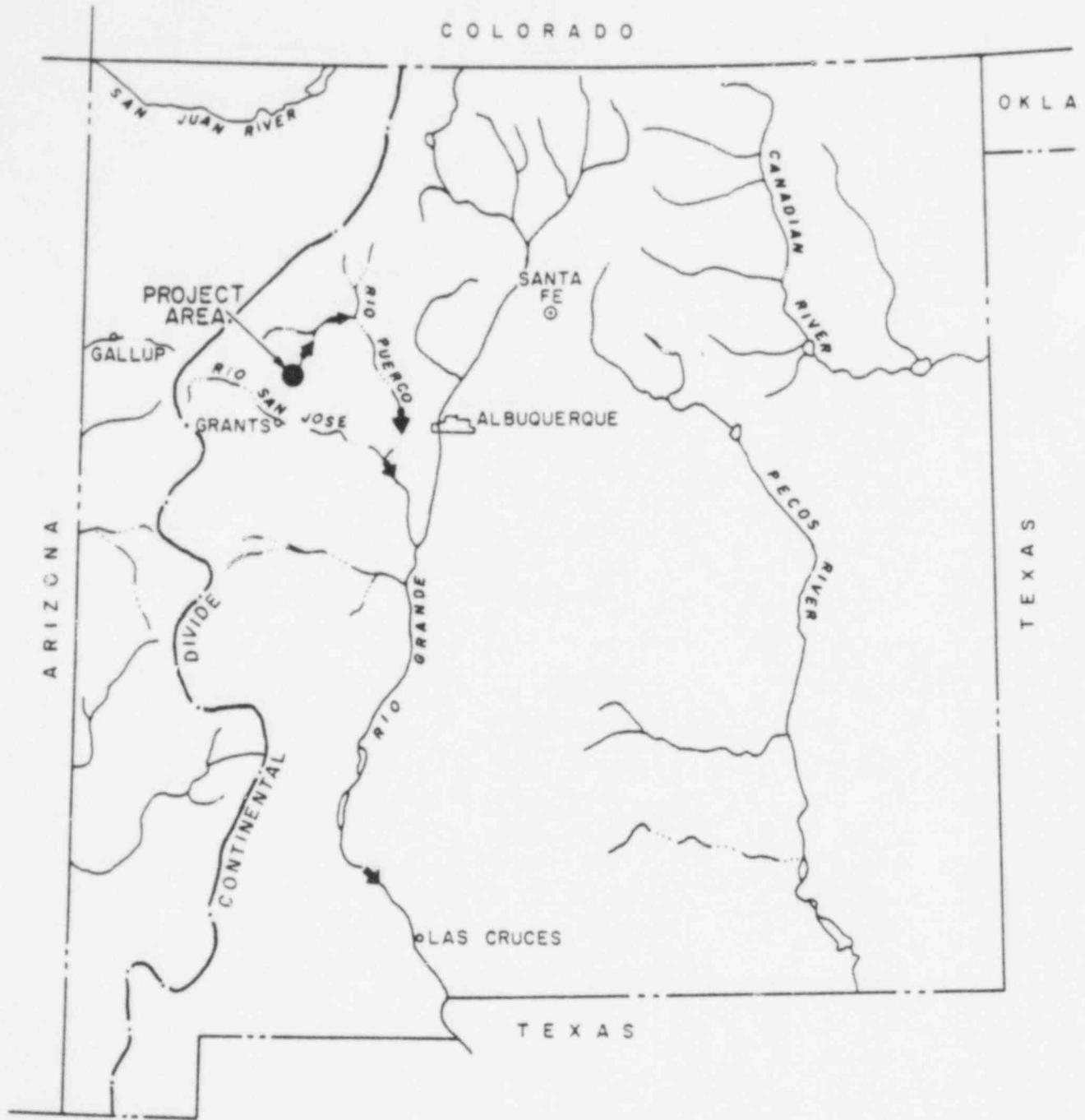


Source: Woodward-Clyde Consultants 1977  
 USGS map: Albuquerque, 1:250,000 scale

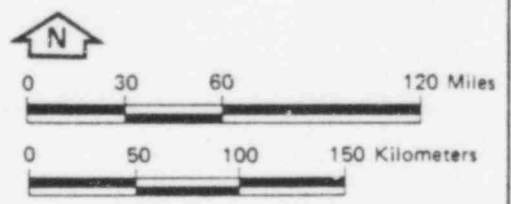
Figure 2.3-1.  
 REGIONAL DRAINAGE PATTERNS

839 141





839 142



Source: Woodward-Clyde Consultants 1977

Figure 2.3-2.  
DRAINAGE PATTERNS IN NEW MEXICO  
1-23

1 Precipitation ranges from approximately 10 to 12 inches per year in  
2 the project vicinity up to about 20 inches per year near Mt. Taylor.  
3 Because much of the annual precipitation occurs during brief, intense  
4 thunderstorms which often cause flooding and extreme peak discharges, the  
5 land surface is incised by many pronounced drainage channels. These  
6 channels, or arroyos, are usually dry and on a regional basis exhibit low  
7 annual runoff rates. There are no standing bodies of water within the  
8 project area, and streams would best be termed intermittent. San Mateo  
9 Creek, the perennial stream nearest the project area, is in a different  
10 drainage basin and therefore will not be impacted by operation of either  
11 the mill or the tailings impoundment. One of the primary factors in  
12 selecting the San Lucas mill site was its location north of a natural  
13 drainage divide. As a result, any unexpected surface drainage from  
14 the mill will flow north via the unpopulated San Lucas Canyon rather  
15 than south near the community of San Mateo. Ground water remains the  
16 principal water supply source in the region.

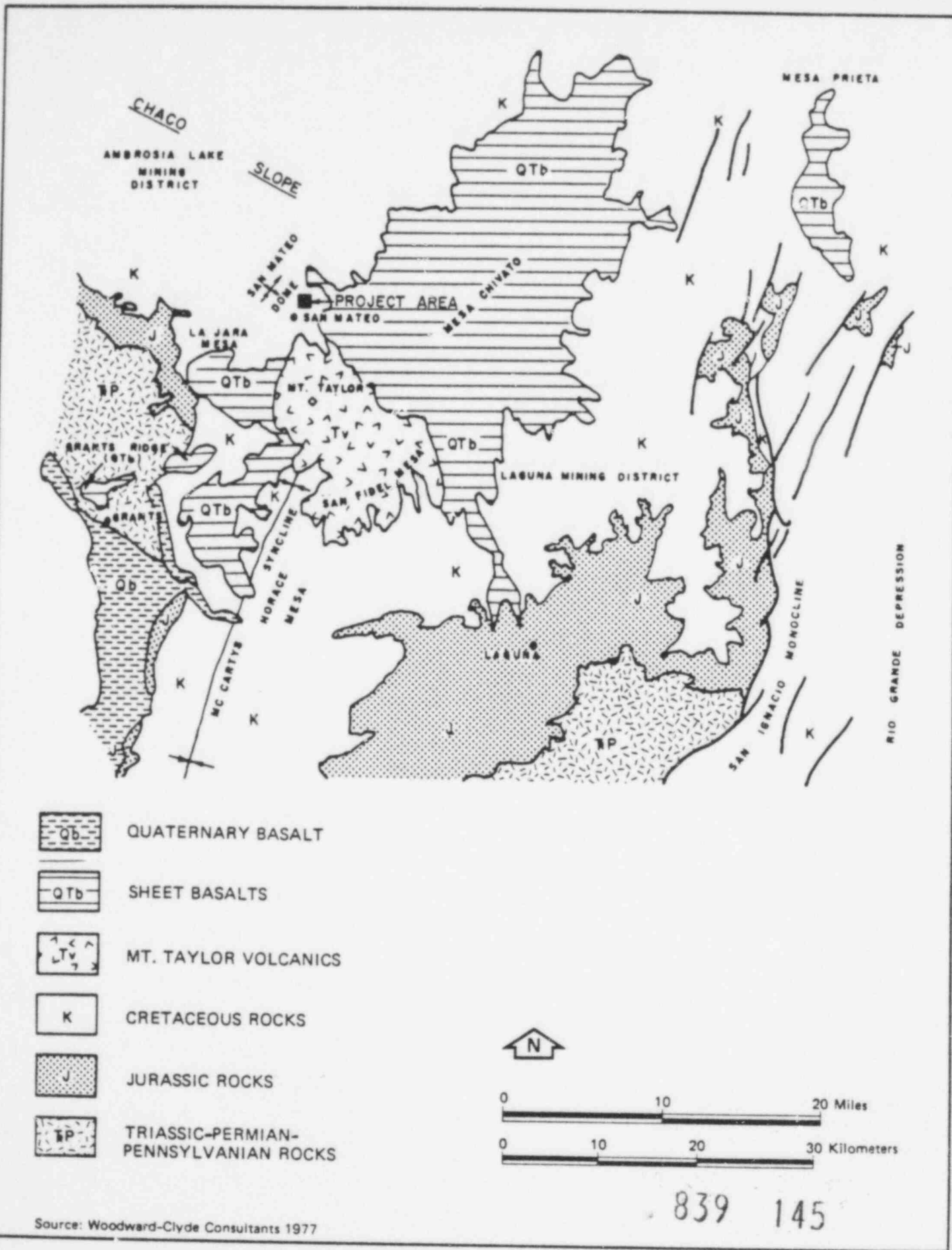
1 2.4 GEOLOGY AND SEISMOLOGY

2  
3 2.4.1 Geology

4 The project area lies in the eastern part of the Colorado Plateau geologic  
5 province near the southern boundary of the San Juan Basin. The site  
6 is about 35 miles west of the San Ignacio faulted monocline that forms  
7 the boundary between the Colorado Plateau and the Rio Grande Depression  
8 (Figure 2.4-1).

