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RTI Project 44U-2507
Contract No. EMW-C-0707
FEMA Work Unit 1611C

FINAL REPORT

RTI/2507/00-01F

NATIONAL UNDERGROUND MINES INVENTORY

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Prepared for:
Federal Emergency Management Agency
Washington, D.C. 20472

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20. and from mine owners and operators during visits to six underground mines. The data collected were incorporated into a computerized underground mine data file at the FEMA/Olney Computer Center.

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Abstract

The purpose of this study was to identify and, to the extent that data are available, to characterize the underground, non-coal mines in the United States and to assemble the data obtained into a national inventory of underground mines having the potential of providing lodging and shelter as a civil defense measure during a natural or man-made disaster. Data were collected from the Mine Safety and Health Administration, the U.S. Bureau of Mines, from discussions with mine inspectors, and from mine owners and operators during visits to six underground mines. The data collected were incorporated into a computerized underground mine data file at the FEMA/Olney Computer Center.



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I. INTRODUCTION

In recent years, civil defense planners have emphasized two major alternatives for protecting the civilian population in the event of a nuclear attack on the United States. The first alternative--implemented should an attack occur suddenly, without warning--consists of sheltering the population in the immediate vicinity of its locale at the time of attack. The second alternative--implemented during a period of international tensions that could lead to war--consists of relocating (evacuating) populations of likely target areas into areas of lower risk where shelter from fallout would be provided. The success of both alternatives depends on the availability of suitable lodging and weapons effects shelter.

Federal civil defense officials have for a number of years been seeking low-cost means of providing lodging and shelter. To this end, a civil defense rapid enhancement concept was developed under which plans are made whereby civil defense capabilities can be improved by a concentrated effort over a relatively short period of time ranging from a few weeks to a year or more. These efforts would be initiated under conditions of heightened international tensions. Previous civil defense research at RTI [Ref. 1] has shown that underground mines can be made usable as shelters in a short period of time and at a low cost; therefore, these facilities appear to be ideally suited for incorporation into rapid enhancement plans.

Under the National Shelter Survey (NSS), underground mines near metropolitan areas were surveyed and are identified in the NSS data files. However, unsurveyed mines that are remote from metropolitan areas could prove to be a valuable resource for the crisis relocation option. The research program described herein had the objectives of identifying and characterizing

all underground mines in the continental United States and of developing an approach for incorporating underground mines into the civil defense rapid enhancement concept. Since the number of underground mines located in risk areas (and subject to high blast overpressures) is relatively small, the emphasis of this study was toward their use as congregate lodging and fallout shelters rather than as direct effects shelters.

Effective use of underground mines as crisis shelters is a function of several factors:

- . Mine location and physical character,
- . Mine environment, and
- . Resource availability for mine upgrading.

Mine location is important in determining its usefulness either as a risk-area or host-area shelter. Location is also an important determinant of accessibility for occupants and timely delivery of materials and supplies. In host areas, fallout radiation protection is the primary function of shelters, although low-level blast effects may also be experienced. Underground mines provide excellent fallout protection by virtue of the shielding provided by the earth cover and most mines would not be affected by low-level blast overpressures. In risk areas, shelters must provide protection from all weapons effects including blast, thermal pulse, and initial nuclear radiation, as well as fallout. The earth cover provides excellent protection from the initial nuclear radiation, thermal pulse, and fallout radiation with the exception of areas near entranceways of drift-entry mines. Most underground mines also provide good blast protection, although quantification of blast protection requires a detailed analysis of each mine. Data important to such an analysis include geologic formations around the mine; mine age; mine entranceway type, size, and number; mine volume and interior configuration;

mine depth; mine support characteristics; and hoist equipment susceptibility to blast damage. Usable floor area, means of ingress and egress, and adaptability to upgrading make up the physical character of a mine. Each of these parameters is an important determinant of a mine's usefulness as a fallout shelter.

The internal environment of a mine is made up of thermal, chemical, and biological characteristics of the mine atmosphere. Thermal characteristics include temperature and humidity; chemical characteristics refer to the chemical makeup of mine air, which may include toxic gases; and biological characteristics refer to the potential presence of disease-producing agents within a mine. Each of these environmental elements must be within a habitable range in mines used as personnel shelters.

In their natural state, most mines would not be suitable for housing large numbers of people. As a minimum, lighting and ventilation systems will need to be added or upgraded. Expedient means of adding or upgrading these items should be available during a rapid enhancement period and should make use of readily available materials and equipment to the extent possible. Hence, the availability of upgrading resources is an important consideration in evaluating a mine's fallout shelter potential.

The project described herein had objectives of identifying all U.S. underground mines that have the potential of being used as crisis shelters, obtaining, to the extent that data are publicly available, information that could be used to evaluate each mine's shelter potential, and assembling the collected information into a computerized national inventory of underground mines compatible with the TENOS* civil defense operating system model.

* TENOS - Test and evaluation of National Operating Systems.

While a great deal of success was achieved in the first and third objectives, progress toward the second objective was quite limited. Work performed and results achieved during the course of the project are described in the following sections.

II. MINE INVENTORY DEVELOPMENT

The first part of the study involved development of a national inventory of underground mines and was carried out in two phases: a data collection phase and a data file preparation phase. Data collection consisted of purchasing computer files, written and telephone solicitations, and field visits to mining operations. Data file preparation consisted of assembling and computerizing the collected data, estimating missing data elements, and calculating needed parameters.

A. DATA COLLECTION

1. Examination of Data Files

The initial data collection task was the purchase of the most recent list of U.S. mines from the Department of Labor, Mine Safety and Health Administration (MSHA). The list was obtained on computer tape and represents the status of metal and nonmetal mines at the end of the second quarter of 1982. Some of the important data elements contained in the MSHA file for each mine include: an identification number, name, location (state and county), Standard Industrial Classification (SIC) code for the primary commodity mined, current status of mining operations, mailing address, and a code identifying the mine as a surface or underground operation. Because this study is concerned only with underground mines, the purchased data file was processed to create a new data file pertaining only to underground mines. This new data file served as the basis for the national underground mines inventory.

Once the mine listing was obtained, descriptive information for each mine was solicited through contacts with district, subdistrict, and field offices of MSHA. Contacts were made by mail and by telephone. Information requested

included mine location, estimated mined out area, entry type, wetness data, toxic gas data, and mining status. In most cases, staff members at subdistrict or field offices were able to supply the information requested.

From initial contacts with MSHA offices, it was learned that the MSHA Safety and Health Analysis Center in Denver had compiled an information file describing mine hoist systems for approximately 75 percent of U.S. mines with hoisting equipment. Copies of the hoist information forms were requested and subsequently provided to the project staff. Information from the hoist data file was matched with other information by matching mine identification numbers.

Information files maintained by MSHA did not generally contain all of the data needed to assess a mine's shelter potential. The data obtained from MSHA showed a great deal of variation in usefulness for civil defense purposes. In some cases, followup conversations to clarify or supplement written communications were adequate for our needs, while in other cases, desired information was unavailable. In the latter cases, estimates or assumptions were made to complete the missing data when practical.

The data tape purchased from MSHA does not contain information on abandoned mines. Because abandoned mines are potentially useful as shelters, efforts were made to identify these mines. Two important sources of abandoned mine data were identified: (1) the U.S. Department of Interior's Bureau of Mines (BOM) and (2) MSHA supervisors and field inspectors. The BOM Minerals Availability Field Office (Denver) has developed an inventory of both operating and abandoned mines which includes underground mines for metals of strategic importance. RTI obtained a listing of their computerized data file which, for each mine listed, identifies mine name, mine owner, county location, longitude and latitude, commodity mined, date of data entry, depth

and number of shafts, condition of mined out area, and amount of mined out area. The BOM information is more extensive than that available from MSHA; however, its availability is somewhat limited for certain metals (gold, for example) and it is unavailable for most nonmetals. Information relating to internal conditions (e.g., wetness data) of mines was frequently not available in the BOM file. Such mines are included in the mine inventory even though they may not be of use to Civil Defense Rapid Enhancement plans. Before any mines in this category are incorporated into civil defense plans, more definitive information regarding their shelter potential must be obtained and evaluated by civil defense planners.

In addition to the BOM data on abandoned mines, MSHA personnel identified mines that are not found on present MSHA computer files. In most cases, the mines were known to have been taken off the computer lists for some reason but were also known to have been developed and were thought to be in a condition to provide shelter. In eastern states, abandoned mines are predominantly nonmetal while in rocky mountain and western states, they are predominantly metal. Abandoned nonmetal mines were identified in both the northeast and northcentral MSHA districts.

It is unlikely that all abandoned mines in the country were identified during this project; however, information on the Bureau of Mines printout, which identifies metal mines, combined with information obtained from MSHA district, subdistrict, and field offices, which predominantly relates to nonmetal mines, provides a relatively thorough inventory of abandoned underground mines. For most of the abandoned mines, no shelter space number has been estimated because of uncertainty regarding the condition and size of the mine.

2. Mine Visits

Because much of the mine information was obtained orally and is based on imprecise estimates by MSHA inspectors, field visits were made to six mines to obtain, first hand, a feel for conditions in and around actual underground mines. The mine visits provided the project team with a sound basis for interpreting the information provided by MSHA. The visits also provided the project team with practical insights into the interior configuration and conditions in a variety of metal and mineral mines where various mining methods are used. The six mines were selected to represent a cross-section of mines by geographic location, commodity mined, entry type, and mining method used. The six mines visited were:

- (1) Weeks Island Mine; Morton Salt Company;
Weeks Island, Louisiana; salt.
- (2) San Manuel Mine; Magma Copper Co.;
San Manuel, Arizona; copper.
- (3) Homestake Mine; Homestake Mining Co.;
Lead, South Dakota; gold.
- (4) Volmeyer Mine; Columbia Quarry Company;
Columbia, Illinois; limestone.
- (5) Friedensville Mine; N. J. Zinc Co.;
Friedensville, Pennsylvania; lead-zinc.
- (6) Whitestone Mines (No.1); Georgia Marble
Co.; Whitestone, Georgia; limestone
marble.

The three metal mines and the salt mine are multilevel mines. All four have shaft entries and, in addition, the Friedensville mine has an inclined portal entry that is used for vehicular traffic. The two limestone mines are single level mines with portal entries.

Most of the general information provided by MSHA personnel on these six mines was determined during the visits to be accurate. However, for two mines, substantial differences were found in the size estimates provided by

MSHA and those provided by mine personnel. For these mines, the size information obtained at the mine site was considered to be more up-to-date and, consequently, more accurate. Differences were also found in the hoisting capabilities estimated from MSHA records and that found during the mine visit. These differences were taken into account in the values entered in the data file.

Internal conditions of the mines visited were generally favorable to their use as civil defense shelters. Excessive temperatures were found only in one mine, the Homestake Mine, Lead, South Dakota. In this mine, drifts below the 4,000 foot level have temperatures in excess of 85° F. Consequently, these lower levels may not be suitable as shelters. Mine wetness was discussed with mine personnel and was carefully inspected during the visits. Based on these discussions and observations, mine wetness is not expected to present major problems even in mines considered to be extremely wet, such as the Friedensville Mine. RTI found that significant portions of wet mines are usable as shelter. None of the mines visited contained toxic gases other than blasting products.

Heavily timbered mines with no natural ventilation may become oxygen deficient over time because of oxygen absorption by wood during the aging process. Such an oxygen deficiency could be hazardous to individuals entering a mine for the first time unless some form of forced ventilation is used. In timbered mines, the oxygen content of the air inside should be measured before being used as shelter or lodging.

In addition to providing a basis for interpreting data from other sources, the mine visits also provided an opportunity to review the

availability of resources at or near mine sites. Electricity, fuel storage, water, communication systems, transportation, and waste disposal facilities are resources that are used in active mining operations and would be useful during a shelter period. Based on personal inspection during the mine visits, the project staff concluded that at most mines, electrical power is provided by a local electric utility and that most mines do not have emergency generators. It was also observed that diesel fuel is commonly used in mining equipment and is frequently stored inside shaft mines for convenience. Potable water is frequently not piped into the mine but water is available on the surface and is carried into the mine in containers for use by underground workers. The naturally occurring water in some mines is potable without treatment.

Toilets are available inside mines but the number is not adequate for a shelter population. All six of the mines visited had toilets, showers, and washing facilities near the mine entrance at ground level. Telephones and/or radio phones are generally placed throughout mines for communication within the mine and with the surface. Audio paging systems are also sometimes found in mines. Existing communication systems could prove to be extremely useful in shelter situations.

All of the mines visited were served by a well maintained roadway. This is likely to be the case at most mines although a few mines are well removed from paved roads and may not be easily accessible by ordinary vehicles. Many mines are served by railroads which could be used to transport people and supplies.

While observations of available resources during the mine visits provide a very general idea of useful resources that may be available at mining sites, detailed civil defense plans will require that each mine in the inventory

be investigated to determine the resources available and the additional resources required to upgrade them to a useful civil defense shelter. The following discussion covers specific characteristics of each mine visited.

a. Weeks Island Mine, Morton Salt Company.

The MSHA file lists three mines for Morton Salt Company at the Weeks Island location, one active, and two abandoned. All three reside in the same salt structure called a salt dome. A large part of the "abandoned" mine is used to store petroleum as part of the U. S. strategic reserves. The site is served by rail, barge, and highway and is within approximately two hundred yards of the Gulf of Mexico. Emergency generators are maintained at the site to provide power to the fans and hoists during electrical outages. A 1,000 gallon storage tank for diesel fuel is located inside the mine and a 3,000 gallon tank is located on the surface. Water is piped to the mine from an onsite chemical plant which operates a water treatment system. Four nearby lakes provide water to the plant, mill, and mine.

MSHA data related to the size and condition of the Weeks Island Mines were quite accurate; however, the MSHA hoist file did not contain sufficient detail to permit an accurate assessment of hoist capacity for civil defense use. Based on discussions with the plant manager, hoist capacity was estimated at 460 persons per hour. The MSHA records indicated a capacity of 280 persons per hour.

b. San Manuel, Magma Copper

MSHA data on the San Manuel copper mine were somewhat limited. The mine was identified as a large mine, but the actual amount of open floor area is not large because of the mining method used. In removing the ore, stopes are blasted in such a way that as the ore is removed, the overburden is allowed to settle into the mined out stopes. Therefore, only those haulage lines and

drifts that are currently under development are habitable and previously mined out levels do not exist. Although the haulage lines provide considerable space, this particular mining method does not leave large areas that can be used as shelter.

During mine development, pockets of water are sometimes encountered in the rock structure and must be pumped out. Nevertheless, the mine is considered dry so that its entire area is useable as shelter. Only a small volume of water collects in the mine at the sump level.

c. Homestake Mine, Lead, South Dakota

The Homestake Mine is an old, widely known gold mine. Although MSHA provided many details regarding the physical features of the mine, additional information related to mine temperature was obtained during the mine visit. The temperature inside the mine increases by approximately 1° F per 100 feet as one moves downward from the surface. At the 8,000 foot level, the air temperature is 134°F. These high temperatures could prevent the use as shelter of over 50 percent of the habitable mine area unless cooled air is used to ventilate the warmer levels. For current operations, approximately 5,000 cubic feet per minute (CFM) of ventilating air is provided to each drift to keep temperatures tolerable .

The Homestake mine is an active mine but the mining method uses extensive backfilling which keeps the usable shelter space relatively small compared to the space generated when backfilling is not used. Because of the temperature problems and the use of backfilling, the usable area in the Homestake Mine is likely to stay relatively constant.

A portion of the mines electrical needs is supplied by a small company-owned hydroelectric facility. Although for full mining operations,

power is purchased from an electric utility, the company-owned plant is adequate for lighting and partial hoist operations. This independent source of electricity could be a valuable asset during a crisis condition. The mine contains a large concrete-lined, underground water storage tank with a capacity of 2 million gallons. The water is potable and would be especially useful in a shelter situation.

The mine has one inactive hoist in place, which, according to mine personnel, could be made operable within 24 hours, if needed. This feature could also be very valuable in using the mine as a Civil Defense shelter.

d. Friedensville Mine, New Jersey Zinc

The Friedensville mine is the wettest of the six mines visited. Nevertheless, it is an attractive mine for shelter purposes. The extensive water drainage system is well designed to minimize water accumulation on the drift levels. In many areas, sufficient water has accumulated to make the use of boots a necessity, but there are also many areas that are free of standing water. The MSHA data accurately characterized the nature of the mine. At one time, this mine was allowed to flood, with the result that approximately one-third of the mine filled with water. Should the mine cease operation in the future one could assume that no more than one-third of the mine would flood and that the remainder of the mine would remain habitable.

Entrance to this mine is by vertical shaft or by a 2-mile long inclined portal which also is used for ventilation. Drinking water is tapped within the mine and is estimated to be available in adequate quantities to support a shelter population. Washing and toilet facilities are also available inside the mine.

e. Valmeyer Mine Columbia Quarry Co. and Whitestone Mines, Georgia

The two limestone mines are very similar and will, therefore, be discussed together. As is apparently the case for most limestone mines, these are single level mines except for one of the five Whitestone mines, which has two levels. For the Valmeyer mine, floor area estimates by MSHA personnel and those by mine personnel were in good agreement, but for the Whitestone mines there were significant differences in area estimates.

The mines are quite dry, cool, and easily accessible by vehicles. The Valmeyer mine has approximately 25 openings into the limestone structure and consequently has excellent natural ventilation. However, the large number of openings adversely affects radiation protection in the vicinity of the openings, which would reduce the capacity of the mine as a fallout shelter.

These limestone mines do not contain the water, toilet, and communication networks that are found in large shaft-entry mines. All parts of the mine are easily accessible by vehicles and mine personnel move in and out of the mine easily and regularly as needed. Consequently, support facilities can be located outside the mine and still be readily accessible. Upgrading mines of this type for shelter use should be much easier than upgrading large shaft-entry mines because of easy entry, good access, and a more pleasant environment inside the mine.

B. DATA FILE PREPARATION

The initial source of information for the data file was a magnetic tape file of the MSHA second quarter 1982 Metal/Nonmetal Address/Employment Data. At the request of RTI, coal mines had been purposely eliminated from the file due to potential safety problems related to their use as civil defense shelters. The format in which data are arranged in this file is shown in Figure 1.

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|--------------------------------|----------------|---|
| 1-7 | Mine ID | Pic 9(7) | MSHA Mine ID assigned to a mining operation. |
| 8-10 | Contractor | Pic X(3) | Contractor performing work at the site of the primary Mine ID operation. <u>Blank</u> if owner. Coal = 1 alpha - 2 numeric characters. metal/nonmetal numeric only. |
| 11-12 | | Pic 99 | |
| 12-16 | Inspection Office | Pic 9(4) | Code for MSHA Field office exercising jurisdiction over this mining operation. First two characters = District. First three characters = Subdistrict. All four characters designate Field office. |
| 17-18 | State Code | Pic 99 | FIPS code for state in which mine is located. |
| 19-21 | County Code | Pic 999 | FIPS code for county within a state in which mine is located. |
| 22-26 | SIC | Pic 9(5) | Standard Industrial Code for primary commodity mined. |
| 27 | Canvass or Class | Pic 9 | Designate a general product class based on SIC code. |
| 28-29 | Mine Type | Pic 99 | Metal/Nonmetal mine type code. Based on subunit operations code and canvass code. |
| 30 | Status Code | Pic X | Code for status of operations of mine (active to permanently closed.) Coal = Alpha A through H. Metal/Nonmetal = Numeric - 1, 2, and 3. |
| 31-36 | Status Date | Pic X(6) | Date of latest add or change of status. YYMMDD. |
| 37-40 | Seam Height | Pic 9(4) | Coal seam height in inches. Coal only. |
| 41-42 | Education & Training Indicator | Pic 99 | MSHA Education and Training District office having jurisdiction over this mine. |
| 43 | Surface/Underground District | Pic X | Indicator for Education and Training showing surface or underground. U = underground; S = surface. |
| 44-46 | Travel Area | Pic X(3) | Metal/Nonmetal inspection travel area. 1 alpha and 2 numeric characters. |
| 47 | Mailing Control | Pic 9 | Provides for suppression of mailouts. = all mailouts; = suppress selected mailouts. |
| 48-77 | Company Name | Pic X(30) | Company owning or having primary responsibility for the operation of this mine. |
| 78-107 | Mine or Plant Name | Pic X(30) | Name applied to this mine by the company. |
| 108-137 | Street or PO Box Number | Pic X(30) | Mailing address for this mining operation. |
| 138-150 | City | Pic X(13) | City to which mail is sent for this mine. |
| 151-152 | State Abbreviation | Pic XX | State abbreviation for mailing purposes. |
| 153-157 | Zip code | Pic 9(5) | Zip Code for mailing purposes. |
| 158-181 | County Name | Pic X(24) | Name of county in which mine is located. |

Figure 1. Original MSHA File Format

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|-----------------------------|----------------|--|
| | | | The next two items represent information supplied quarterly by the mining company on Form 7000-2. They may not accurately reflect actual accidents/illnesses reported. Occurs 4 times - once for each reporting quarter. |
| 182 | Injury Flag | Pic 9 | Company statement that this company had reportable injuries or illnesses during this report quarter. 1 if yes; 2 if no. |
| 183-185 | Injury Count | Pic 9(3) | Number of reportable accidents and illnesses given on employment form. |
| 198-199 | Filler | Pic XX | No longer needed information. |
| 200-201 | Update Addition Year | Pic 99 | Year address information was added to file. |
| 202-204 | Update Addition Year | Pic 999 | Update cycle number address information was added to file. |
| 205-206 | Update Change Year | Pic 99 | Year of latest change to address information. |
| 207-209 | Update Change Number | Pic 999 | Update cycle number of latest change to addresses information. |
| 210 | Subunit Operations (number) | Pic 9 | Number of subunit operations (formerly department) for this ID. Employment trailer count. The next 7 items occur from 0 to 4 times according to the employment trailer in character position 210. |
| 211 | Subunit Code | Pic 9 | Subunit Code. |
| 212-216 | Men | Pic 9(4) | First quarter employment count for subunit code. |
| 217-224 | Man-hours | Pic 9(8) | First quarter total man-hours worked under subunit code. |
| 225-234 | Production | Pic 9(10) | First quarter pounds of mined commodities. |
| 235-257 | | | Men, man-hours, and production fields for second quarter. |
| 259-281 | | | Men, man-hours, and production fields for third quarter. |
| 282-304 | | | Men, man-hours, and production fields for fourth quarter. |

Figure 1. Original MSHA File Format (continued)

A procedure employing a FEMA Computer Center (FEMACC) utility was developed to extract the MSHA information from the tape data file for use in developing the National Inventory of Underground Mines. Once the data were extracted, the first 210 data columns, were reformatted into three 80-column card records for each underground mine. The 80-column format was chosen for ease in manual editing through a remote terminal. The format of the 80-column card file, which was used in all subsequent processing steps to represent the MSHA data, is shown in Figure 2.

The MSHA data did not include a number of information items that are desirable in a mine inventory. For example, latitude and longitude, mine size, number and types of mine entries, and the number of shelter spaces in each mine. These data and other relevant data were obtained from MSHA field offices and other sources, as described earlier, and were manually entered into a supplemental mine information file. After the supplemental information file was verified, the file was sorted by 7-digit Mine ID so that its order then matched that of the MSHA data. The record format of the supplemental mine information file is presented in Figure 3. It should be noted that numeric fields, such as latitude/longitude and number of spaces, are generally left blank, as is any field, when the information is unknown, whereas the value "0" represents a known entity.

The following paragraphs describe the information included in the supplemental mine data file, discusses the procedures for quantifying or estimating each data element, and describes shortcomings and discrepancies in the data.

Card 1

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|-------------------------------|----------------|---|
| 1-7 | Mine ID | Pic 9(7) | MSHA Mine ID assigned to a mining operation. |
| 8-10 | Contractor | Pic X(3) | Contractor performing work at the site of the primary Mine ID operation. Since only owner records kept on this file, <u>blank</u> in all cases. |
| 11-12 | | Pic 99 | |
| 12-16 | Inspection Office | Pic 9(4) | Code for MSHA Field office exercising jurisdiction over this mining operation. First two characters = District. First three characters = subdistrict. All four characters designate Field office. |
| 17-18 | State Code | Pic 99 | FIPS code for state in which mine is located. |
| 19-21 | County Code | Pic 999 | FIPS code for county within a state in which mine is located. |
| 22-26 | SIC | Pic 9(5) | Standard Industrial Code for primary commodity mined. |
| 27 | Canvass or Class | Pic 9 | Designate a general product class based on SIC code. |
| 28-29 | Mine Type | Pic 99 | Metal/Nonmetal mine type code. Based on subunit operations code and canvass code. |
| 30 | Status Code | Pic X | Code for status of operations of mine (active to permanently closed.) Coal = Alpha A through H. Metal/Nonmetal = Numeric - 1, 2, and 3. |
| 31-36 | Status Date | Pic X(6) | Date of latest add or change of status. YYMMDD. |
| 37-40 | Seam Height | Pic 9(4) | Coal seam height in inches. Coal only. Meaningless for the records on this file. |
| 41-42 | Education & Training District | Pic 99 | MSHA Education and Training District office having jurisdiction over this mine. |
| 43 | Surface/Underground Indicator | Pic X | Indicator for Education and Training showing surface or underground. U = underground; S = surface. |
| 44-46 | Travel Area | Pic X(3) | Metal/Nonmetal inspection travel area. 1 alpha and 2 numeric characters. |
| 47 | Mailing Control | Pic 9 | Provides for suppression of mailouts. = all mailouts; = suppress selected mailouts. |
| 48-77 | Company Name | Pic X(30) | Company owning or having primary responsibility for the operation of this mine. |
| 78-79 | Filler | Pic XX | Left Blank. |
| 90 | Card Identifier | Pic 9 | Has value 1. |