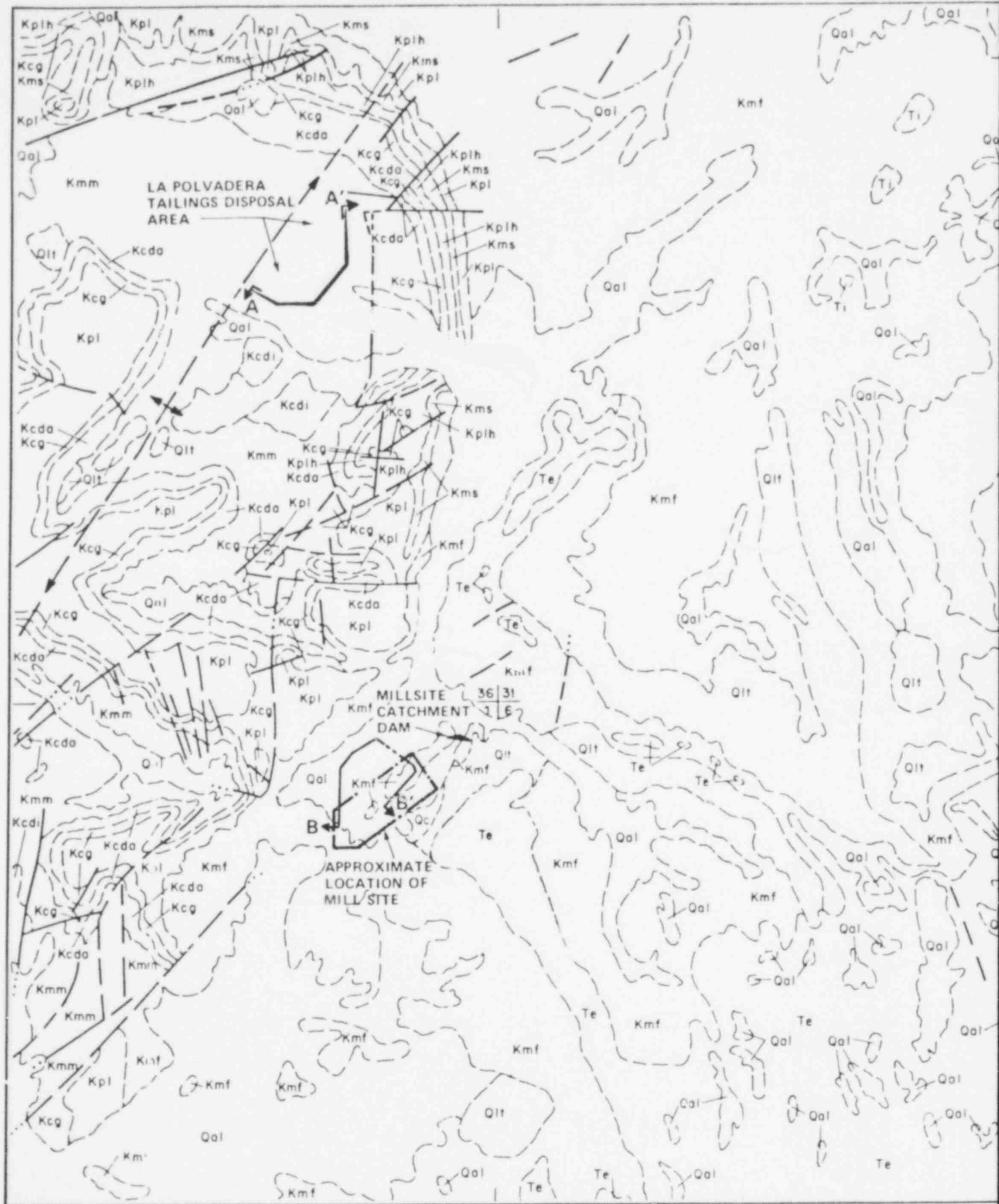
9  
10 La Polvadera Canyon, the site of the proposed tailings impoundment, is  
11 at the northeast end of San Mateo Dome, an elongated structure that  
12 trends northeasterly. The flank of the dome coincides with a part of  
13 the west flank of the McCartys syncline. Contours drawn at the base  
14 of the Dakota Sandstone show that the San Mateo Dome retains its general  
15 structure at depths of 1600 to 2000 feet. The dome is cut by normal  
16 faults which can be traced for several miles and exhibit both vertical  
17 and horizontal displacement. The canyon area is a broad, rolling, bowl-  
18 shaped basin drained by several washes that converge and drain through  
19 a series of low hogback ridges into San Lucas Canyon. The hogbacks,  
20 formed by resistant sandstone beds dipping 20 to 30 degrees east, form  
21 the eastern flank of the San Mateo Dome. The axis of the dome bisects  
22 the central portion of the canyon. As a result the bedrock units, consist-  
23 ing primarily of a thick sequence of interbedded sandstones and shales,  
24 are generally flat-lying or gently dipping in the broader parts of  
25 the basin. The impoundment will be located in this area. Bedrock outcrops  
26 in the canyon include Cretaceous sandstone, siltstone and shales of  
27 the Menefee Formation, Point Lookout Sandstone, Crevasse Canyon Forma-  
28 tion, Gallup Sandstone, and Mancos Shale. Their stratigraphic and struc-  
29 tural relationship in the Canyon area is shown in Figure 2.4-2.  
30 The advantage of the La Polvadera Canyon site is that it is underlain  
31 by essentially impervious Mancos Shale. This formation will effectively  
32 preclude any intrusion of tailings impoundment seepage into the deep aquifers.

839 144



POOR ORIGINAL

Figure 2.4-1.  
REGIONAL GEOLOGIC FEATURES



Source: Modified from Cooper and John 1968; and from Santos 1966

POOR ORIGINAL



- Qlt LANDSLIDE AND TALUS MATERIAL
- Qc RESIDUAL DEPOSITS: BEDROCK DECOMPOSED TO CLAY, (MAPPED AS SAPROLITE BY USGS)
- Qal ALLUVIUM (SILT, CLAY WITH OCCASIONAL GRAVELLY LENSES)
- Te BASALT, ANDESITE AND OTHER INTRUSIVE ROCKS
- Kmf MENELEE FORMATION (INTERBEDDED SILTSTONE AND FINE TO MEDIUM GRAINED SANDSTONE)
- Kpl POINT LOOKOUT SANDSTONE, MAIN BODY
- Kplh POINT LOOKOUT SANDSTONE, HOSTA TONGUE
- Kcg CREVASSE CANYON FORMATION, GIBSON COAL MEMBER (INTERBEDDED SANDSTONE, SILTSTONE, SHALE & COAL BEDS)
- Kcda CREVASSE CANYON FORMATION DALTON SANDSTONE MEMBER
- Kcdi CREVASSE CANYON FORMATION, DILCO COAL MEMBER (INTERBEDDED SANDSTONE, SHALE, AND COAL BEDS)
- Kms MANCOS SHALE, SATAN TONGUE (INTERBEDDED SANDSTONE, SILTSTONE, AND SHALE)
- Kmm MANCOS SHALE, MULATTO TONGUE (INTERBEDDED SHALE AND SANDSTONE)

- CONTACT BETWEEN GEOLOGIC FORMATION, APPROXIMATELY LOCATED
- FAULT, DASHED WHERE LOCATED APPROXIMATELY; DOTTED WHERE CONCEALED
- ANTICLINE, SHOWING CREST LINE AND PLUNGE
- REFERENCED TAILINGS DAM SITE, APPROXIMATELY LOCATED

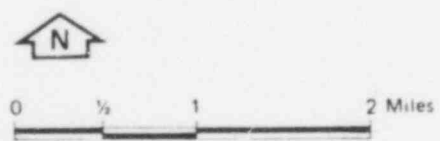


Figure 2.4-2.  
GEOLOGIC MAP OF PROJECT AREA  
1-27

839 147

Only one major fault lies within the tailings impoundment area. This normal, near-vertical, east-west trending fault, located near the northern margin of the pond, is considered inactive. Details can be found in Section 2.4 of the Environmental Report.

The mill will be located in the Lower San Lucas Valley. The valley consists of alluvial, eolian, and alluvial fan soil deposits which overlie siltstones and sandstones of the Menefee Formation and the Point Lookout Sandstone. The Menefee Formation, exposed or at very shallow depths on the east side of the valley, underlies most of the mill project area. Pressure tests in the exploration holes indicate that the fracture permeability in the Menefee is low; in fact, in the reservoir area above the proposed mill impoundment dam the Menefee is essentially impervious thus forming a barrier against the migration of any potential seepage. The Point Lookout Sandstone is exposed on the west side of the valley beyond the dam and is characterized by widely spaced jointing. Both the Menefee Formation and Point Lookout Sandstone dip gently to the east.