Figure 2. MSHA 80-column Card Format

Card 2

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|-------------------------|----------------|--|
| 1-30 | Mine or Plant Name | Pic X(30) | Name applied to this mine by the company. |
| 31-60 | Street or PO Box Number | Pic X(30) | Mailing address for this mining operation. |
| 61-73 | City | Pic X(13) | City to which mail is sent for this mine. |
| 74-75 | State Abbreviation | Pic XX | State abbreviation for mailing purposes. |
| 76-79 | Filler | Pic X(4) | Left Blank. |
| 80 | Card Identifier | Pic 9 | Has value 2. |

Card 3

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|-----------------------------|----------------|---|
| 1-5 | Zip Code | Pic 9(5) | Zip Code for mailing purposes. |
| 6-29 | County Name | Pic X(24) | Name of county in which mine is located. |
| 30 | Injury Flag | Pic 9 | Company statement that this company had reportable injuries or illnesses during first quarter. 1 if yes; 2 if no. |
| 31-33 | Injury Count | Pic 9(3) | Number of reportable accidents and illnesses given on employment form for first quarter. |
| 34-37 | | | Injury flag and injury count for second quarter. |
| 38-41 | | | Injury flag and injury count for third quarter. |
| 42-45 | | | Injury flag and injury count for fourth quarter. |
| 46-47 | Filler | Pic XX | Unneeded information. |
| 48-49 | Update Addition Year | Pic 99 | Year address information was added to file. |
| 50-52 | Update Addition Year | Pic 999 | Update cycle number address information was added to file. |
| 53-54 | Update Change Year | Pic 99 | Year of latest change to address information. |
| 55-57 | Update Change Year | Pic 999 | Update cycle number of latest change to address information. |
| 58 | Subunit Operations (number) | Pic 9 | Number of subunit operations for this ID. |
| 59-79 | Filler | Pic X(21) | Left blank. |
| 80 | Card Identifier | Pic 9 | Has value 3. |

Figure 2. MSHA 80-Column Card Format (continued)

| <u>Data Element</u> | <u>Data Field</u> | <u>Data Element</u> |
|---------------------|-------------------|---|
| 1 | 1-7 | Mine ID |
| 2 | 8 | Status Code |
| 3 | 9-17 | Mine location |
| | 9-12 | latitude (DDMM) (D-Degrees, M-Minutes) |
| | 13-17 | longitude (DDDMM) (D-Degrees, M-Minutes) |
| 4 | 18-22 | SIC |
| 5 | 23-29 | Size (acres) |
| 6 | 30-32 | percent intact |
| 7 | 33-38 | Entry data |
| | 33-34 | number of entries - first type |
| | 35 | code for first entry type |
| | 36-37 | number of entries - second type |
| | 38 | code for second entry type |
| 8 | 39-41 | percent dry |
| 9 | 42-52 | toxic gases (Type gas) |
| 10 | 53-55 | hoist capacity (persons/hr) |
| 11 | 56-59 | percent habitable |
| 12 | 60-68 | number of shelter spaces |
| 13 | 69-78 | additional features |
| 14 | 79 | Blank |
| 15 | 80 | Indicator of continuation record for additional features* (blank = No, * = Yes) |

Status Code (Col.8)

0 Under development
 1 Active
 2 Inactive/Standby
 3 Permanently closed
 4 Caretaker
 5 Intermittent
 9 Indicates continuation record

Entry Codes (Cols. 27 & 30)

1 Portal
 2 Vertical Shaft
 3 Capped (Sealed) Shaft
 4 Inclined Shaft
 5 Inclined portal
 6 Sealed portal
 7 Sealed inclined shaft

Note: Blanks are inserted if data are unavailable or not applicable.

*on continuation record, columns 1-7 have mine ID, column 8 has a 9, column 9 is blank, and columns 10-41 have continuation data.

Figure 3. Supplemental Mine Information File Format

1. Mine ID

Mine identification number is a 7-digit number assigned by MSHA to enhance mine identification in computer files and elsewhere. The first two digits of the number identify the state in which the mine is located and the remaining five digits identify the individual mine. Data obtained from BOM did not contain an MSHA compatible ID number for abandoned mines. To make the data for these mines consistent with the data for other mines, RTI developed and assigned ID numbers to abandoned mines using the MSHA system. These numbers were selected so that as new mines are added to the MSHA files, their ID numbers will not duplicate the abandoned mine numbers. This was accomplished by leaving approximately 1,000 unassigned numbers for use in identifying new MSHA mines.

2. Status Code

The status code is a number ranging from 0 through 5 which identifies the status of mining operations at a mine. A mine may be actively mined, may be inactive, which implies that mining operations have ceased but might resume, or may be abandoned, which implies that no future mining operations are anticipated. The cost fluctuation in metal commodities over the past several years has caused frequent and numerous changes in mine status for western metal mines. The demand for limestone, clay, sandstone, and other minerals from underground mines has been much more stable with the result that mining operations in these mines has also been more stable than operations of metal mines.

The MSHA computer file uses 3 codes to identify the status of a mine as active, inactive, or abandoned. Three additional codes are used in the RTI data file to identify a mine as operating intermittantly, as being under

development, or as in a caretaker (inactive) status. These additional status codes help to more accurately reflect the nature and state of mining operations as of spring 1983.

The caretaker status was used by one of the New Mexico MSHA field offices and was added to the data file even though no other sources used this designation. There is undoubtedly some overlap in the use of inactive/standby, caretaker, and intermittent status codes.

Mines classified as inactive fall into a broad category of mines which could abruptly become active if commodity prices move upward. Some inactive mines employ one or two people to maintain the workings by such activities as pumping water, while other mines are completely inactive but still have the potential of being actively mined.

An abandoned mine is, by definition, one that is sealed or capped. Normally, these mines are never reopened, although on rare occasions, mines classified as abandoned have been brought back into production.

"Under development" is a temporary classification for new mines. The length of time required to bring a mine into production varies considerably from one mine to another depending on such factors as entryway type (shafts or portals), number of entries, wetness, etc. For civil defense purposes, a portal entry mine could provide shelter spaces during development, while a shaft entry mine would be of little use until the extraction of ore or rock is initiated at some level.

Overall, the mine status information is useful and should be helpful to users of the mine data. Mine status can be updated by obtaining the MSHA computer tapes for the most recently available quarter.

3. Location (latitude and longitude)

Latitude and longitude are important data elements to making the mine inventory compatible with the TENOS computer model because the TENOS data base uses a 2-minute by 2-minute grid of the U.S. The MSHA data file did not contain mine longitude and latitude data but the Bureau of Mines file did contain them to the nearest second. Therefore, those few active mines found on both MSHA and BOM files and most abandoned mines in the BOM file had latitude and longitude information reported. For the remaining mines, location coordinates were estimated in various ways. In some cases, the city or town nearest the mine was identified and this information was used to estimate latitude and longitude. In the east and midwest this procedure should give results that are accurate to within a few miles but for western states, which generally have far greater spacing between cities or towns, accuracy is much poorer. To the extent possible, the estimates for western mines were refined through discussions with MSHA field personnel.

Because of the inaccuracy of mine location information, the location of some mines in the inventory (especially western mines) may not be properly identified within their actual 2-minute by 2-minute grid used in the TENOS file. However, the location of all mines is believed to be properly identified within the correct county.

4. SIC Codes

The Standard Industrial Classification (SIC) code for the primary commodity mined at each mine is included on the data record for each mine in the file. This information could provide planners with a qualitative indication of the general usefulness of a mine for civil defense purposes.

In some cases, the SIC code for a mine is uncertain. For example, many small western mines extract silver and gold bearing ores and could properly have the primary commodity mined designated as either gold or silver. In other cases, SIC codes make somewhat artificial distinctions between mining operations. For example, limestone and marble operations are essentially the same since marble is a type of limestone. Therefore, a mine producing crushed and broken marble (SIC-14291) is, for civil defense purposes, the same as one producing crushed and broken limestone (14220). These distinctions do not reduce the usefulness of the information, however.

5. Size (Acres)

Information describing the size of mined out area was requested for each mine in the inventory but was not obtained for all mines. Mine size information was not provided for any mines in Tennessee and for some mines in New Mexico. For many mines in the inventory, MSHA inspectors were able to estimate the mined out area in acres; however, these estimates were not obtained for most western mines. Instead, inspectors for these mines described them as small, medium, or large. These indicators are imprecise and their meanings may vary from one individual to another. In an effort to improve the usefulness of the size information, RTI converted these indicators to a numerical value based on information obtained over the course of the study. The general rules used to estimate metal mine acreages is 1 to 5 acres for a small mine, 10 to 35 acres for a medium mine, and 40 to 200 acres for a large mine. The number entered in the data file is based on these figures and on mine type. For example, among small mines, silver and gold mines were estimated at 1 or 2 acres because most were very small short-lived operations.

Copper mining requires large quantities of ore and the mines tend to be large. Their sizes were estimated toward the upper end of the size ranges.

The size estimates could be in error by a factor of 2 or 3 from the actual mine size; estimates for small mines could be in error by even more. While for individual mines, the potential variation between estimated and actual size is substantial, the differences are reduced when considering summaries of the data such as all mines within a state or region. The BOM data contained information, though frequently dated, on the extent or length of workings for some mines but typically had no indication of actual size. When length of workings was reported, RTI used the reported figure and an assumed average width of all workings of 10 feet to estimate mine floor area.

6. Percent Intact

Intactness refers to the structural soundness of the mined out area of a mine and relates directly to the use of mines as fallout shelters. Intactness is a strong function of the geologic formations that contain the mine. Some mineral formations are extremely strong and remain completely intact for many years, while others, like salt formations, become plastic and cave in after a few years of exposure to the atmosphere. This characteristic could keep the habitable area of salt mines relatively small given a steady rate of extraction. This data element is an estimate of the percentage of mined out area that is structurally sound. The values entered in the file are estimates provided by MSHA personnel.

7. Entry Data

Type of mine entry is of critical importance to a mine's usefulness for civil defense shelter. Consequently, a special effort was made to accurately define the entranceways for each mine in the inventory. Since some

mines were found to have both vertical and horizontal entranceways, the format of the data file was set up to allow two types of entries to be identified. A code to identify the type of entry and the number of each type of entry are contained in the file. The entry codes are listed in Figure 1 and are defined below.

1. portal (adit) - horizontal drift entry that is relatively flat and can be entered by people on foot and/or by ordinary vehicles.
2. Vertical shaft - a vertical opening that houses hoisting equipment for transporting people, equipment, and/or ore.
3. Capped (sealed) shaft - a vertical shaft that has been sealed shut.
4. inclined shaft - a non-vertical opening that houses hoisting equipment.
5. inclined portal - an inclined opening which can be traversed by wheeled vehicles or by people on foot.
6. Sealed portal - a horizontal entry that has been sealed shut.
7. Sealed inclined shaft - an inclined shaft that has been sealed shut.

Aside from differences in terminology used by MSHA personnel, (e.g., adit and portal were used interchangeably) no problems were experienced obtaining entry information. The only inconsistency that may exist in the data is the use of either adit or portal for entries that may in fact be inclined. However, for shelter purposes, the important distinction is between entries that require hoisting equipment to move people and materials and those that can be entered on foot or in vehicles. Entry information in the data file is believed to be very reliable.

In mines that have both portal and shaft entries, portals are used for the passage of heavy equipment and shafts are used for hoisting personnel and ore. If a mine has more than one type of entry, all portions of the mine are generally accessible by either mode of entry.

8. Wetness Data

This data item indicates the percentage of the mine floor area that is sufficiently dry to be habitable. Sufficient water accumulates in most mines to require pumping, although the amount of water that collects is generally relatively small and would not create severe problems for a sheltered population even if pumping were stopped. Because the horizontal working surfaces in underground mines are not level, natural drainage creates wet spots in mines. While the overwhelming majority of mines have some water in them, a few mines, such as salt mines, are absolutely dry.

In some western states, mines may accumulate significant volumes of water during the snowmelt season but have an insignificant amount of water during other times. Mines where this is known to occur have an identifier in item 13 (additional features) of the data file to indicate the situation. Many mines in Colorado, Idaho, Montana, Wyoming, and Washington are likely to have large seasonal variations in water accumulation but it was not possible to quantify such information for inclusion in the data file.

9. Toxic Gases (gas type)

An entry is made in this item to identify any toxic gases present in the mine atmosphere. Methane and radon gases are the most prevalent types of toxic gases found in mines. Methane occurs rarely in noncoal mines and MSHA personnel stated that outside of Colorado, and New Mexico, very few mines have radon or other gas problems. These states plus Utah and Wyoming make up the area where uranium is mined. Radiation levels in uranium and other mines are usually quite low and appear to pose no great health risk for short exposure periods. All uranium mines are listed as having radiation exposure.

During periods of active mining, most underground mines have problems with air quality as a result of blasting. No such problems should develop

under shelter conditions and no indication is made in the data file related to this condition.

10. Hoist Capacity (Persons/hour)

The estimated hoist capacity was entered in this data item in terms of persons per hour that a hoist can transport into a mine. This information is important to assessing potential occupancy limitations that a mine might have as a result of limited hoist capacity.

As stated earlier, hoist information obtained from a recent survey was provided by MSHA's Health and Safety Analysis Center. The survey forms provided information on shaft depth, maximum hoist speed, and hoist usage (i.e., whether men and materials or crushed rock and ore are transported). MSHA estimated that approximately 75 percent of mine hoists are included in the survey. Information was not available for recently developed mines.