#### 2.4.2 Seismology

Seismic evidence, both historical and instrumentally recorded, indicates that the Mt. Taylor project site is in an area of low seismic activity. Historically recorded tremors in the region have been mild, with reported damage slight and confined to localized areas. Only two earthquakes have occurred within a 50-mile radius of the project area. The first centered near Grants, New Mexico with a Magnitude 4.4 on December 23, 1973. Only minor damage occurred in the area and Grants experienced a maximum intensity of VI. The second and most recent seismic event within a 50-mile radius of the site occurred on January 5, 1976 with the epicenter located 45 miles northwest of the site. This event registered Magnitude 5.0 with the epicentral area experiencing intensity VI.

1 There have been numerous other earthquake events within a 250-mile radius  
2 of the site. Their effect, if any, in the project area is expected  
3 to have been negligible. The Environmental Report (Section 2.5) documents  
4 these events as well as presenting an earthquake risk evaluation for the  
5 site.

7 Based on the seismic history of the area, it has been calculated that  
8 the area would experience a maximum ground acceleration of 0.07g. Build-  
9 ings and dam structures are designed to withstand ground accelerations  
10 of 0.10g, thereby affording a significant factor of safety.



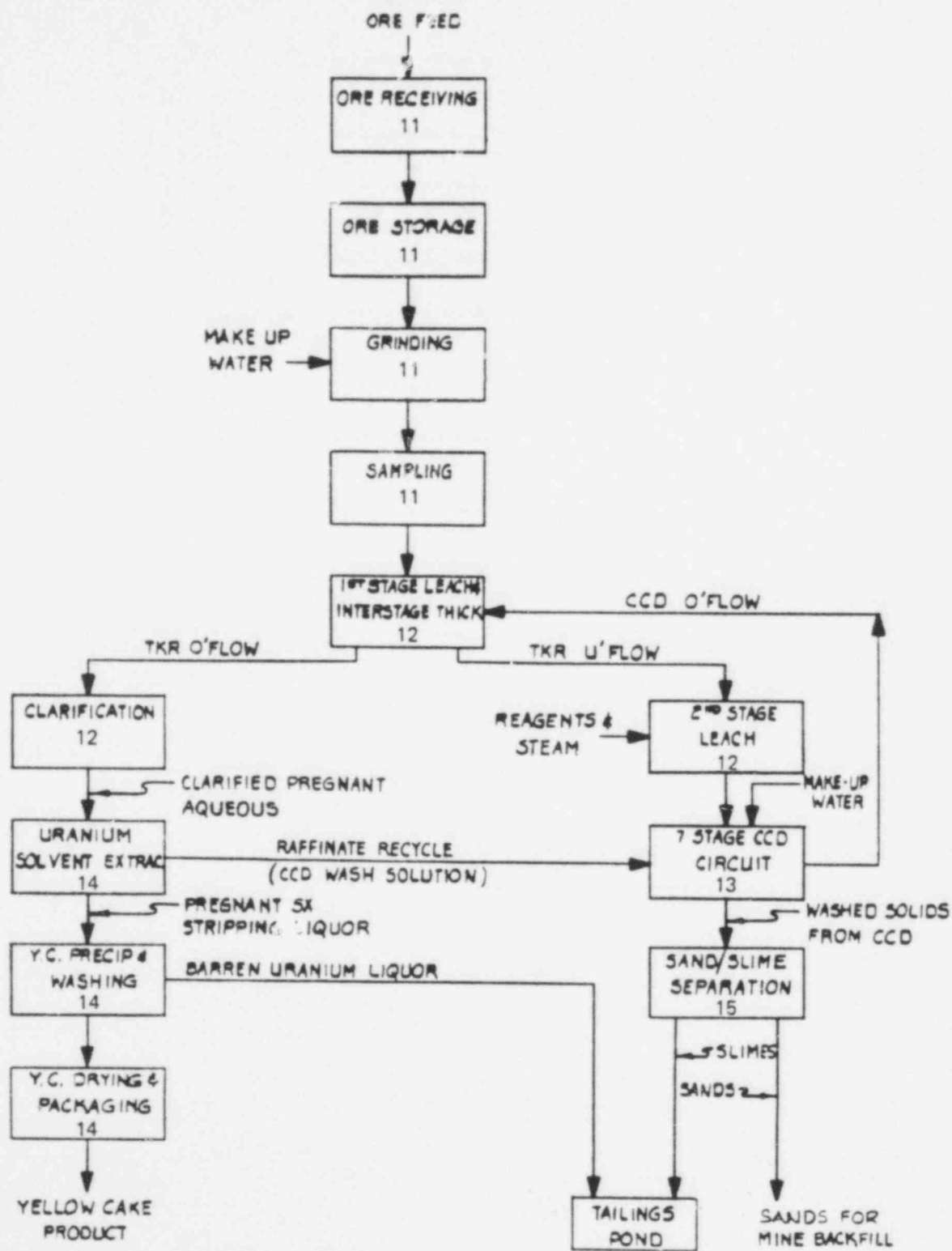
### 3.1 MILL PROCESS

The mill facility will be located in lower San Lucas Canyon, Section 1, T13N, R8W, McKinley County, New Mexico. The site is in an area isolated from the public. A mill impoundment will preclude the release of any accidental process spills to watercourses in the area. Buildings will house grinding equipment and the yellowcake washing, drying, and packaging, as well as offices, a laboratory, boilers, shops, and warehousing. Tankage will be of various sizes depending on the specific processes involved, and will be positioned in areas where required by the process. The entire mill site will be fenced and access to the facilities will be controlled.

The mill process flow diagram is shown on Figure 3.1-1. The proposed mill will have the design capacity to process blended ore assaying between 0.05 and 0.50 percent uranium ( $U_3O_8$ ) to a finished yellowcake product at a design rate of 4200 dry tons of ore per stream day. Coarse ore will be delivered to the mill via truck and placed into ore storage piles. A front-end loader will be used to feed coarse ore to the mill feed system.

The milling process begins with grinding the coarse ore to separate the sand grains from the interstitial cementing matrix. Uranium values are then leached from the solids in two stages of leach, followed with the leached sand/slime residue being separated from the uranium-rich

SIMPLIFIED BLOCK FLOW DIAGRAM  
(WITH AREA DESIGNATIONS)



Source: Jacobs Engineering Co. 1979

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Figure 3.1-1.  
SCHEMATIC FLOW  
DIAGRAM OVERALL PROCESS  
1-31

POOR ORIGINAL

1 leach solution by countercurrent washing in thickeners. Provision is  
2 made for the uranium-free residues to be classified into sand and slime  
3 fractions. The resulting sands, after being washed, can be returned  
4 to the mine for backfill or used for tailings pond reclamation. The  
5 slime fraction and any sands not separated will be pumped to the tailings  
6 pond.

7  
8 The subsequent steps of the milling process, which consist of recovery  
9 and purification of the uranium values from the acid leach solution,  
10 begin with clarification of the uranium-rich leach solution, followed  
11 by filtration to remove the fine suspended solids, and solvent extraction  
12 to recover and purify the uranium. In the solvent extraction process,  
13 the uranium is transferred to an organic phase consisting of an amine  
14 in a kerosene diluent. After solvent extraction, the uranium-free leach  
15 solution (raffinate) is recycled to the countercurrent decantation (CCD)  
16 circuit as a wash solution. The uranium is removed from the solvent  
17 with a sodium carbonate solution, and the solvent recycled to the solvent  
18 extraction circuit. The sodium carbonate solution, now containing the  
19 uranium, is acidified and then pumped to precipitation tanks where  
20 uranium is precipitated as uranyl peroxide ( $UO_4 \cdot 2H_2O$ ) by digestion  
21 in a hydrogen peroxide solution. The uranyl peroxide is then washed  
22 in thickeners, centrifuged, and calcined in a multiple hearth furnace.  
23 The resulting yellowcake is packaged in drums for shipment via truck in  
24 accordance with Department of Transportation regulations.

25  
26 A slurry pipeline (described in Section 3.4.1 of the Environmental Report)  
27 will transport the tailings to an impoundment located in La Polvadera  
28 Canyon approximately six miles north of the mill. The site is a natural  
29 canyon bordered on three sides by high bluffs, providing protection  
30 from both wind and storm damage as well as total isolation from the  
31 public. The tailings retention dam of the impoundment area will be  
32 a zoned earth and rockfill structure with a sloping upstream clay core.