All hoists are considered to be available to transport people and supplies into mines during a crisis situation. Hoist capacity was calculated by assuming that each hoist trip is to the bottom of the shaft and that hoist speed is near maximum. These figures were used to compute the time required for each trip and the figure obtained was then rounded to whole minutes. Total trip time was computed by adding one minute at the beginning and end of each trip to allow for loading and unloading people. Since the survey forms did not provide an indication of man cage capacity, it was estimated at 10 people based on discussions with MSHA personnel and on observations during the mine visits discussed in Section A.

An example hoist capacity calculation for a hoist having a maximum speed of 250 feet per minute traveling in a 500-foot shaft would be as follows:

$$\text{One way trip time} = 500\text{ft}/250\text{ ft/min} = 2\text{ minutes}$$

Total trip time:

1 minute (loading)
+ 2 minutes (down)
+ 1 minute (unloading)
+ 2 minutes (up)
= 6 minutes (total)

At six minutes per trip, the hoist can make 10 trips per hour. If 10 persons are carried into the mine per trip, the calculated hoist capacity would be 100 persons per hour.

11. Percent Habitable

Percent habitable designates the portion of a mine that might be useful as lodging or shelter and was computed using intactness and wetness data. While the most straightforward way to compute the percent habitable is to take the product of percent intact and percent dry, discussions with mine personnel and MSHA inspectors and observations during mine visits convinced RTI that mine areas considered to be wet are not necessarily unusable as shelter. Consequently, estimates of habitable area assume that some parts of wet mines are usable space. If a mine is reported to have 50 percent or more of its area dry, percent habitable is computed as the product of percent intact and percent dry. If a mine is reported to have less than 50 percent of its area dry, percent habitable is computed as the product of percent intact and 0.5. In effect, the assumption is that no more than 50 percent of a mines intact area will be unusably wet. The basis for the space estimates is an RTI observation that in wet mines, a great deal of effort is devoted to the design and construction of an effective drainage system. A result of these efforts is that substantial portions of such mines are relatively free of standing water and mud and therefore could be used as lodging or shelter area.

It was further observed that in mines that are relatively dry, much less emphasis is given to water drainage. Consequently, wet areas in relatively dry mines are likely to be unusably wet. A figure of 50 percent wet or dry was somewhat qualitatively selected as the border between mines that are considered wet and those that are considered dry.

Using the above procedure, a mine that is reported as 25 percent wet is estimated to have 75 percent of its intact area habitable and a mine that is reported as 75 percent wet is estimated to have 50 percent of its intact area habitable. As an example of the procedure, the Homestake Mine in Lead, South Dakota has 25 percent of its workings intact and is 100 percent wet. Percent habitable is therefore, $(.025) \times (0.50) = 0.125$ or 12.5 percent.

12. Number of Shelter Spaces

This entry contains the estimated number of shelter spaces in a mine. To estimate the number of shelter spaces, RTI used a ratio of 30 square feet of floor area per space which amounts to 1,452 spaces per acre. Estimates for individual mines were made by computing the product of percent habitable, mine size in acres, and 1,452 spaces per acre. The resulting number was entered on the data file.

13. Additional Features

The additional features entry in the mine data file contains information pertaining to any special or unusual features of a mine that affect its usefulness for civil defense purposes. Some typical entries for this item include:

1. identification of multi-level mines,
2. seasonal wetness,

3. abandoned mines that are likely to be flooded,
4. excessive temperatures,
5. special ventilation characteristics, and
6. mining method used.

Such information was identified only for a small percentage of mines but was entered in the data file when available.

Once the MSHA 80-column card data and the supplemental mine information records were both available in mine ID order, the next step in creating a complete mine inventory file was the consolidation of the MSHA and supplemental information files into one. A program was created that successfully accomplishes this consolidation. The result is a mine inventory file containing information for 1,198 underground mines. The record format for the file is given in Figure 4. In the process of creating the mine inventory file, the SIC and status codes on the MSHA data records were updated with those on the supplemental information files, since the latter were based on more recent data. Thus, 21 SIC code and 208 status code changes were made to the MSHA data values in creating the mine inventory file. All data fields for which values were unknown are blank on the mine inventory file.

Therefore, for the 181 mines appearing on the supplemental information file that were not on the MSHA file, all the fields normally on the MSHA data, except mine ID, SIC code and status code are blank. Similarly, for one mine (Lockport Plant, Lockport, Kentucky) on the MSHA file for which no supplemental information could be found, the fields that are usually taken from the supplemental information file are blank. The 5-digit SIC codes used on the supplemental information file and appearing on the mine inventory file were chosen from the same list used for the original MSHA file; the list, in numeric order, is given in Figure 5.

Card 1

Identical to MSHA 80-column card-1 format (see Figure 2), except status code chosen from range of values shown in Figure 3.

Card 2

Identical to MSHA 80-column card-2 format (see Figure 2).

Card 3

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|---------------------|----------------|--|
| 1-58 | | | Identical to corresponding columns of MSHA 80-column card-3 format (see Figure 2). |
| 59 | Filler | Pic X | Left Blank. |
| 60-63 | Latitude | Pic 9(4) | In DDMH format; taken from supplemental mine information file. |
| 64-68 | Longitude | Pic 9(5) | In DDDMH format; taken from supplemental mine information file. |
| 69-75 | Size | Pic 9(6) V9 | In acres, with one place to right of the implied decimal, 6 places to left (e.g., entry "0001000" means 100.0 acres); taken from supplemental mine information file. |
| 76-77 | Percent - Intact | Pic 999 | Percentage of mine intact; taken from supplemental mine information file. |
| 78-79 | Filler | Pic XX | Left Blank. |
| 80 | Card Identifier | Pic 9 | Has value 3. |

Card 4

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|---------------------|----------------|--|
| 1-2 | Number of entries | Pic 99 | Number of entries of first indicated type (code list in Figure 3), taken from supplemental mine information file. |
| 3 | Entry type | Pic 9 | Code for first entry type; taken from supplemental mine information file. |
| 4-6 | | | Number of entries and code for second indicated entry type; taken from supplemental mine information file. |
| 7-9 | Percent-dry | Pic 999 | Percentage of intact portion of mine that is dry, taken from supplemental mine information file. |
| 10-20 | Toxic Gases | Pic X(11) | List of toxic gases present in mine, delimited by commas and containing the chemical formulas for the substances, except for the notational use of the keywords "none", "radiation" ("rad"), "radon"; taken from supplemental mine information file. |

Figure 4. Mine Inventory File Format

Card 4 (continued)

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|--------------------------|----------------|---|
| 21-23 | Hoist capacity | Pic 999 | Total capacity, in persons/hour of all hoists in mine; hoists generally found at shaft entries; taken from supplemental mine information file. |
| 24-27 | Percent-habitable | Pic 999V9 | Percentage of mine habitable as shelter spaces; generally product of percent-intact and percent-dry, but not less than 50 percent of intact area; taken from supplemental mine information file. |
| 28-36 | Number of Shelter Spaces | Pic 9(9) | Number of shelter spaces in mine, obtained by product of mine size (in acres), percent-habitable, and 1452 sheltered persons per usable mine acre; taken from supplemental mine information file. |
| 37-78 | Additional features | Pic X(42) | Verbal comments not elsewhere recorded that either explain the other entries further or tell about particular entries or limitations of this mine as shelter; character positions 37-46 are taken from the normal supplemental mine information record, character 47-70 are either blank or taken from character positions 10-41 on the continuation record in the same file. |
| 79 | Filler | Pic X | Left Blank. |
| 80 | Card Identifier | Pic 9 | Has value 4. |

Figure 4. Mine Inventory File Format (continued)

| | | | |
|-------|------------------------------|-------|------------------------------------|
| 10110 | Iron Ore | 14530 | Clay (Fire) |
| 10210 | Copper Ore | 14550 | Clay (Common) |
| 10310 | Lead and/or Zinc Ore | 14590 | Clay, Ceramic & Refractory, NEC |
| 10410 | Gold (Lode and Placer) | 14591 | Aplite |
| 10440 | Silver Ores | 14592 | Brucite |
| 10510 | Aluminum Ore | 14593 | Feldspar |
| 10610 | Ferroalloy Ores | 14594 | Kyanite |
| 10611 | Chromite | 14595 | Magnesite |
| 10612 | Cobalt | 14596 | Shale (Common) |
| 10613 | Columbiank - Tantalum | 14720 | Barite |
| 10614 | Manganese | 14730 | Fluorspar |
| 10615 | Molybdenum | 14740 | Potash, Soda & Borate Minerals NEC |
| 10616 | Nickel | 14741 | Boron Minerals |
| 10617 | Tungsten | 14742 | Potash |
| 10920 | Mercury | 14743 | Trona |
| 10940 | Uranium - Vanadium Ores | 14744 | Sodium Compounds |
| 10941 | Uranium | 14750 | Phosphate Rock |
| 10942 | Vanadium | 14760 | Salt (Rock) |
| 10990 | Metal Ores, NEC | 14770 | Sulfur |
| 10991 | Antimony | 14790 | Chemical and Fertilizer, NEC |
| 10992 | Beryl | 14791 | Lithium |
| 10993 | Platinum Group | 14792 | Pigment Mineral |
| 10994 | Rare Earths | 14793 | Pyrites |
| 10995 | Tin Ore | 14794 | Strontium |
| 10996 | titanium | 14920 | Gypsum |
| 10997 | Zircon | 14960 | Talc, Soapstone & Pyrophyllite |
| 11110 | Coal, Anthracite | 14990 | Nonmetallic Minerals, NEC |
| 12110 | Coal, Bituminous | 14991 | Asbestos |
| 13111 | Oil Shale | 14992 | Gemstones |
| 14110 | Stone, Dimension NEC | 14993 | Gilsonite |
| 14111 | Granite (Dimension) | 14994 | Mica |
| 14112 | Limestone (Dimension) | 14995 | Peat (before 1979) |
| 14113 | Marble | 14996 | Perlite |
| 14114 | Sandstone (Dimension) | 14997 | Pumice |
| 14115 | Slate (Dimension) | 14998 | Vermiculite |
| 14116 | Traprock (Dimension) | 28190 | Industrial Chemicals, NEC |
| 14220 | Limestone (Crushed & Broken) | 28191 | Alumina (Mill) |
| 14230 | Granite (Crushed & Broken) | 28193 | Bromine |
| 14290 | Stone, Crushed & Broken, NEC | 29900 | Leonardite |
| 14291 | Marble (Crushed & Broken) | 28991 | Salt (Evaporated) |
| 14292 | Sandstone (Crushed & Broken) | 28992 | Salt (In Brine) |
| 14293 | Slate (Crushed & Broken) | 32410 | Cement |
| 14294 | Traprock (Crushed & Broken) | 32740 | Lime |
| 14410 | Sand & Gravel | | |

Figure 5. SIC Codes Used by MSHA

In order to make the mine inventory information more amenable to an analysis of the adequacy of underground non-coal mines in meeting rapid enhancement shelter needs, a mine sheltering capability report, which presents the post-relocation population and available mine spaces by county was developed. In the report, mine spaces are presented separately for portal entry mines, (i.e., those with entry type codes 1,5, or 6) and other mines. However, the mine inventory records that consisted only of supplementary information did not, at this point, have a FIPS* county code and corresponding name on them. In addition, some of the mine data records in the MSHA file were determined to have an incorrect county designation. A procedure was therefore developed to update the FIPS county codes and associated names on the mine inventory file and, in the process, to supply the FIPS state code where needed. It should be noted that the FIPS state codes are different from the MSHA state codes, which are embedded in the first two digits of the mine ID field; their correspondence is shown in Figure 6. The final mine inventory file, has, on most records, the latitude -longitude and the FIPS state and county codes, which provide a direct link to TENOS.

The other total needed, by county, for the mine sheltering capability report was post-relocation population. This population was found from a summary of the Rapid Enhancement Plan A, 1980 Conglomerate Listing, which contains the estimated 1980 Census population, risk population, allocated population, and ratio of allocated to host populations, by county, for all

*FIPS location codes are codes to identify named populated places and related entities of the states of the United States and were developed by the national Bureau of Standards as part of the Federal Information Processing Standards.

| State Name | Abbreviation | MSHA Code | FIPS Code | State Name | Abbreviation | MSHA Code | FIPS Code |
|---------------|--------------|-----------|-----------|----------------------------|--------------|-----------|------------|
| Alabama | AL | 01 | 01 | New Mexico | NM | 29 | 35 |
| Arizona | AZ | 02 | 04 | New York | NY | 30 | 36 |
| Arkansas | AR | 03 | 05 | North Carolina | NC | 31 | 37 |
| California | CA | 04 | 06 | North Dakota | ND | 32 | 38 |
| Colorado | CO | 05 | 08 | Ohio | OH | 33 | 39 |
| Connecticut | CT | 06 | 09 | Oklahoma | OK | 34 | 40 |
| Delaware | DE | 07 | 10 | Oregon | OR | 35 | 41 |
| Florida | FL | 08 | 12 | Pennsylvania | PA | 36 | 42 |
| Georgia | GA | 09 | 13 | Rhode Island | RI | 37 | 44 |
| Idaho | ID | 10 | 16 | South Carolina | SC | 38 | 45 |
| Illinois | IL | 11 | 17 | South Dakota | SD | 39 | 46 |
| Indiana | IN | 12 | 18 | Tennessee | TN | 40 | 47 |
| Iowa | IA | 13 | 19 | Texas | TX | 41 | 48 |
| Kansas | KS | 14 | 20 | Utah | UT | 42 | 49 |
| Kentucky | KY | 15 | 21 | Vermont | VT | 43 | 50 |
| Louisiana | LA | 16 | 22 | Virginia | VA | 44 | 51 |
| Maine | ME | 17 | 23 | Washington | WA | 45 | 53 |
| Maryland | MD | 18 | 24 | West Virginia | WV | 46 | 54 |
| Massachusetts | MA | 19 | 25 | Wisconsin | WI | 47 | 55 |
| Michigan | MI | 20 | 26 | Wyoming | WY | 48 | 56 |
| Minnesota | MN | 21 | 27 | District of Columbia | DC | 49 | 11 |
| Mississippi | MS | 22 | 28 | Alaska | AK | 50 | 02 |
| Missouri | MO | 23 | 29 | Hawaii | HI | 51 | 15 |
| Montana | MT | 24 | 30 | Pacific Island Possessions | PP | 52 | Mult. No's |
| Nebraska | NE | 25 | 31 | Panama Canal Zone | CZ | 53 | 61 |
| Nevada | NV | 26 | 32 | Puerto Rico | PR | 54 | 72 |
| New Hampshire | NH | 27 | 33 | Virgin Islands | VI | 55 | 78 |
| New Jersey | NJ | 28 | 34 | | | | |

Figure 6. State Code Table

high-risk areas in the United States, including military installations, basic industries, and population concentrations of 50,000 or more. A given county may appear in one or more conglomerates and may have a risk population, a host population, or both. The summary, across conglomerates by FEMA region and FIPS state and county codes, was created as part of an earlier project; the record format for the resulting file, modified to contain MSHA instead of FIPS state codes, is shown in Figure 7.

The next step in obtaining the mine sheltering capability report was the creation of a report input file containing MSHA state codes, FIPS county codes, post-relocation population by county, and the corresponding drift, other, and total mine shelter spaces. The county post-relocation population was obtained from the sum of the allocated, host, and residual (neither risk nor hosting, but resident) populations from the conglomerate summary file described above. From the report input file, the mine sheltering capability report was produced and is contained in Appendix B. Asterisks in the percentage fields of a mine sheltering capability report line imply that mine shelter spaces are more than 10 times the post-relocation population, or that the post-relocation population is zero, thus preventing percentages from being determined. Counties generally appear in alphabetical order within states; however, in those states, such as New Mexico, that have mine shelter spaces with no county designation, such spaces appear last within their respective state and are labelled "Unknown County."

| <u>Character Positions</u> | <u>Data Element</u> | <u>Picture</u> | <u>Description</u> |
|----------------------------|----------------------|----------------|---|
| 1-2 | Region | Pic 99 | FEMA Region Code (not used). |
| 3-4 | State | Pic 99 | MSHA state code. |
| 5-7 | County | Pic 999 | FIPS county code. |
| 8-15 | Estimated Population | Pic 9(8) | Total 1980 population, estimated from 1970 Census figures (not used). |
| 16-23 | Risk Population | Pic 9(8) | Total population at risk (not used). |
| 24-31 | Host Population | Pic 9(8) | Total host population. |
| 32-39 | Other population | Pic 9(8) | Total residual (neither risk nor host) population. |
| 40-47 | Allocated Population | Pic 9(8) | Total population allocated to county for hosting purposes. |

Figure 7. Conglomerate Summary File Format.

III. MINE USE EVALUATION

A. Planning Requirements

Effective use of underground mines for civil defense shelters in a crisis situation will require detailed planning. Local civil defense personnel are the most likely candidates for completing these plans because of their ready access to detailed local information.

In evaluating whether to include a mine as a host area shelter in a rapid enhancement plan, several factors must be considered. These factors include the percentage of host area shelter requirements that could be satisfied by the mine or mines, the quality of alternative available shelters, accessibility of the mine site(s), and the habitability of the mine(s).

In some cases, a county contains mines capable of sheltering many times the designated post-relocation population. In such a case, consideration could be given to allocating people from neighboring counties if other factors are favorable. For example, an NSS facility generally would require less advance planning and less habitability upgrading than a mine, and would therefore be preferred in developing a rapid enhancement plan. However, in a county that is expected to be subject to low blast overpressures, the mine might be preferred. If a mine is to be employed as shelter, the site must be accessible, both for the people to be sheltered and for supplies. Parking is a potential problem at some mine sites. Finally, if a large number of people is to be sheltered in a mine, habitability is a primary concern.

Improving the habitability of a mine includes providing food and medical supplies, providing a minimal degree of lighting to prevent people from becoming disoriented, providing sufficient ventilation to maintain the oxygen and carbon dioxide concentrations at acceptable levels, providing potable water for consumption and personal hygiene, and providing for the sanitary

handling and disposal of wastes. The problem of food and medical supply provision is common to all types of shelter, and will not be addressed here. In a previous study (Ref. 1), RTI developed a planning manual for crisis-utilization of mines. In the manual, procedures are described for evaluating and upgrading the lighting, ventilation, water supply, and waste disposal systems in a mine. The following paragraphs summarize the minimum requirements for these services, and the planning and upgrading material requirements to implement each system in a mine.

Only minimal levels of illumination (0.5 to 3.5 lumens per square foot) are required in a mine (Ref. 2). Tasks such as food preparation that require a reasonably high level of light can be performed in the vicinity of a light source. It is unlikely that an active mine will contain a lighting system, though an inactive mine might be lighted if it is being used for another purpose such as storage. From the standpoint of designing a lighting system, underground mines fall into two categories: (1) mines where room and pillar or similar methods have been employed to extract ore, leaving large rooms suitable for use as shelter and, (2) mines where other mining methods (stoping, caving, etc.) have been utilized in which most or all of the habitable floor area is found in the haulage drifts.

The requirements for light bulbs and sockets and for generating capacity are much less in mines with large rooms than in mines with only haulage drifts available for shelter. Table 1 contains requirements for these resources in both types of mines. The requirements for a mine with large rooms were estimated assuming pillars spaced 50 feet on center and 40-watt light bulbs located in alternate rooms. The requirements for a mine in which haulage drifts would be used were derived assuming 8-foot wide drifts and 100-foot spacing of 40-watt light bulbs. In general, lights should be spaced at

Table 1. Primary Resource^a Requirements to Attain Minimum Habitability Level

| <u>Type of Service</u> | <u>Upgrading Resource</u> | <u>Resource Requirement</u> |
|------------------------|--------------------------------|---|
| Lighting | light bulbs and sockets | 1 bulb & socket/27 spaces ^b 1 bulb & socket/170 spaces ^c |
| | generating capacity | 40w/27 spaces ^b 40w/170 spaces ^c |
| Ventilation | generating capacity | 1 kw/910 spaces ^d |
| Water | storage capacity | 3.5 gal/space |
| | watering points | 1/50 spaces |
| | water disinfectant | 0.00002 lb chlorine/space |
| | storage container disinfectant | 0.00009 lb chlorine/space |
| Excreta Disposal | disposal capacity | 2.1 gal/space |
| | toilet seats | 1/50 spaces |
| Solid Waste Disposal | collection capacity | 15 gal/50 spaces |

^aResources that might not be locally available in adequate quantities.

^bRequirements for a mine with shelter space in haulage drifts. Assumes 40-w light bulbs at 100-ft intervals in 8-ft wide drift.

^cRequirements for a mine with shelter space in large rooms. Assumes pillars spaced 50 feet on center and 40-w light bulbs located in alternate rooms.

^dBased on the volume of air delivered by four 5-foot diameter axial fans, driven by 10-horsepower motors, having a rated capacity of 53,000 cfm in free air, installed in a mine in Kansas City.

100-foot intervals. Forty-watt light bulbs will suffice, though larger bulbs could be used if sufficient generating capacity is available.

Regardless of the type of mine involved, an electrical engineer or experienced electrician should be consulted early in the planning process to lay out lighting circuits, prepare specifications, and estimate resource requirements. Arrangements should be made with an electrical contractor(s) to install the lighting system should the rapid enhancement plan be enacted. Also, sources of light bulbs, sockets, and engine-generators as well as fuel; feeder wire; branch lines; hammer drills and carbide-tipped bits; expansion bolts or lead expansion shields; conduit, junction boxes, and pull boxes or messenger cable and insulators; and one working platform (preferably a covered truck or panel truck) per two-man team of electricians must be identified.

Because of the high heat-absorbing capacity of rock, temperature control is not generally required in underground mines. Therefore, the ventilation system only needs the capacity to deliver 3 cfm per occupant, which will maintain the quality of the air at acceptable levels. Most active underground mines contain forced ventilation systems, which in many cases will be adequate to meet the needs of shelter occupants. An existing forced ventilation system can be augmented if necessary. In some cases the quantity of natural ventilation (convection) will be adequate, though this will vary with outside temperature and should be checked at various times throughout the year. If natural ventilation is inadequate, a forced ventilation system with the capacity to satisfy the total ventilation requirement is needed. It is also possible that distribution of ventilation within the mine will need augmentation, particularly if the entrances are close together. This can be accomplished by installing partitions or by using ducts to distribute air to regions of the mine remotely located from openings.

Table 1 lists a generating requirement of 1 kw per 910 shelter spaces. This is based on the volume of air delivered by four 5-foot diameter axial fans, driven by 10-horsepower motors, having a rated capacity of 53,000 cfm in free air, installed in a mine in Kansas City (Ref. 2). The generating requirement will vary with the type of fan used and will be greater if ducts must be used, particularly if the ducts have bends.

In the early stages of planning, a ventilation specialist should be consulted to help evaluate existing ventilation systems and if needed, to plan upgraded system. If upgrading is required, an electrical contractor should be identified to install the fans and engine-generators. In addition, sources of fans, engine-generators, fuel, hand tools, lumber, nails, plastic duct or polyethylene if air distribution is inadequate, should be located.

The Federal Civil Defense Guide (Ref. 3) calls for a minimum of 3.5 gallons of water per shelter occupant. This quantity of water is only enough to satisfy physiological requirements and does not allow for cooking and basic cleanliness. In addition, one watering point per 50 people should be made available.

Most mines contain water that enters from groundwater sources. A health department sanitarian or water works employee should test any existing water for potability and if required, should also assist in identifying methods of augmentation. If insufficient quantities of water are available inside the mine, water storage in cans, barrels, tank trucks, etc. will be needed. Depending on the source of water and method of storage, disinfection may be required. As is shown in Table 1, 0.00002 pounds of chlorine per space is needed to disinfect drinking water and 0.00009 pounds of chlorine per space is needed to disinfect storage containers before filling with potable water. In planning to use a mine as shelter, it is also important to identify sources of

cans, barrels, tank trucks, etc., disinfectants; hand tools; faucets; and plastic pipe if water is to be piped into the mine.

The disposal of human excreta and solid waste in a mine is important in the prevention and control of common vehicle- and vector-borne communicable diseases. Existing waste disposal systems will not be adequate to handle the quantity of wastes that would be generated if a mine were used as shelter. A public health specialist, sanitarian or sanitary engineer should be consulted early in the planning process.

Table 1 displays the primary resource requirement for excreta and solid waste disposal. One toilet seat per 50 spaces and a disposal capacity of 2.1 gallons per space are needed for sewage (Ref. 3). For solid waste collection, one 15-gallon container per 50 spaces should be supplied (Ref. 1). In addition, disinfectants (e.g., chloride of lime), plastic trash can liners, handsprayers, insecticides, rodenticides, hand tools, lumber, plywood, and if incineration is planned, fuel, corrugated iron sheets, and/or wire baskets are required. Planning should include location of sources for all of the above supplies as well as making arrangements for delivery to the mine.

B. Impact Estimates

The 1,198 underground mines incorporated into the mine inventory are located in 217 counties and 24 states. The 1980 conglomerate listing did not include 51 of the 217 counties with mines. This implies that these 51 counties are not considered to be in either a host or risk area in a nuclear attack situation. As can be seen from the listing in Appendix B, the range of estimated mine shelter spaces in the 51 counties with no post-relocation population data is similar to the range for other counties. Because of the potential advantages of mine shelters over other types of shelters, civil defense planners may want to consider modifying existing host area

designations to include some or all of these 51 counties. A decision to make such modifications can only be made after carefully weighing resource availability in existing host counties against those of the alternate counties.

The listing in Appendix B also shows that estimated mine shelter spaces in the 166 counties found in the conglomerate file varies from a fraction of a percent of the post-relocation population to more than 10 times the post-relocation population. If further investigation by local planners shows that the excess spaces are attractive shelters, there may be an incentive to redistribute the relocated population to more fully use these mine spaces. It should be pointed out that there may be additional shelter spaces available in abandoned mines. The county summaries do not give any credit for space in abandoned mines.