1 Tailings distribution into the impoundment area will be via a sand  
2 cell system for total tailings or a perimeter discharge system when  
3 only slime tailings are being impounded. Downstream of the tailings  
4 impoundment is a catch dam to provide containment of any minor spills.  
5 Both the impoundment and catchment areas will be completely fenced.  
6 The tailings impoundment area is fully described in Section 3.4.2 of  
7 the Environmental Report.  
8

9 Based on current ore reserve and market assessments, the production life  
10 of the mill will be 20 years. At this time, no other outside source  
11 of ore is expected to be processed through this facility. The mill  
12 will r even days a week, with three eight-hour shifts each day.  
13 Production capacity rates for the years 1981 through 1984 will be 2100  
14 dry tons per stream day which could yield a yellowcake product of 12,500  
15 pounds of  $U_3O_8$  equivalent per day (4.3 million pounds per year). Commencing  
16 in approximately 1985 production capacity will be increased to 4200 dry  
17 tons per stream day which could yield a yellowcake product of 25,000  
18 pounds of  $U_3O_8$  equivalent per day (8.6 million pounds of  $U_3O_8$  per year).  
19 Final yellowcake quality will assay greater than 85 percent  $U_3O_8$ .  
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32

### 3.2 SAFETY INSTRUMENTATION AND CONTROL

1  
2  
3 Any leakage in the tailings line will be detected by flow difference  
4 between redundant flowmeters placed at the beginning and end of the  
5 tailings line. The redundant flowmeters compare measurements not only  
6 from end to end of the pipeline, but from the adjacent units at each  
7 end as well. A flow difference between adjacent flowmeters will cause  
8 an alarm to sound indicating meter malfunction. A difference in measure-  
9 ment from flowmeters from end to end of the pipeline will result in  
10 the sounding of an alarm and shutdown of the tailings pumping system.  
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#### 4.1 GASEOUS

The majority of the mill process equipment will be located outdoors. Two areas will be housed: (1) the grinding and sampling circuit, and (2) yellowcake processing, drying, and packaging. Each of these two buildings will provide positive exhaust ventilation with six complete air changes per hour in each structure to purge radon from the working environment. Fugitive dust will be controlled as appropriate.

Dust emissions from the grinding circuit will be controlled at transfer points. In addition, exhaust hoods will be located over discharges of the grinding mills. The yellowcake dryer and the yellowcake packaging system will each have separate closed circuit ventilation systems, each containing a high energy wet venturi scrubber. Control efficiency for wet venturi scrubbers is rated at 99.4 percent.

A summary of all discharge points affecting radiological emissions, their stack height, proposed control system, rated efficiency and associated emissions is given in Tables 4.1-1 and 4.1-2.

Table 4.1-1. MILL ATMOSPHERIC EMISSION SOURCES

Area	Component	Source	Release Height (ft)	Exhaust Volume (acfm)	Stack Diameter (inches)	Exhaust Temperature (°F)	Control Equipment	Rated Control Efficiency (%)
11	Ore Storage	Ore Piles	30	NA	NA	NA	Spray Suppression	98.0
11	Ore Storage	Ore Piles & Storage Area	0-30	NA	NA	NA	Spray Suppression	98.0
12	First Stage Leach	Stack	20	750	18	95	Wet Scrubber	99.0
12	Second Stage Leach	2 Stacks	20	600	30	150	2 Wet Scrubbers	99.0
14	Solvent Extraction	Tanks	20	NA	NA	104	None	--
14	Yellowcake Packaging & Calcining	Stack	100	13,500	36	150	Wet Scrubber	99.4

1-36

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Table 4.1-2. MILL ATMOSPHERIC EMISSION SUMMARY, CONTROLLED (tons per year)

<u>Area</u>	<u>Operation</u>	<u>Particulates</u>
11	Ore Receiving, Storage	5.08
12	First Stage Leach	0.38
12	Second Stage Leach	0.45
14	Solvent Extraction	
14	Yellowcake Calcining & Packaging	1.59
	TOTAL	7.50



## 4.2 LIQUIDS AND SOLIDS

Tailings that are not utilized for mine backfill, as well as waste fluids from the milling process, are to be transported through a pipeline to the La Polvadera tailings impoundment. The pond is sized to contain all wastes derived over the mill's approximate 20-year operating life. The dam, which will be constructed in four stages over the life of the project, is a zoned earth and rockfill structure designed as a water-reservoir type of dam. The embankment has a sloping upstream clay core and a large downstream earth-rock shell zone. A continuous chimney drain separates the core and the earth-rock section. All overburden soils and alluvium under the foundation will be removed so that the dam will rest entirely on bedrock. A positive clay cutoff is provided under the core and well into the bedrock for foundation seepage control. Significant statistics associated with the impoundment are listed below; details and drawings of the pond and dam construction are given in the Environmental Report.

● distance from mill	6+ miles
● ultimate pond surface area	418 acres
● drainage area above dam	1,025 acres
● ultimate storage volume	25,800 acre-feet
● dam embankment type	compacted, zoned earth-rock and rockfill
● maximum height above streambed	148 feet
● maximum height above foundation	228 feet
● upstream slope	3:1 (horizontal to vertical)
● downstream slope	2.5:1 (horizontal to vertical)
● dam foundation type	rock
● ultimate length of dam	1.5 miles
● design flood retention (PMF series)	2,800 acre-feet

1 In order to control fugitive dust emissions from the pond, it is proposed  
2 to sluice total tailings into a system of small cells created within the  
3 impoundment area. As sluicing into the cells continue, the sand fraction  
4 will settle out, leaving the sluice water and slime fraction to overflow  
5 the cells into the principal retention area. When a cell is filled  
6 with sand it will be immediately covered with earth to control dust.  
7 The slimes will not present a fugitive dust problem. Details of this  
8 unique system are provided in Section 3.4.2 of the Environmental Report.

9  
10 Although one small area of the pond (approximately 20 acres) will have  
11 a primary membrane liner installed on a 12-inch compacted clay secondary  
12 liner due to the presence of a fault zone, the primary control for  
13 seepage will be the geologic structure and bedding of the underlying  
14 formations. Seepage may move downward through the Dilco and Gallup  
15 units and perch on the Mancos Shale. A perched ground water mound may  
16 build upward to intersect the pond and spread laterally through the  
17 sandstone fractions of the Gallup and Dilco units. Initial seepage  
18 rates will appear relatively high until the mound intersects the pond,  
19 at which time seepage rates will decrease as the gradient decreases  
20 with time. Lateral migration of seepage will occur generally to the  
21 north and east. Assuming no retention of seepage water in bank storage  
22 (in reality there will be a significant amount) the calculated probable  
23 seepage rate totals 142 acre-feet per year or about 0.28 acre-foot  
24 per year per acre of pond. The maximum probable seepage rate was  
25 calculated to be 425 acre-feet per year or 0.85 acre-foot per year  
26 per acre assuming a surface area of 500 acres. It should be noted  
27 that the seepage rates noted above do not take into consideration the  
28 decrease in seepage rates to be expected as a result of the build-up  
29 of slimes on the floor of the tailings impoundment. In addition, natural  
30 attenuation processes within the vadose zone will tend to improve the  
31 quality of the seepage water; degradation of ground water in the Gallup  
32 Sandstone should therefore be minimal. As described in Section 6.2.2 of the

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1 Environmental Report, a shallow monitoring system has been designed to  
2 detect the rate and quality of seepage accumulation perched on the  
3 Mancos Shale. The impervious Mancos Shale will act as an aquiclude  
4 to prevent migration of seepage to the underlying Dakota Sandstone.  
5 Two deep monitor wells will, nonetheless, be drilled to the base of the  
6 Dakota (see Section 6.2.2 of the Environmental Report).

8 A catch dam, to provide emergency storage in the event of an accidental  
9 spill resulting from a break in one of the pipelines transporting slurry  
10 to the impoundment or clear water back to the mill, will be constructed  
11 one-half mile downstream of the tailings dam. The catch dam will have  
12 a maximum storage volume of about 100 acre-feet; it is not intended  
13 for the dam to retain the spill resulting from a major tailings dam  
14 failure. To provide flood protection, the catch dam will be provided  
15 with a spillway to store and pass the PMF inflow associated with its  
16 drainage basin. The Environmental Report contains a discussion of the  
17 subsurface investigation and laboratory testing involved in the tailings  
18 dam study, as well as information regarding the construction methods  
19 and specifications.

21 In order to monitor the structural integrity of the tailings impoundment  
22 dam, embankment instrumentation will be installed. Surface displacement  
23 monuments, which will be located at the downstream edge of the embankment  
24 crest, will monitor any horizontal or vertical displacement. Piezometers  
25 will be installed to measure and monitor pore water pressures, piezometric  
26 levels in the dam embankment and foundation, and the effectiveness  
27 of the chimney drain and drain blanket. The piezometers will be operated  
28 from terminal boxes located near the toe of the embankment. In addition  
29 to the piezometers and surface displacement monuments, seepage into the  
30 downstream collection and pump-back sump will be monitored. Two deep  
31 wells are provided for monitoring seepage.

1 The tailings pipeline system consists of two pumping facilities at the  
2 mill, two slurry pipelines from the mill to the tailings impoundment  
3 and one decant return line from the tailings impoundment to the mill,  
4 which if the need arises, can also be utilized as a slurry line. A  
5 highly reliable and sophisticated control system has been developed  
6 to automatically shut down the tailings pumping system in the event  
7 of a significant leak or major failure. Two magnetic flowmeters will  
8 be placed at each end of the pipeline system. The flowmeters will  
9 compare signals with the adjacent meter and with the meters at the opposite  
10 end of the pipeline. A difference between adjacent meters will cause an  
11 alarm to sound indicating meter malfunction. A difference between meters  
12 on opposite ends of the pipeline will also cause an alarm to sound,  
13 indicate failure and commence a shutdown sequence. A separate system  
14 for detecting separation of pipe sections is provided in a continuity  
15 circuit which also sounds an alarm and institutes shutdown should a  
16 continuity failure occur.