There are several aspects of the mine inventory data that must be kept in mind by civil defense planners when considering the use of mine spaces. The estimates of shelter spaces are based on imprecise data and should not be construed to necessarily represent the actual spaces available in mines. Local planners will need to make their own determination of shelter capacity as a part of the planning process. In many mines, the amount of usable floor area and thus the shelter capacity varies substantially with season of the year. Data describing these variations may need to be considered in the planning process. Mining is a dynamic industry in that (1) the status of mining operations at a particular site may change abruptly depending on market conditions, (2) conditions within mines, such as the structural soundness of particular mine areas, may degenerate with time, and (3) the mined out area and thus the potential shelter area in mines constantly changes.

Operability of hoist equipment following a nuclear detonation may not be a certainty. If a mine is located in an area subject to blast effects, hoisting equipment could be damaged and rendered unusable. If a mine is not in an area subject to blast effects, hoisting equipment may not operate because of damage to electric utilities unless emergency generators are available at the mine site. These potentialities should be considered before incorporating shaft-entry mines into shelter plans.

The mine inventory file is available at the FEMA computer facility in Olney, Maryland. The inventory resides on a permanent file called "FEMA*MINES." and may be accessed by that name. Data may be extracted from the file using the format given in Figure 4.

References

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2. Wright, M.D., E. L. Hill, J.S. McKnight, and S.B. York, III. Mine Lighting and Ventilation in Crises. Final Report 43U-982-1. Research Triangle Park, N.C.: Research Triangle Institute. October 1975.
3. Federal Civil Defense Guide, Part D, Chapter 2, Appendix 4, Fallout Shelter Water Requirements, Washington, D.C.: Office of Civil Defense, July 1965.
4. Rajagopalan, S. and M.A. Shiffman. Guide to Simple Sanitary Measures for the Control of Enteric Diseases, Geneva: World Health Organization, 1974.

APPENDIX A:

Listing of Mines in the National Underground Mines Inventory

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| ROCKWOOD MINE | 0100010 | 01 | 059 | 29040 |
| | 0100100 | 01 | 073 | |
| | 0100101 | 01 | 111 | |
| | 0100102 | 01 | 125 | |
| MIAMI MINE LEACHING OPERATION | 0200139 | 04 | 007 | 90750 |
| SAN MANUEL MINE | 0200151 | 04 | 021 | 72600 |
| MAGMA MINE | 0200152 | 04 | 021 | 72600 |
| MARCH MINE | 0200286 | 04 | 003 | 7260 |
| SAFFORD BRANCH | 0200299 | 04 | 009 | 72600 |
| WHITE HILLS G.A.R. SHAFT | 0200444 | 04 | 015 | 7260 |
| LAKE SHORE MINE | 0200498 | 04 | 021 | 72600 |
| MIAMI EAST-SHAFT 5 | 0200825 | 04 | 007 | 18150 |
| ORACLE RIDGE | 0200840 | 04 | 019 | 18150 |
| EL DORADO MINE | 0200951 | 04 | 007 | 14520 |
| BIG SKY MINING | 0201118 | 04 | 003 | 7260 |
| CHRISTMAS UG MINE | 0201319 | 04 | 007 | 7260 |
| TWIN BUTTES \TWIN BUTTES -1 AD | 0201565 | 04 | 019 | 7260 |
| BRICK MINE | 0201575 | 04 | 023 | 7260 |
| COPPER QUEEN BRANCH | 0201656 | 04 | 003 | 72600 |
| STATE OF MAINE MINE | 0201737 | 04 | 003 | 2904 |
| DRY HILLS MINE | 0201760 | 04 | 003 | |
| DOVE VENTURE MINE | 0201950 | 04 | 027 | 2904 |
| SOLSTICE NO 1 | 0201951 | 04 | 003 | 2904 |
| THE INDEPENDENCE & AUNT SALLEY | 0201959 | 04 | 003 | 2904 |
| HULDA | 0201969 | 04 | 015 | 2904 |
| HACKS CANYON 2 | 0201973 | 04 | 015 | 36300 |
| SACATON SHAFTS | 0201979 | 04 | 021 | 0 |
| LEAD BULLET | 0201987 | 04 | 015 | 0 |
| COMPENSATION MINE | 0201993 | 04 | 011 | 0 |
| NICHOLAS | 0202001 | 04 | 003 | 2904 |
| HEL-ROC MINE & MILL | 0202027 | 04 | 019 | 7260 |
| SUNCHIEF MINE | 0202031 | 04 | 007 | 2904 |
| ASH PEAK | 0202033 | 04 | 011 | 7260 |
| GOLDBERG | 0202044 | 04 | 021 | 7260 |
| HACKS CANYON 1 | 0202058 | 04 | 015 | 0 |
| DIPLOMAT | 0202065 | 04 | 015 | 2904 |
| EDITH SHAFT | 0202066 | 04 | 025 | 2904 |
| RED CLOUD MINE | 0202067 | 04 | 027 | 2904 |
| V & M MINE | 0202068 | 04 | 021 | 2904 |
| ACQUISITION MINE | 0202069 | 04 | 025 | 2904 |
| GOLDEN RULE MINE | 0202070 | 04 | 003 | 2904 |
| DAVIS DUNKIRK | 0202073 | 04 | 025 | 2904 |
| TAKO MINE | 0202077 | 04 | 003 | 2904 |
| PIDGEON | 0202084 | 04 | 005 | 0 |
| POLLY ANN | 0202087 | 04 | 011 | 2904 |
| GOLDEN GEM | 0202089 | 04 | 015 | 2904 |
| SUMMIT | 0202090 | 04 | 015 | 2904 |
| SUN MINE | 0202092 | 04 | 003 | 2904 |
| GRAND CENTRAL MINE | 0202093 | 04 | 003 | 2904 |
| MATCH BOX MINE | 0202094 | 04 | 025 | 2904 |
| APACHE MINE | 0202097 | 04 | 003 | 2904 |
| | 0204000 | 04 | 007 | |
| | 0204001 | 04 | 007 | |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| | 0204002 | 04 | 007 | |
| | 0204003 | 04 | 007 | |
| | 0204004 | 04 | 015 | |
| | 0204005 | 04 | 023 | |
| | 0204006 | 04 | 023 | |
| | 0206001 | 04 | 000 | |
| | 0206002 | 04 | 000 | |
| | 0206003 | 04 | 000 | |
| ARKANSAS LIMESTONE OPERATION | 0300051 | 05 | 065 | 261360 |
| GUION MINE AND MILL | 0300313 | 05 | 065 | 254100 |
| EL DORADO LIMESTONE CO | 0400104 | 06 | 017 | 7260 |
| SAN LEANDRO QUARRY | 0400242 | 06 | 001 | 7260 |
| SIDE HILL | 0400581 | 06 | 027 | 7260 |
| ORIENTAL | 0400898 | 06 | 091 | 4356 |
| PINE CREEK MINE | 0400899 | 06 | 027 | 81675 |
| ECLIPSE MINE | 0401098 | 06 | 027 | 7260 |
| YUCCA PIT | 0401107 | 06 | 071 | 3267 |
| KATE HARDY OMEGA MINES | 0401285 | 06 | 091 | 2904 |
| HAZARD MINE | 0402441 | 06 | 061 | 2904 |
| BEN HUR MINE | 0402456 | 06 | 073 | 2904 |
| ALHAMBRA-ATLANTA GOLD MINE | 0402459 | 06 | 017 | 2904 |
| LAWS MILL & MINE | 0402653 | 06 | 027 | 2904 |
| GRANTHAM MINE | 0402656 | 06 | 027 | 4356 |
| PLUMBAGO MINE | 0403065 | 06 | 091 | 2904 |
| RUBY MINE | 0403108 | 06 | 091 | 2904 |
| STRAWBERRY MINE | 0403143 | 06 | 039 | 2904 |
| BROWN BEAR MINE | 0403206 | 06 | 105 | 2904 |
| UPPER BRUSH CREEK | 0403309 | 06 | 091 | 2904 |
| WASHINGTON MINE & MILL | 0403425 | 06 | 089 | 2904 |
| OLD NOBLE MINE | 0403708 | 06 | 073 | 0 |
| COLORADO QUARTZ | 0403828 | 06 | 043 | 2904 |
| BLUE LEAD MINE | 0403859 | 06 | 057 | 2904 |
| CHEROKEE MINE | 0404004 | 06 | 007 | 2904 |
| TRAIL CLAIM | 0404046 | 06 | 017 | 2904 |
| EL DORADO - PLUMBAGO MINES CON | 0404070 | 06 | 091 | 2904 |
| BILLIE MINE | 0404218 | 06 | 027 | 145200 |
| GOLDEN CROWN | 0404234 | 06 | 091 | 2904 |
| BLAZING STAR | 0404242 | 06 | 009 | 2904 |
| GOLDEN LION | 0404259 | 06 | 091 | 2904 |
| BLUE LEDGE MINE | 0404283 | 06 | 017 | 2904 |
| MILLER MINE | 0404295 | 06 | 009 | 29040 |
| EMPIRE QUARTZ MINE | 0404307 | 06 | 091 | 2904 |
| SOLWOODS MINE | 0404309 | 06 | 091 | 2904 |
| MORNING GLORY MINE | 0404311 | 06 | 091 | 2904 |
| MINNIE #D# MINE | 0404312 | 06 | 091 | 2904 |
| OCEOLA MINE | 0404313 | 06 | 091 | 2904 |
| WHISKEY CREEK #1 | 0404317 | 06 | 091 | 2904 |
| GLEN OLIVE MINE | 0404318 | 06 | 029 | 2904 |
| IRELAN | 0404319 | 06 | 091 | 2904 |
| ARCADE MINE | 0404321 | 06 | 091 | 2904 |
| OROFLAME QUARTZ MINE | 0404322 | 06 | 091 | 2904 |
| LONG DAVE | 0404344 | 06 | 111 | 2904 |
| CRESTMORE MINE | 0404347 | 06 | 065 | 21780 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| REX MONTIS MINE | 0404366 | 06 | 027 | 2904 |
| SHINING DAWN | 0404370 | 06 | 071 | 2904 |
| SENECA PROPRTIES | 0404373 | 06 | 063 | 2904 |
| THE LARKIN-STORY HAZZARD MINE | 0404374 | 06 | 063 | 2904 |
| EASLES NEST MINE | 0404379 | 06 | 065 | 2904 |
| MORNING STAR MINE | 0404380 | 06 | 071 | 2904 |
| SAGAMORE MINE | 0404381 | 06 | 071 | 2904 |
| KELLY MINE | 0404385 | 06 | 105 | 2904 |
| KEYSTONE MINE | 0404390 | 06 | 027 | 2904 |
| HOP DEMONSTRATION UNITS = 1,2, | 0404394 | 06 | 029 | 0 |
| IRON TAIL MINE | 0404403 | 06 | 091 | 2904 |
| FOUR HILLS MINE | 0404406 | 06 | 091 | 2904 |
| GOLD POINT MINE | 0404413 | 06 | 091 | 0 |
| IRON DOOR | 0404415 | 06 | 091 | 2904 |
| CRYSTAL DAWN =1 | 0404432 | 06 | 007 | 0 |
| JEREMIAH-RANDELL =1 | 0404433 | 06 | 007 | 2904 |
| HARPY =1 | 0404434 | 06 | 007 | 2904 |
| PENON BLANCO MINE | 0404436 | 06 | 043 | 0 |
| GOLD RUN MINE | 0404438 | 06 | 061 | |
| ZACA ALPINE | 0404444 | 06 | 003 | 2904 |
| MERZ MINE | 0404453 | 06 | 061 | 2904 |
| FRAZIER MINE | 0404454 | 06 | 111 | 2904 |
| O K WEST =1 | 0404456 | 06 | 071 | 2904 |
| GREAT NORTHERN | 0404457 | 06 | 071 | 2904 |
| REID MINE | 0404458 | 06 | 089 | 2904 |
| BULLY CHOOP | 0404459 | 06 | 105 | 2904 |
| GLOBE MINE | 0404460 | 06 | 105 | 2904 |
| HILTON CREEK MINE | 0404461 | 06 | 051 | 0 |
| FLUME HOUSE MINE | 0404466 | 06 | 009 | 2904 |
| GRAND PRIZE | 0404481 | 06 | 005 | |
| STEWART LETHIA MINE | 0404486 | 06 | 073 | 2904 |
| BLACKSTONE MINE | 0404488 | 06 | 009 | 2904 |
| SOLEDAD EAST | 0404489 | 06 | 029 | 2904 |
| BONDURANT | 0404491 | 06 | 043 | 0 |
| MISSION MINE | 0404501 | 06 | 065 | 2904 |
| EL ORO MINE | 0404510 | 06 | 057 | 2904 |
| WYOMING MINE | 0404512 | 06 | 027 | 2904 |
| BEAUREGARD | 0404513 | 06 | 051 | 2904 |
| BUTTE LODGE | 0404518 | 06 | 029 | 2904 |
| MODOC GROUP MINING PROPERTIES | 0404519 | 06 | 027 | 2904 |
| MAY LUNDY | 0404520 | 06 | 051 | 2904 |
| WHITE BEAR MINE | 0404522 | 06 | 091 | 2904 |
| WOODHOUSE MINE | 0404523 | 06 | 009 | 2904 |
| PRINCETON LANDS | 0404527 | 06 | 043 | |
| M-JON =1 | 0404529 | 06 | 007 | |
| GARRISON'S CRAYER =2 | 0404530 | 06 | 007 | |
| GOLDBUG | 0404531 | 06 | 027 | |
| OMEGA MINE | 0404536 | 06 | 109 | 2904 |
| MINNIEHAHA MINE | 0404540 | 06 | 007 | 2904 |
| GOLDSTRIPE PROJECT | 0404543 | 06 | 063 | 2904 |
| GRIZZLEY PEAK MINE | 0404547 | 06 | 091 | |
| STORM KING I II III IV V | 0404552 | 06 | 071 | 2904 |
| ANGELS NO. I II III IV | 0404554 | 06 | 071 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|---------------------------|---------|-------|--------|----------------|
| BEN JUAN I II III | 0404555 | 06 | 071 | 2904 |
| HI-GRADE MINE | 0404557 | 06 | 037 | 2904 |
| REWARD-BROWN MONSTER | 0404558 | 06 | 027 | 2904 |
| GOLD SUGAR-COLD BEEF MINE | 0404562 | 06 | 073 | 2904 |
| D B MINE | 0404567 | 06 | 073 | 2904 |
| MCLAUGHLIN | 0404568 | 06 | 055 | |
| SILVER CROSS | 0404570 | 06 | 029 | 2904 |
| MUZZLE LOADER | 0404571 | 06 | 073 | 2904 |
| BUENA VISTA MINE | 0404572 | 06 | 009 | 2904 |
| GOLDEN CHARIOT MINE | 0404576 | 06 | 073 | 2904 |
| ROUND VALLEY MINE | 0404581 | 06 | 027 | 2904 |
| FOUR SQUARE | 0404582 | 06 | 071 | 2904 |
| OPTIMIST MINING CO | 0404584 | 06 | 109 | |
| POKA DOT 1 | 0404587 | 06 | 029 | 2904 |
| | 0406000 | 06 | 015 | |
| | 0406001 | 06 | 019 | |
| | 0406002 | 06 | 025 | |
| | 0406004 | 06 | 027 | |
| | 0406005 | 06 | 027 | |
| | 0406006 | 06 | 061 | |
| | 0406007 | 06 | 063 | |
| | 0406008 | 06 | 085 | |
| | 0406009 | 06 | 085 | |
| | 0406010 | 06 | 089 | |
| | 0406011 | 06 | 093 | |
| ROCK CREEK | 0500187 | 08 | 101 | 2904 |
| LARIAT MINE | 0500223 | 08 | 059 | 4356 |
| CLIMAX MOLYBDENUM MINE UG | 0500354 | 08 | 065 | 58080 |
| MT EMMONS PROJECT | 0500409 | 08 | 051 | 1742 |
| EAGLE MINE | 0500411 | 08 | 037 | 163350 |
| EMPERIUS | 0500412 | 08 | 079 | 30492 |
| BULLDOG MTN. OPERATION | 0500413 | 08 | 079 | 581 |
| IDARADO MINE | 0500414 | 08 | 091 | 32670 |
| RICO ARGENTINE | 0500416 | 08 | 033 | 2033 |
| SUNNYSIDE MINE | 0500417 | 08 | 111 | 36300 |
| CAMP BIRD MINE | 0500437 | 08 | 091 | 7805 |
| LEADVILLE UNIT | 0500516 | 08 | 065 | 21780 |
| CONTINENTAL CHIEF | 0500534 | 08 | 065 | 5808 |
| SMITH MINE | 0500539 | 08 | 047 | 1089 |
| LONDON MINE | 0500571 | 08 | 093 | 3630 |
| CARTER-RAYMOND MINES | 0500575 | 08 | 051 | 1997 |
| MAMMOTH REVENUE MINE | 0500579 | 08 | 021 | 2904 |
| SHERMAN MINE | 0500604 | 08 | 065 | 27225 |
| HOCK HOCKING MINE | 0500622 | 08 | 093 | 4356 |
| FRANKLIN 73 | 0500630 | 08 | 019 | 1452 |
| HENDERSON MINE | 0500790 | 08 | 019 | 34450 |
| SCHWARTZWALDER MINE | 0500791 | 08 | 059 | 29040 |
| DUGGAN ADIT | 0500891 | 08 | 085 | 8712 |
| LOST DUTCHMAN | 0500909 | 08 | 077 | 2904 |
| NEW VERDE | 0500916 | 08 | 077 | 2904 |
| OCTOBER ADIT | 0500918 | 08 | 077 | 2904 |
| SUNBEAM | 0501065 | 08 | 085 | 2904 |
| CARNATION | 0501106 | 08 | 113 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| MESA #5 (CG-27) | 0501117 | 08 | 077 | 2904 |
| ANDREW'S MINING CO | 0501159 | 08 | 085 | 2904 |
| ST PATRICK NO 7 | 0501179 | 08 | 085 | 2904 |
| SUNDAY | 0501197 | 08 | 113 | 2033 |
| SEPTEMBER MORN | 0501278 | 08 | 085 | 2904 |
| PEACHES | 0501304 | 08 | 077 | 2904 |
| THORNTON | 0501311 | 08 | 085 | 8712 |
| HENRIETTA MINE | 0501382 | 08 | 111 | 2904 |
| COUCH PLACER & CHAFFEE MINE | 0501390 | 08 | 047 | 726 |
| GOLDEN WONDER | 0501506 | 08 | 053 | 2178 |
| SILVER TIPMINE | 0501527 | 08 | 049 | 1452 |
| RESURRECTION NO 2 SHAFT | 0501603 | 08 | 065 | 726 |
| URA | 0501653 | 08 | 085 | 2904 |
| NIL | 0501658 | 08 | 085 | 2904 |
| SUNCUP NO 2 | 0501679 | 08 | 113 | 2904 |
| TWILIGHT #1/SFCL STUDIES SEC | 0501714 | 08 | 085 | 2904 |
| EULA BELLE | 0501740 | 08 | 085 | 1452 |
| MIDNIGHT MINE | 0501754 | 08 | 103 | 2904 |
| RAJAH 49 | 0501761 | 08 | 077 | 2904 |
| RAJAH 30 | 0501765 | 08 | 077 | 2904 |
| RIM ROCK #2 | 0501780 | 08 | 085 | 2904 |
| DEREMO-SNYDER | 0501786 | 08 | 113 | 34558 |
| PACK RAT | 0501793 | 08 | 077 | 8712 |
| RED BIRD | 0501806 | 08 | 085 | 2904 |
| BURRO MINE | 0501819 | 08 | 113 | 6897 |
| COLONY SHALE OIL PROJECT | 0501887 | 08 | 045 | 1452 |
| REX 38 | 0502013 | 08 | 085 | 2904 |
| BROMIDE MINE | 0502039 | 08 | 081 | 2904 |
| LOGAN WASH OIL SHALE | 0502248 | 08 | 045 | 2904 |
| CLIMAX TEN MILE TUNNEL | 0502255 | 08 | 117 | 0 |
| AJAX-CRESSON MINE & MILL | 0502266 | 08 | 119 | 2178 |
| CLUB MINES | 0502338 | 08 | 085 | 2904 |
| MONOGRAM MINES | 0502340 | 08 | 085 | 2904 |
| BALD EAGLE MINE | 0502354 | 08 | 019 | 726 |
| LONG PARK 15 | 0502379 | 08 | 085 | 2904 |
| GEO #1 MINE | 0502383 | 08 | 085 | 2904 |