17  
18 A service road will parallel the entire route of the pipeline. The pipeway  
19 will be diked. The dikes will direct any leakage or spills to one of ten  
20 containment basins located at low points along the route. The pipeline  
21 system, including typical cross-sections of the pipeline and containment  
22 basins, is shown in Figures 3.4-1 and 3.4-2 of the Environmental Report.  
23 The entire route of the pipeline will be inspected each shift.

24  
25 The basic requirements for reclamation and restoration of the La Polvadera  
26 tailings disposal area include:

- 27  
28 ● control of fugitive dust from dried, exposed tailings surfaces
- 29  
30 ● control of erosion caused by waters entering and leaving the
- 31 tailings impoundment area
- 32

- reduction of radon gas emanation from the tailings deposit
- amenability to long-term stabilization and isolation and to the eventual return of the land to productive use

The specific requirements for the reduction of radon gas emanation from the deactivated tailings disposal area have not yet been firmly established, but planning at this point in time calls for covering the top of the deactivated tailings pond with six feet of earth cover. The actual thickness of earth or other type of cover used will be in accordance with the "state of the art" at the time of reclamation, probably in the early part of the 21st century.

Gulf will post a bond with the State of New Mexico to ensure compliance with all required reclamation and license provisions. Once all reclamation requirements and license provisions have been met, the bond will be released.

Gulf's legal rights with respect to the tailings impoundment property are as follows:

Gulf Oil Corporation is the Lessee under a certain Lease Agreement with Fernandez Company, Ltd., the Lessor therein, dated July 15, 1976, effective January 1, 1976. Fernandez Company, Ltd. is the owner of the lands described in the Lease Agreement. The Lease Agreement covers the land upon which the dam covered by this application is to be located. The Lease Agreement is effective through June 30, 2019, and may be extended beyond such date in accordance with the terms contained therein. The Lease Agreement grants Gulf Oil Corporation the right to construct the dam covered by this application.

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1 Pursuant to 40 CFR 6, Section 6.906, a New Source and Environmental Ques-  
2 tionnaire (NS/EQ) was submitted to EPA, Region VI on March 23, 1978.  
3 The NS/EQ stated that no discharge to navigable waters would occur  
4 as a result of operation of the Mt. Taylor Uranium Mill Project and  
5 therefore neither certification nor NPDES discharge permit (pursuant  
6 to Sections 401 and 402, FWPCA) requirements were applicable. By letter  
7 dated June 21, 1978, Mr. Robert B. Elliot, Chief Permits and Support  
8 Branch, Region VI, notified Gulf that no NPDES permit would be required  
9 for the Mt. Taylor Uranium Mill Project.  
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1 4.3 CONTAMINATED EQUIPMENT  
2

3 All contaminated disposable materials, including coveralls, filters and  
4 cleaning materials, will be placed in a container when their useful lives  
5 have ended. When any such container is full, it will be sealed and  
6 transported to the tailings impoundment for burial. All obsolete, worn-  
7 out, or malfunctioning process machinery will be decontaminated using  
8 either an acid wash or chelating solutions. These solutions will be  
9 contained and pumped to the tailings impoundment. Subsequent to decontami-  
10 nation procedures, all machinery will be scanned with appropriate counting  
11 instruments to assure that no residual radioactivity remains. If repairs  
12 are needed, the machinery will be released for repair work. If the  
13 machinery is of no further use, it will either be released and sold  
14 for salvage or stored in the salvage area.  
15

16 Equipment will be considered to be contaminated if it has removable radio-  
17 nuclides in excess of 1000 alpha disintegrations per minute per 100  
18 square centimeters of surface area. During decontamination efforts, surveys  
19 and air samples will be taken as necessary for exposure control. Equipment  
20 will be re-surveyed to insure that the radionuclides are reduced to a level  
21 consistent with the ALARA philosophy. A reasonable effort will be made to  
22 eliminate residual contamination.  
23

24 Disposal of contaminated equipment or material will be accomplished in  
25 accordance with 10 CFR 20.301 and 20.304.  
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5.1 CORPORATE ORGANIZATION AND ADMINISTRATIVE PROCEDURES

5.1.1 Corporate Organization

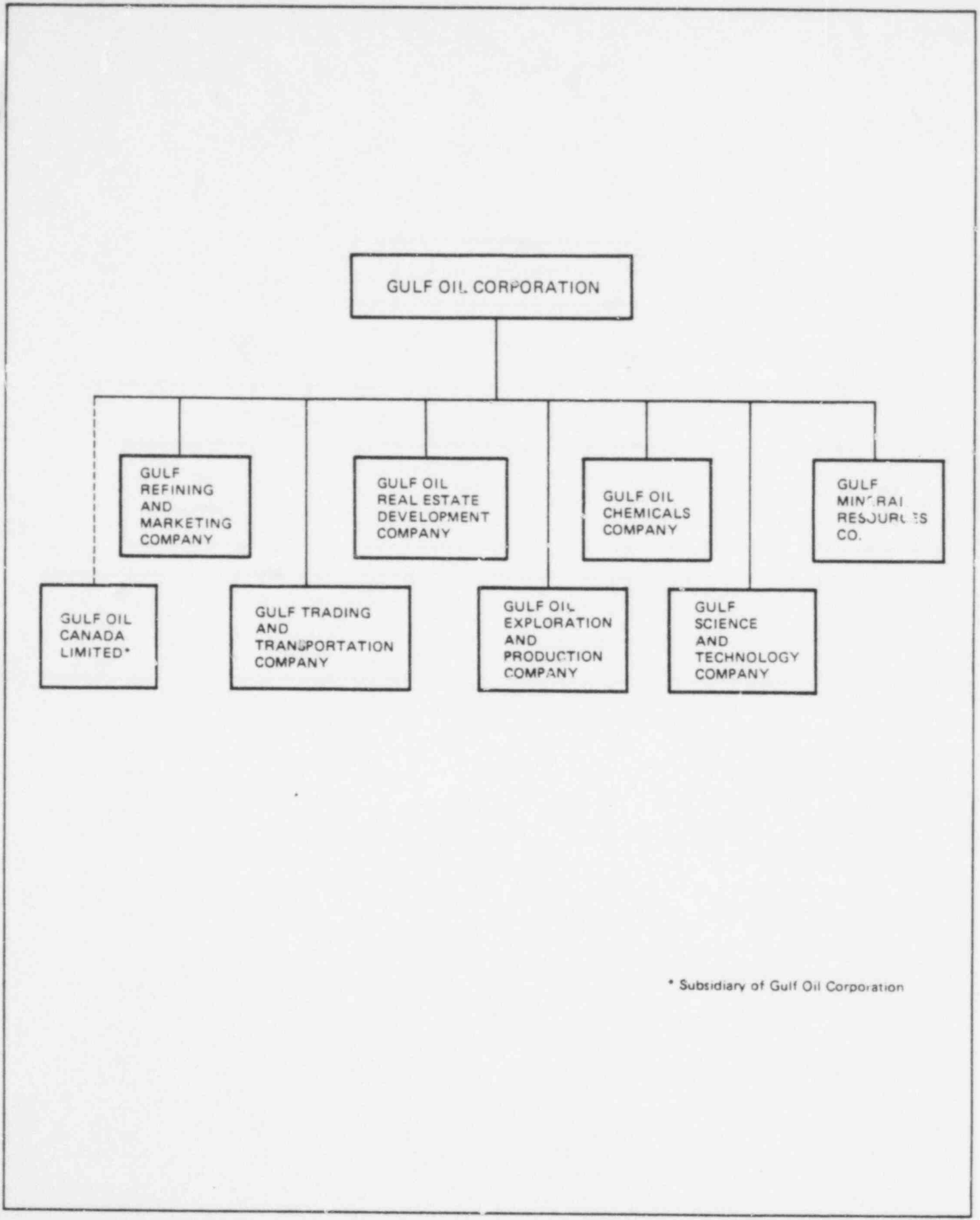
Gulf Mineral Resources Co., headquartered in Denver, Colorado, is a strategy center of the Gulf Oil Corporation, headquartered in Pittsburgh, Pennsylvania. Organizational charts of these companies are shown in Figures 5.1-1 and 5.1-2.

The Mt. Taylor mine/mill operations will be under the direct supervision of an Operations Manager who will report to the Senior Vice-President, Operations & Marketing - Uranium. Mill Operations will be the responsibility of the Mill Manager who will report directly to the Operations Manager. The Radiation Safety Officer (RSO) will be responsible for all aspects of Radiation Safety and will report directly to the Operations Manager. Radiation, health and medical expertise in the Medical Division of the Gulf Science & Technology Company, Pittsburgh, Pennsylvania, will be available to the Radiation Safety Officer as required for medical examinations, data review, auditing, analyses, and advisory purposes.

5.1.2 RSO Responsibilities

Any training requirements, process changes, unusual maintenance work or equipment modification requires the approval of the RSO prior to implementation. An operating manual covering each phase of the operation, including both routine and non-routine work, will be written and made





\* Subsidiary of Gulf Oil Corporation

Figure 5.1-1.  
CORPORATE MANAGEMENT STRUCTURE  
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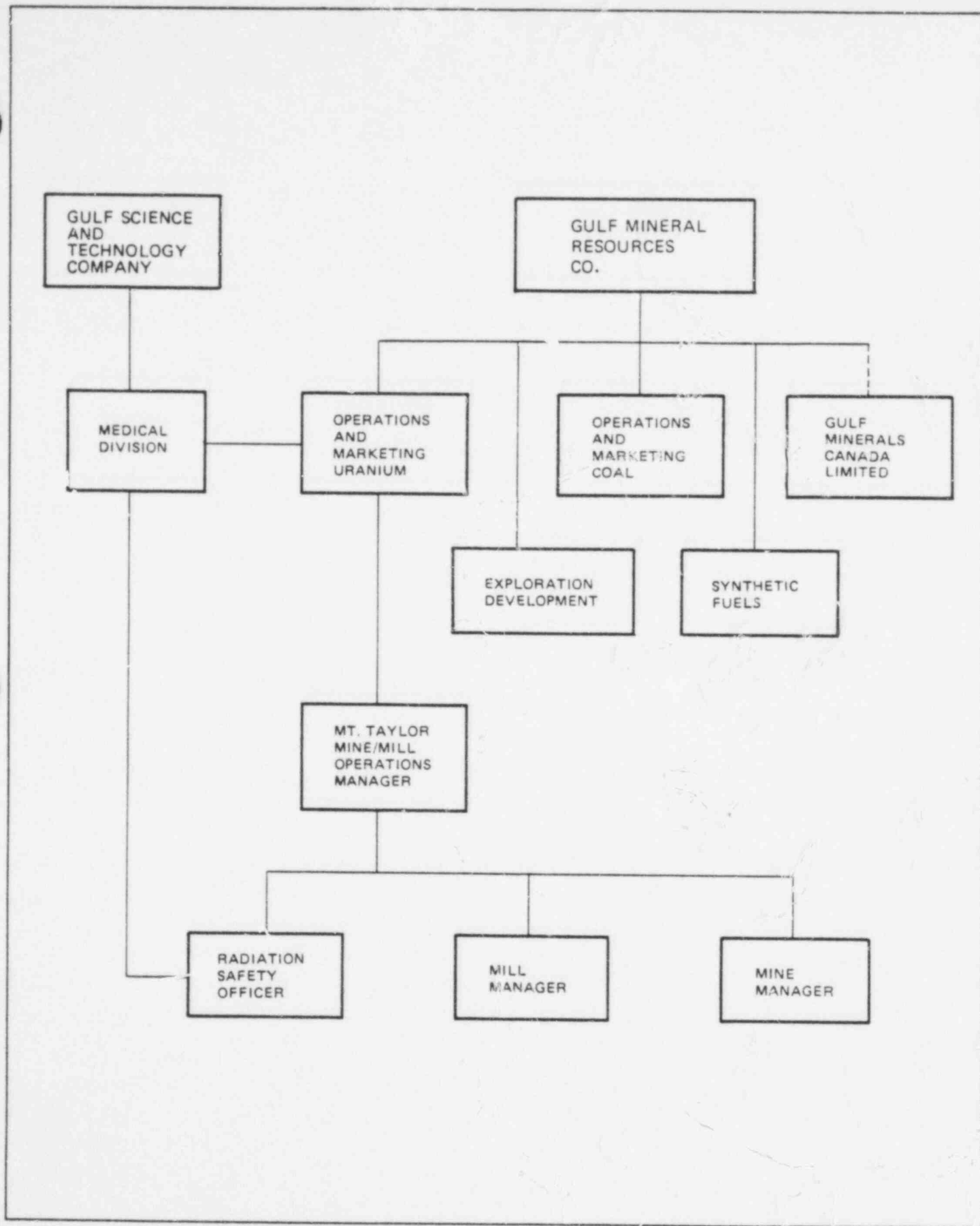


Figure 5.1-2.  
 GULF MINERAL RESOURCES COMPANY  
 MANAGEMENT STRUCTURE

available to each mill and maintenance employee. The RSO will approve the health and safety aspects of the operational procedures. The manual will be updated as necessary. As operations will not commence before 1981, these manuals have not yet been finalized.

#### 5.1.3 Employee Exposure Review Program

In addition to routine safety inspections, the RSO will make monthly inspections of work areas and practices. All monitoring and exposure data will be reviewed monthly to insure compliance. Any trends or deviation from the ALARA principle will be addressed. A monthly status report will be prepared for the Operations Manager, with periodic audits by the Corporate Medical Department. Any worker whose exposure is found to exceed 25 percent of the quarterly limit (1.25 rem/quarter total body gamma, 3.75 skin dose beta plus gamma) will trigger action to investigate that employee's work area and work habits, in order to pinpoint the reason for the exposure.

#### 5.1.4 ALARA

Gulf's commitment to ALARA and plans for implementing such a program in the work areas is presented in Section 2.1 of Volume 4. In order to maintain effluent releases to a level which is as low as reasonably achievable, Gulf has included as a fundamental part of the mill design dust control features which are described in Sections 3.1, 3.2 and 3.3 of Volume 4. Monitoring and efficiency checks on these control features are described in Section 3.4 of Volume 4.

1 5.2 QUALIFICATIONS  
2

3 The minimum educational requirements for the individual holding the posi-  
4 tion of Radiation Safety Officer is a bachelor's degree in the physical  
5 sciences, mathematics or engineering from an accredited college or univer-  
6 sity, equivalent experience, or a combination of equivalent experience  
7 and education. Equivalent experience shall be at least four years of  
8 relevant radiation safety experience.  
9

10 The individual holding the position of Radiation Safety Technician  
11 shall have as a minimum educational requirement a high school diploma  
12 or equivalent, with training in the operation and use of the various moni-  
13 toring instruments.  
14

15 As mentioned in Item 10, NRC-2, individuals have not been selected  
16 to fill all positions to date, but a synopsis of the qualifications  
17 of the RSO is attached to NRC-2.  
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1 5.3 TRAINING  
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3 Each new employee will be given initial training in radiation safety  
4 through the use of a slide presentation closely integrated with safety  
5 manuals provided the employee. These manuals will be developed speci-  
6 fically for the Mt. Taylor Project and will follow the provisions of  
7 10CFR19.12. Each training session will conclude with an open question-and-  
8 answer session after which each employee will be given a short test on the  
9 material just presented. Records will be kept on each employee and the  
10 date of training. Training sessions will be repeated to each employee at  
11 least on an annual basis.  
12

13 It is anticipated that the training sessions will follow the format outlined  
14 below:  
15

- 16 (1) Sign in by each employee.
- 17 (2) General description of the activities of the RSO.
- 18 (3) Presentation of the material in the training manuals,  
19 probably with the aid of a slide/audio cassette and/or  
20 video tape presentation.
- 21 (4) Location of by-product sources and associated safety precau-  
22 tions.
- 23 (5) Question and answer session.
- 24 (6) Each employee answers the test questions at the end of each  
25 presentation corresponding to one of the manuals.  
26

27 Additional training sessions will be presented from time to time on safety,  
28 covering such topics as chemical hazards, physical hazards (noise, heat  
29 stress), protective equipment, and self-contained breathing apparatus.  
30

31 A manual for supervisors will also be available that will cover much of  
32 the information in the training manuals and in addition will include a

1 radiation protection guide for each area covering a description of the  
2 operation, types of exposures, the radiological hazard involved, protec-  
3 tion requirements, emergency procedures, and decontamination procedures.  
4

5 Female employees, in addition to the training indicated above, will also  
6 be given instructions in accordance with Regulatory Guide 8.13, "Instruction  
7 Concerning Prenatal Radiation Exposure." This will include training in  
8 the biological effects of ionizing radiation and the effects of that radi-  
9 ation exposure on the fetus.  
10

11 The employee radiological safety training program is under development.  
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1 5.4 SECURITY  
2

3 Both the mill complex and tailings pond areas will be enclosed by a peri-  
4 meter fence to restrict access. All fences will be posted with appropriate  
5 signs in accordance with 10CFR20.  
6

7 Each visitor will be checked in and out on a visitor's register, issued a  
8 security pass, and be escorted at all times while within the confines of  
9 the secured area. Visitors having work assignments, such as equipment manu-  
10 facturer repairmen, may be given security, safety, and radiation protection  
11 orientation and subsequently allowed to perform their duties without escort.  
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1 5.5 RADIATION SAFETY  
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3 5.5.1 Instrumentation

4 The methods, instrumentation, and equipment, including personnel monitor-  
5 ing devices, used to determine employee exposure to external radiation  
6 are provided in Section 4.1 of Volume 4. As mentioned in Section 5.1.3  
7 of this volume, the action level for external employee exposure has  
8 been set at 25 percent of MPC. The type of surveys to be accomplished  
9 and the audit functions are set forth in Sections 4.2.4 and 4.2.5 of  
10 Volume 4, respectively. The number and category of personnel involved  
11 in the personnel dosimetry program has not yet been determined.  
12

13 5.5.2 In-Plant Air Sampling Program

14 For some period subsequent to mill start-up, the efficiency of the venti-  
15 lation system for controlling build-up of radon daughters within various  
16 portions of the mill, will be surveyed. Modifications to the ventilation  
17 system will be made if monitor results exhibit higher than acceptable  
18 concentrations of radon daughters.  
19

20 Once the ventilation system has been shown to be operating properly, daily  
21 radon daughter measurements will be made at the grinding, solvent extrac-  
22 tion, acid leach, CCD, mill ore pad and sand tailings pile areas, as  
23 described in Section 4.2 of Volume 4. At the time of sampling, a record  
24 will be made of any process change (mill down, fans off, repair work  
25 in progress, etc.) which could potentially affect the monitoring result.  
26 Periodic review may result in monitor program adjustments.  
27

28 In addition, monthly airborne particulate samples will be taken in several  
29 areas of the mill, including the grinding area and the yellowcake drying  
30 and packaging area. These samples will be analyzed for uranium, radium and  
31 thorium. Once an adequate data base has been collected, this program  
32 may be adjusted. While non-routine operations are in progress, daily

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1 airborne radionuclide particulate analyses and radon daughter analyses  
2 will be performed.

3  
4 Details of the planned radiation safety program, including corrective  
5 action requirements and procedures for sample analysis, etc., have not  
6 been finalized.

### 7 8 5.5.3 Employee Exposure Measurements

9 Sampling of the mill atmosphere will be conducted in accordance with para-  
10 graph 57.5-37, Title 30 CFR. Individual employee exposure records will  
11 be maintained in accordance with 30 CFR 57.5-40. The filter paper used  
12 in the sampling program will be analyzed by a reliable laboratory at  
13 least monthly to determine the uranium, thorium and radium levels. Action  
14 level criteria will be 25 percent of MPC.

### 15 16 5.5.4 Prevention of Contamination of Clean Areas

17 To minimize any potential contamination in administrative offices and  
18 clean areas, in addition to routine surveillance, employees (on an in-  
19 dividual job basis) may be required to shower and change clothing.  
20 For employees not normally considered as part of the mill operating  
21 crew and members of the mill operating crew not covered above, normal  
22 personal hygiene will be required. Each employee is responsible for  
23 individual safety and work quality and for adherence to safety and  
24 radiation protection rules as a condition of employment. All supervisory  
25 personnel are required to insure these rules are enforced. Additionally,  
26 a specific part of employee training will be on personal and area hygiene  
27 which will include measures to prevent the spread of contamination and  
28 will address specifically eating, drinking, smoking and lunchroom hygiene.

### 29 30 5.5.5 Environmental Monitoring - Air

31 Table 5.5-1 presents a synopsis of the proposed environmental monitoring  
32 program. Locations of the airborne radioactive particulate samplers

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Table 5.5-1. PLANNED ENVIRONMENTAL MONITORING PROGRAM

Description	Parameters	Frequency (No. per year)	Comments
MILL			
Effluents			
<u>Airborne</u>			
● Stacks			
- Dryer and packaging	Nat. U, Th-230, Ra-226	2	
- Other	Nat. U	2	
● Boundaries	Nat. U, Th-230, Ra-226 Pb-210, Rn-222	12	1 wk/mo, 3 locations
<u>Water</u>			
● Surface discharge	---No release to unrestricted surface area---		
● Tailings Area Seepage	Nat. U, Ra-226, Th-230,	12	
● Groundwater	Nat. U, Ra-226, Th-230	2	Selected wells
Environmental			
<u>Airborne</u>			
● Soil	Nat. U, Ra-226, Th-230	1	4 locations NESW
● Vegetation	Nat. U, Ra-226, Th-230	1	4 locations NESW
<u>Penetrating Radiation</u>	Gamma	1	4 sets of duplicate dosimeters

1-55

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1 have not yet been selected. These locations will be specified once  
2 the current meteorological monitoring has been completed, but will in-  
3 clude sites at the boundary of the exclusion area as well as the nearest  
4 residence. Radon samples will also be collected from these same loca-  
5 tions.

6  
7 Direct gamma radiation will be measured using thermoluminescent dosi-  
8 meters set up in duplicate at four locations outside the mill security  
9 fence. From these measurements annual doses will be calculated.

10  
11 More information of Gulf's proposed environmental monitoring program  
12 can be found in Section 6.2 of the Environmental Report.

#### 13 14 5.5.6 Environmental Monitoring - Water

15 The liquid effluent monitoring program will focus on tailings pond seep-  
16 age and ground water quality because there will be no discharge into  
17 surface waters. The system of monitoring wells, which include both  
18 near surface and deep wells, is described in detail in Section 6.2.2  
19 of the Environmental Report. Water samples from all wells will be  
20 analyzed for natural uranium, radium-226, and thorium-230. In addition,  
21 water from two area wells studied for baseline purposes will be sampled  
22 and analyzed for the same radionuclides. The proposed water monitoring  
23 program is summarized on Table 5.5-1.

24  
25 All water samples will be analyzed in the laboratory facilities to be  
26 set up in the mill complex. Certification of the lab will be obtained.  
27 Split samples will be sent to a commercial laboratory on a random  
28 basis as a means of quality control.

29  
30 Unless significant changes are made in analytical techniques by the time  
31 the mill and laboratory is in operation, the standard approved analytical  
32 procedures described in 1975 Annual Book of ASTM Standards, Water Analysis,

1 Part 31, will be strictly followed for natural Uranium, Radium-226, and  
2 Thorium-230.  
3

4 5.5.7 Radiation Safety Program/Radioactive Sources and Gauges

5 Until such time as Gulf makes a determination regarding the types of  
6 radioactive sources and gauges to be utilized at the mill, if any,  
7 development of an associated radiation protection program is premature.  
8

9 5.5.8 Interim Tailings Stabilization Program

10 The management program proposed to eliminate the blowing of tailings  
11 from the tailings retention system is described in Section 3.4.1 of  
12 the Environmental Report. Briefly, the program consists of sluicing  
13 total tails into a system of small cells within the impoundment, so  
14 that the sands will settle out within the cell. Sluice water and slimes  
15 will then discharge into the retention area below the cells. Slime  
16 tailings should not represent a fugitive dust problem as they will be  
17 wet. When dry, slimes tend to form hard cakes which are not susceptible  
18 to wind erosion. A high volume particulate sampler will be located  
19 nearby to monitor the adequacy of this system.  
20

21 5.5.9 Mill Atmospheric Emissions Control

22 A narrative of the dust control features throughout the mill, atmospheric  
23 emission sources, and control features are provided in Section 4.1  
24 of this volume. Procedures for verifying the efficiency of the control  
25 devices are described in Section 3.0 of Volume 4.  
26

27 5.5.10 Decommissioning

28 Reclamation of the tailings impoundment area, including surety arrange-  
29 ments, is discussed in detail in Section 9.0 of the Environmental Report.  
30  
31  
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1 5.5.11 Tailings Management and Reclamation

2  
3 Direct Gamma Radiation. The tailings impoundment, containing radium-226,  
4 is large enough so that for purposes of calculating the gamma-ray exposures  
5 at the surface of the impoundment near its center, it may be treated as a  
6 radiation-emitting slab of infinite area. Every disintegration of an  
7 atom of radium-226 eventually results in the production, through decay  
8 of its daughter products, of an average of 2.18 photons. These photons  
9 have a mean energy of 0.824 MeV. More than 95 percent of this gamma  
10 energy is from radon daughters. The total gamma-ray flux at the surface  
11 of the impoundment is made up of unscattered primary gamma rays and second-  
12 ary gamma rays that have been scattered by material inside the impound-  
13 ment but still reach the surface. The primary gamma-ray flux is a function  
14 of the gamma-ray emission rate and energies, the linear attenuation  
15 coefficient of the tailings, and the thickness of the tailings. The  
16 secondary or scattered gamma-ray flux may be described by a buildup  
17 factor which is a function of the linear attenuation coefficient, the  
18 energy of the primary gamma rays, and the thickness of the slab (USEPA,  
19 1976).

20  
21 Schiager\* has performed some theoretical calculations for uranium mill  
22 tailings piles and has reduced them to the following:

23  
24 
$$x (\mu\text{R/hr}) = 2.5 C_{\text{Ra}} (\text{pCi/g})$$

25  
26 This simple formula allows the estimation of the exposure rate (x) above  
27 a tailings pile if the concentration of the radium in the tailings is  
28 known. Schiager assumed that the density of the tailings pile was

29  
30 \_\_\_\_\_  
31 \*Schiager, K.J. 1974. Analysis of Radiation Exposures on or Near Ura-  
32 nium Mill Tailings Piles, Radiation Data and Reports. U.S. Environmental  
Protection Agency, Volume 15, Number 7, July.

1 1.6 g/cm<sup>3</sup> and that the linear attenuation coefficient was 0.11 cm<sup>-1</sup>.  
2 The buildup factor increases only slowly after one to two feet of  
3 tailings. Thus, the formula, which includes buildup, does not have  
4 to be corrected unless the depth of the tailings is less than about  
5 one foot, in which case the exposure at the surface of the pile will  
6 be smaller than predicted by this equation (USEPA, 1976).

7  
8 The Mt. Taylor tailings have been estimated to contain approximately  
9 1230 pCi/g. Using Schiager's formula then gives an estimate of the  
10 gamma-ray exposure rate at the surface of the uncovered tailings of about  
11 3100  $\mu$ R/hr or 27R/yr. The earth cover placed over the tailings during  
12 reclamation will attenuate gamma rays. In theory, each foot of packed  
13 earth (1.6 g/cm<sup>3</sup>) covering the tailings\* will reduce this exposure rate  
14 by a factor of approximately 10 or more (USEPA, 1976). Therefore, the  
15 10-foot cover planned for the Mt. Taylor tailings would give an attenuation  
16 of 10<sup>10</sup> or greater. In practice, diffusion and decay of radon-222  
17 in the soil will produce gamma-ray emissions in the upper layers of  
18 the cover, reducing very slightly the effective attenuation of the gamma-  
19 ray field. The cover is expected to reduce the gamma ray field to  
20 essentially background levels.

21  
22 Radon Emanation Rate. The average radium-226 content of six soil samples  
23 in the project area is 3.76 pCi/g. Based upon this value, it was  
24 calculated that the current background flux of radon-222 is 6.0 pCi/m<sup>2</sup>-sec.  
25 Therefore, the performance objective of the tailings cover is to reduce  
26 the radon-222 flux to 12.0 pCi/m<sup>2</sup>-sec.

27  
28  
29 

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\*Swift, J.J., J.M. Hardin, and H.W. Calley. 1976. Potential Radiolog-  
30 ical Impact of Airborne Release and Direct Gamma Radiation to Indivi-  
31 duals Living Near Inactive Uranium Mill Tailings Piles. U.S. Environ-  
32 mental Protection Agency. EPA-520/1-76-001, July.

1 It has been calculated that the radon flux from the surface of the com-  
2 pacted, non-reclaimed tailings would be 590 pCi/m<sup>2</sup>-sec. Applying appro-  
3 priate factors for the reduction of radon-222 through varying thicknesses  
4 of clay and earth, it is calculated that the tailings impoundment will  
5 have to be covered with a one-foot thick clay cap, overlain with a nine-  
6 foot thick cover of earth materials. Applying the reduction due to the  
7 above-described cover, the radon flux at the surface of the reclaimed  
8 tailings has been estimated at 9.4 pCi/m<sup>2</sup>-sec.

9 Calculations regarding the radon attenuation capacity of the proposed  
10 cover material is presented in Appendix F.

11  
12 Monitoring and Maintenance. Implementation of the reclamation and  
13 restoration program described in Section 9.0 of the Environmental Report  
14 should eliminate the need for an ongoing monitoring and maintenance  
15 program. Briefly, the program calls for the placement of ten feet  
16 of clay and earth on top of the tails, followed by approximately six  
17 inches of topsoil. The topsoil will be seeded and fertilized as necessary  
18 to establish vegetation. In addition, permanent erosion control and  
19 surface drainage facilities for the covered tailings deposit will consist  
20 of the following:

- 21  
22 ● rock-lined ditches extending from natural drainageways at the  
23 edge of the deposit to a common low point near the left abut-  
24 ment of the dam
- 25  
26 ● an extension of the retention dam to provide five feet of  
27 freeboard above the top of the reclaimed pond for added flood  
28 protection
- 29  
30 ● an open-cut drainageway in rock on the left abutment of the  
31 dam to pass storm water
- 32  
33 ● an 18-inch layer of rock on the downstream face of the dam.

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6.0  
ACCIDENTS

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The potential for accidents related to the operation of the Mt. Taylor Project will be minimized through conservative design, construction, and operation, as well as a quality assurance program designed to monitor and maintain safe operations. Notwithstanding these safeguards, the consequences of any potential release of radiological materials to the environment have been evaluated according to three degrees of severity ranging from trivial through large. Analyses of potential accidents are given in Section 7.0 of the Environmental Report and will therefore not be repeated here.

In any case where an accidental release of radioactive materials did occur, Gulf would immediately survey the affected area with appropriate monitoring equipment, determine what, if any, mitigating measures were warranted, and then assume responsibility for restoring the environment to background conditions. The Nuclear Regulatory Commission will be notified of any unanticipated release of radioactive material to the environment from the tailings disposal system.



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Applicant's quality assurance program will cover mill and tailings disposal system design, construction, and operation to assure safety, reliability, and economy of operation. The Project Manager will be responsible for ensuring that the requirements of the quality assurance program are met.

#### 7.1 DESIGN

During design, the Project Manager will be responsible for:

- determining that design criteria meet applicable building standards, pressure vessel codes, seismic and meteorological consideration
- ensuring that design criteria are reviewed and approved by qualified personnel
- ensuring that design documents are reviewed for conformance with design criteria
- ensuring that only approved design documents are issued for construction
- preparing procedures and material specifications
- reviewing and approving specifications for conformance to design criteria
- reviewing and approving procurement documents that conform to specifications

1 7.2 CONSTRUCTION

2  
3 During construction, the Project Manager or his delegate will be responsible  
4 for:

- 5
- 6 ● ensuring that the installation is constructed in conformance with
- 7 approved drawings and specifications
- 8 ● reviewing, approving, and documenting construction design changes
- 9 ● implementing a receiving inspection system to assure that
- 10 materials and components are inspected for conformance to speci-
- 11 fications and that nonconforming items are identified and con-
- 12 trolled to prevent inadvertent use
- 13 ● implementing a program of testing of materials and components to
- 14 ensure conformance with specifications
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1 7.3 ACCEPTANCE TESTS  
2

3 Prior to operation, the Mill Manager will verify that all systems meet  
4 performance standards.  
5

6 Prior to operation, the Radiation Safety Officer will verify:  
7

- 8       • operability of radiation monitors  
9       • readiness of emergency equipment  
10      • proper installation of safety items  
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1 7.4 OPERATION  
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3 The Mill Manager will be responsible for operation and maintenance and  
4 will:  
5

- 6 ● implement a training program for operating and maintenance per-  
7 sonnel in accordance with applicable standards
- 8 ● annually review training documentation to verify adequacy of  
9 course content and training records
- 10 ● establish a procedures system that will prevent exposure of  
11 plant personnel or the environs to radioactive materials in  
12 excess of established limits
- 13 ● approve, issue, and maintain a master file of operating proce-  
14 dures and their revisions
- 15 ● develop and implement a preventive maintenance program  
16

1 7.5 RADIATION PROTECTION AND ENVIRONMENTAL MONITORING  
2

3 The Radiation Safety Officer will be responsible for radiation protection  
4 and environmental monitoring and will:  
5

- 6 ● develop and implement a radiation protection orientation and  
7 training program for all employees
- 8 ● establish a program for training the radiation safety technician(s)
- 9 ● perform annual reviews of training documentation to verify  
10 the adequacy of course content and training records
- 11 ● review and approve sampling and surveying procedures for safety,  
12 radiation protection, and environmental impact considerations
- 13 ● review and approve procurement of radiation protection and  
14 environmental monitoring instruments and calibration standards
- 15 ● perform monthly reviews of survey records to insure complete-  
16 ness, detection of abnormal conditions, and adequacy of followup  
17 actions
- 18 ● review the radiation instrument calibration records and procedures
- 19 ● establish and maintain a program utilizing independent labora-  
20 tories to verify sample analysis accuracy
- 21 ● perform and document quarterly audits of jobs which are hazardous  
22 or critical to the safety of plant personnel to assure compli-  
23 ance with the adequacy of radiation rules and safety procedures
- 24 ● annually review safety, radiation exposure, and radiation survey  
25 records for adherence to ALARA philosophy  
26

27 Recommendations will be discussed with personnel responsible for the work  
28 involved and a date for the institution of corrective action will be estab-  
29 lished. A followup audit will verify compliance.  
30  
31  
32

EVALUATION OF ALTERNATIVES

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Alternative locations for the mill and tailings impoundment were identified at the outset of the planning process. As discussed in Section 10.0 of the Environmental Report, three sites were considered for mill construction. One was rejected because of its proximity to the town of San Mateo, and one was rejected because of excessive capital and operating costs and interference with the selected tailings impoundment area. The site selected, Section 1, T13N, R8W, provides an isolated location topographically suited for the operation of a mill in an environmentally sound and economically feasible manner.

Eight potential sites for the tailings impoundment were identified. The original evaluation was conducted on the basis of a conventional surface impoundment, and La Polvadera Canyon site was selected based upon favorable geologic conditions and minimum risk of ground water contamination, population exposure, and surface erosion.

As a result of the recent emphasis by NRC on below-grade burial of tailings, the potential sites are being reevaluated for below-grade burial.

Section 10.0 of the Environmental Report discusses tailings impoundment alternatives in more detail.

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