| BESSIE G MINE | 0502387 | 08 | 067 | 2904 |
| PAYSTREAK | 0502397 | 08 | 113 | 2904 |
| BUENO MILL | 0502402 | 08 | 013 | 363 |
| ANVIL POINTS MINE & PLANT | 0502500 | 08 | 103 | 2904 |
| SYRACUSE | 0502501 | 08 | 051 | 1997 |
| ALL STARS | 0502512 | 08 | 085 | 2904 |
| BUFFALO BOY | 0502610 | 08 | 051 | 1997 |
| LETTY JONES | 0502671 | 08 | 113 | 2904 |
| KING SOLOMON MINE | 0502675 | 08 | 085 | 8712 |
| GRACE | 0502706 | 08 | 085 | 5808 |
| GOOD FRIDAY MINE | 0502720 | 08 | 013 | 2904 |
| DIXIE GOLD & SILVER MINING LTD | 0502724 | 08 | 019 | 1452 |
| CROSS MINE | 0502730 | 08 | 013 | 1452 |
| VEGA MINE | 0502765 | 08 | 117 | 3630 |
| C-SR-13-A #VETA MAD# | 0502771 | 08 | 113 | 2904 |
| MAAMOTH MINES NO 114 & 423 | 0502774 | 08 | 047 | 1634 |
| C-SR-13 | 0502786 | 08 | 113 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| PEANUT NO 2 | 0502787 | 08 | 085 | 3485 |
| IKE C SR 11 | 0502789 | 08 | 113 | 2904 |
|) | 0502803 | 08 | 019 | 0 |
| MARY NEVIN MINE | 0502815 | 08 | 119 | 36300 |
| CREEDE VENTURE | 0502905 | 08 | 079 | 58080 |
| C-JD4 | 0502912 | 08 | 033 | 2904 |
| PARIS MINE | 0502918 | 08 | 093 | 1452 |
| C-LP-21 | 0502921 | 08 | 085 | 2904 |
| GOLDBELT TUNNELS MINE AND MILL | 0502934 | 08 | 019 | 726 |
| SUN DOG MINE | 0502935 | 08 | 019 | 1452 |
| HUBBARD MINE | 0502940 | 08 | 077 | 2904 |
| BROOKLYN MINE | 0502944 | 08 | 111 | 2033 |
| CENTENNIAL | 0502993 | 08 | 113 | 2904 |
| MINERAL CHANNEL 12 | 0502994 | 08 | 077 | 2904 |
| DONALD L | 0502996 | 09 | 085 | 2904 |
| C-LP-22 MINE | 0503011 | 08 | 085 | 2904 |
| C-JD-7 | 0503031 | 08 | 085 | 2904 |
| U S B M NO. 1 SHAFT | 0503046 | 08 | 103 | 726 |
| FELIX MENDICCO | 0503052 | 08 | 085 | 0 |
| ANNA MAY | 0503053 | 08 | 085 | 2904 |
| STANLEY MINE | 0503054 | 08 | 019 | 1452 |
| C-J-D-9 | 0503066 | 08 | 085 | 2904 |
| ROSEBUD MINE | 0503073 | 08 | 077 | 2904 |
| LITTLE MAUDE | 0503081 | 08 | 111 | 2904 |
| GOLCONDA | 0503083 | 08 | 053 | 2904 |
| ANGLO SAXON #2 | 0503091 | 08 | 111 | 2904 |
| RISORGIMENTO | 0503103 | 08 | 053 | 1452 |
| TRACT C-A | 0503131 | 08 | 103 | 1452 |
| CATHEDRAL BLUFFS | 0503140 | 08 | 103 | |
| PARACHUTE CREEK | 0503143 | 08 | 045 | 32670 |
| C B SHALE OIL LEASE | 0503148 | 08 | 103 | |
| C-B TRACT | 0503149 | 08 | 103 | 3485 |
| S M 18 MINE | 0503152 | 08 | 085 | 2904 |
| ST JUDE MINE | 0503153 | 08 | 113 | 2904 |
| FEDERAL OIL SHALE LEASE-TRACT | 0503179 | 08 | 103 | 0 |
| RIO BLANCO OIL SHALE PRO | 0503181 | 08 | 103 | 0 |
| MATCHLESS MINE | 0503184 | 08 | 077 | 0 |
| C-LP 22A | 0503195 | 08 | 085 | 2904 |
| RUBY TRUST MINE | 0503208 | 08 | 091 | 2323 |
| G3/C027 | 0503209 | 08 | 077 | 2904 |
| BREEZY MINE | 0503211 | 08 | 085 | 2904 |
| EQUINOX | 0503225 | 08 | 085 | 2904 |
| ELLISON MINE | 0503241 | 08 | 113 | 2904 |
| JIM DANDY MINE | 0503249 | 08 | 093 | |
| BONZO | 0503257 | 08 | 059 | |
| AMETHYST QUEEN | 0503263 | 08 | 077 | 2904 |
| FEDERAL OIL SHALE LEASE, TRACT | 0503280 | 08 | 103 | 0 |
| MOFFAT TUNNEL | 0503299 | 08 | 119 | 7260 |
| ALFA CORSAIR ADIT | 0503307 | 08 | 079 | 1452 |
| C SR-10 | 0503415 | 08 | 113 | 2904 |
| EOBERT/ZEBRA | 0503417 | 08 | 085 | 2904 |
| OSCEOLA-PRIDE MINE | 0503428 | 08 | 111 | |
| KING NO 2 | 0503433 | 08 | 113 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|-------------------------|---------|-------|--------|----------------|
| BLACK ROSE MINE | 0503460 | 08 | 005 | 1452 |
| RAHEY MINE | 0503461 | 08 | 013 | 1452 |
| RIFE | 0503462 | 08 | 005 | 726 |
| C-BL-23B | 0503465 | 08 | 085 | 2904 |
| EZRA R | 0503467 | 08 | 111 | 2904 |
| CASHIN MINE | 0503474 | 08 | 085 | 2323 |
| BEVERLY SHAFT MINE | 0503481 | 08 | 105 | 1452 |
| MORNING STAR | 0503487 | 08 | 093 | 1089 |
| ELK PARK MINE | 0503500 | 08 | 111 | 2904 |
| JULIANS MINE | 0503501 | 08 | 085 | 2904 |
| ROSEBUD | 0503503 | 08 | 033 | 2904 |
| TUNGSTEN | 0503524 | 08 | 013 | 1452 |
| REVENUE VIRGINIUS MINE | 0503528 | 08 | 091 | 4646 |
| CLAY COUNTY MINE | 0503530 | 08 | 047 | 1089 |
| BLACK JACK SU | 0503546 | 08 | 113 | 2904 |
| VOLCANO MINE | 0503555 | 08 | 119 | 1452 |
| CENTENNIAL MINE | 0503557 | 08 | 019 | 1452 |
| SCHOOL SECTION MINE | 0503559 | 08 | 119 | 1452 |
| GOLD CREST | 0503561 | 08 | 117 | 1452 |
| MIDLAND MINE | 0503564 | 08 | 051 | 1452 |
| RED POINT MINE | 0503566 | 08 | 045 | 0 |
| POMPEII MINE | 0503568 | 08 | 119 | 1452 |
| GLADIATOR-GEN SHERMAN | 0503576 | 08 | 053 | 2323 |
| NEVADA MINE | 0503583 | 08 | 109 | 1452 |
| COMSTOCK-LAKE MINES | 0503585 | 08 | 019 | 1452 |
| MOOSE MINE | 0503594 | 08 | 093 | 1452 |
| COLUMBINE TUNNEL | 0503596 | 08 | 013 | 1452 |
| CARIBOU MINE | 0503599 | 08 | 013 | 3630 |
| MOUNTAIN TOP MINE | 0503602 | 08 | 091 | 2904 |
| MOBIL EXPERIMENTAL MINE | 0503603 | 08 | 045 | 0 |
| EMMA MINE | 0503605 | 08 | 033 | 3485 |
| HARVEY ADIT | 0503607 | 08 | 077 | 2904 |
| ST KEVIN | 0503609 | 08 | 065 | 0 |
| TOPAZ | 0503613 | 08 | 113 | 2904 |
| HAMILL MINE | 0503614 | 08 | 019 | 1452 |
| CHAMPION-TRIO MINE | 0503615 | 08 | 019 | 0 |
| SENATOR-BLUE RIDGE MINE | 0503616 | 08 | 019 | 0 |
| POORMANMINE | 0503617 | 08 | 019 | 0 |
| PHOENIX MINE | 0503618 | 08 | 019 | 0 |
| BRAZIL MINE | 0503619 | 08 | 019 | 0 |
| HOT POT MINE | 0503620 | 08 | 019 | 0 |
| BRIGHTON MINE | 0503621 | 08 | 019 | 0 |
| WHEATLAND | 0503625 | 08 | 019 | 726 |
| AURUM | 0503634 | 08 | 013 | 726 |
| FRONTENAC MINE | 0503652 | 08 | 047 | 726 |
| TOGO MINE | 0503653 | 08 | 047 | 1452 |
| NEW YORK MINE | 0503655 | 08 | 117 | 1452 |
| FAIR CHANCE MINE | 0503657 | 08 | 119 | 2178 |
| CRAZY GIRL | 0503664 | 08 | 019 | 1452 |
| JUMBO MINE | 0503665 | 08 | 019 | 1452 |
| MAY DAY MINE | 0503674 | 08 | 067 | 2904 |
| NATIONAL MINE | 0503675 | 08 | 047 | 1452 |
| CUMBERLAND | 0503678 | 08 | 067 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| TREASURE MOUNTAIN | 0503680 | 08 | 111 | 2904 |
| SILVER LINK | 0503681 | 08 | 091 | 2904 |
| SUMMITVILLE PROJECT\EXPLORATIO | 0503684 | 08 | 105 | 1452 |
| INTERNATIONAL | 0503688 | 08 | 119 | 1452 |
| COD \REBECCA' | 0503689 | 08 | 119 | 1452 |
| FREDA CLAIM | 0503693 | 08 | 111 | 2904 |
| IRON CLAD MINE | 0503695 | 08 | 119 | 1452 |
| WYOMING MINE | 0503701 | 08 | 037 | 1452 |
| YELLOW PINE | 0503703 | 08 | 013 | 1452 |
| MOOSE MINE | 0503706 | 08 | 047 | 1452 |
| MARY MURPHY MINE | 0503711 | 08 | 015 | 1452 |
| READY CASH MINE | 0503712 | 08 | 065 | 1452 |
| RAINBOW GROUP | 0503715 | 08 | 093 | 1452 |
| OLD SETTLER MINE & MILL | 0503716 | 08 | 019 | 1452 |
| OUT WEST MINE | 0503721 | 08 | 083 | 2904 |
| CONCORD MINERALS CORPORATION M | 0503724 | 08 | 019 | 1452 |
| PEACOCK LORE MINING | 0503725 | 08 | 119 | 1452 |
| SHAUN LORE | 0503728 | 08 | 027 | 1452 |
| LOGOS I | 0503729 | 08 | 047 | 1452 |
| NABOB MINE | 0503734 | 08 | 019 | 2178 |
| OLD HUNDRED MINE | 0503736 | 08 | 111 | 2904 |
| SULTAN MOUNTAIN MINE | 0503740 | 08 | 111 | 2904 |
| FAY/TNT #4 | 0503743 | 08 | 085 | 2904 |
| SILVER GEM | 0503745 | 08 | 093 | 2178 |
| PEERLESS | 0503746 | 08 | 093 | 2178 |
| INDEPENDENT TUNNEL | 0503747 | 08 | 019 | 2178 |
| BABY FAWN | 0503750 | 08 | 085 | 2904 |
| WOOD MOUNTAIN GROUP\WMH&NCCT' | 0503752 | 08 | 013 | 2178 |
| AORTA TUNNEL | 0503763 | 08 | 019 | 1452 |
| BAY STATE TUNNEL | 0503764 | 08 | 019 | 1452 |
| HENDERSON NO 5 SHAFT | 0503766 | 08 | 019 | 10890 |
| RESURRECTION TUNNEL | 0503770 | 08 | 079 | 2904 |
| GROUND HOG | 0503773 | 08 | 037 | 2323 |
| | 0505000 | 08 | 013 | |
| | 0505001 | 08 | 013 | |
| | 0505002 | 08 | 015 | |
| | 0505003 | 08 | 019 | |
| | 0505004 | 08 | 037 | |
| | 0505005 | 08 | 041 | |
| | 0505006 | 08 | 057 | |
| | 0505007 | 08 | 057 | |
| | 0505008 | 08 | 065 | |
| | 0505009 | 08 | 065 | |
| MINE NO 1 | 0900027 | 13 | 123 | 23232 |
| NEW YORK MINE & MILL | 0900030 | 13 | 227 | 43560 |
| MINE NO 6 & MILL NO 5 | 0900031 | 13 | 227 | 29040 |
| MINE NO 4 | 0900047 | 13 | 227 | 26136 |
| MILL NO 1 \U.G. LIMESTONE' | 0900323 | 13 | 123 | 0 |
| MINE NO 2 | 0900324 | 13 | 123 | 17424 |
| ROCK CLIFF MINE - UNDERGROUND | 0900458 | 13 | 213 | 1271 |
| MINE NO 3 | 0900877 | 13 | 227 | 2904 |
| GALENA | 1000082 | 16 | 079 | 232320 |
| BUNKER HILL MINE | 1000083 | 16 | 079 | 232320 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|------------------------------|---------|-------|--------|----------------|
| CRESCENT | 1000085 | 16 | 079 | 58080 |
| STAR MORNING | 1000086 | 16 | 079 | 34848 |
| LUCKY FRIDAY | 1000088 | 16 | 079 | 232320 |
| SUNSHINE MINE & HL | 1000089 | 16 | 079 | 232320 |
| SILVER BUTTE MINE | 1000138 | 16 | 017 | 2904 |
| CLAYTON GROUP | 1000142 | 16 | 037 | 1452 |
| CONSOLIDATED SILVER PROJECT | 1000158 | 16 | 079 | 54450 |
| STAR MINE -1 MAIN VEIN | 1000189 | 16 | 079 | |
| NABOB MINE & HILL | 1000194 | 16 | 079 | 2904 |
| IMA MINE | 1000224 | 16 | 059 | |
| CALADAY PROJECT | 1000409 | 16 | 079 | 0 |
| CONJECTURE MINE | 1000411 | 16 | 017 | 36300 |
| GOLDEN CHEST MINE | 1000414 | 16 | 079 | 2904 |
| DEMOCRAT MINE | 1000467 | 16 | 059 | |
| COEUR MINE | 1000479 | 16 | 079 | 72600 |
| BAILEY LEASE | 1000487 | 16 | 079 | |
| BLACKBIRD MINE | 1000533 | 16 | 059 | 14520 |
| GOLDEN GATE TUNGSTEN | 1000672 | 16 | 085 | |
| LITTLE MOOSE MINE | 1000678 | 16 | 049 | |
| MISSOURI MINE | 1000774 | 16 | 015 | |
| SOUTH MOUNTAIN MINE | 1000866 | 16 | 073 | 2904 |
| CEDAR MOUNTAIN MINE | 1000869 | 16 | 055 | 2904 |
| RESCUE MINE | 1000877 | 16 | 049 | 2904 |
| OZARK EXTENSION | 1000993 | 16 | 049 | 2904 |
| FOUR SQUARE MINE & HILL | 1001004 | 16 | 079 | 2904 |
| KRAKEN HILL MINE | 1001025 | 16 | 037 | 2178 |
| GOLDEN EAGLE MINE | 1001116 | 16 | 049 | 2904 |
| NEW HOPE MINE | 1001223 | 16 | 013 | 0 |
| I D K MINE | 1001237 | 16 | 049 | 2904 |
| BUCHER BAR MINE | 1001258 | 16 | 049 | 2904 |
| KING OF THE WEST | 1001261 | 16 | 025 | |
| BANNER MINE | 1001302 | 16 | 015 | |
| SIX MILE MINE | 1001310 | 16 | 049 | 2904 |
| HAYSTACK MINE | 1001311 | 16 | 049 | 2904 |
| GOLDBACK MINE | 1001317 | 16 | 079 | 2904 |
| LOST CABIN | 1001334 | 16 | 079 | 2904 |
| ROYAL APEX MINE | 1001344 | 16 | 079 | 2904 |
| GREYHOUND MINE | 1001352 | 16 | 037 | 0 |
| MAJESTIC SILVER & LEAD MINE | 1001364 | 16 | 079 | 2904 |
| SILVER BAR MINE | 1001391 | 16 | 015 | 0 |
| WARRIOR MINE | 1001404 | 16 | 049 | 2904 |
| SEVEN GRAND MINING OPERATION | 1001413 | 16 | 049 | 2904 |
| DOUBLE DIAMOND HITCH -1 | 1001414 | 16 | 049 | 2904 |
| IRON MASK MINE | 1001415 | 16 | 017 | 2904 |
| ABELLA | 1001416 | 16 | 015 | |
| LONE PINE MINE | 1001421 | 16 | 049 | 2904 |
| KIMBERLEY MINE | 1001423 | 16 | 049 | 2904 |
| HUMBOLDT MINE | 1001424 | 16 | 049 | 2904 |
| EL ORO MINE | 1001440 | 16 | 039 | |
| WHISTLER TUNNEL | 1001443 | 16 | 079 | 2904 |
| IDAHO LAKEVIEW MINE | 1001453 | 16 | 017 | 2904 |
| SHAMROCK MINE | 1001461 | 16 | 055 | 2904 |
| LOST PACKER MINE | 1001469 | 16 | 037 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|-------------------------------|---------|-------|--------|----------------|
| MASTER MINE #1 | 1001489 | 16 | 055 | 2904 |
| MAJESTIC MINE | 1001493 | 16 | 049 | 2904 |
| BOYD MINE | 1001497 | 16 | 025 | 2904 |
| DIG EDDY MINE | 1001503 | 16 | 079 | |
| CAMP PROJECT | 1001506 | 16 | 079 | |
| CHUCKAR MINE | 1001511 | 16 | 073 | |
| COLUMBIA MINE | 1001515 | 16 | 013 | |
| FIDDLE CREEK DRIFT PLACER | 1001516 | 16 | 049 | 2904 |
| SILVER STRIKE MINE | 1001517 | 16 | 013 | 0 |
| SUNSET MINE | 1001522 | 16 | 015 | |
| CANYON CREEK MINE | 1001526 | 16 | 049 | 2904 |
| GILMORE MINE | 1001527 | 16 | 059 | 4356 |
| CENTER STAR GOLD MINE | 1001534 | 16 | 049 | 2904 |
| HERCULES MINE | 1001538 | 16 | 039 | |
| SEAFOAM MINE | 1001546 | 16 | 037 | |
| RED HORSE MINE | 1001549 | 16 | 025 | 2904 |
| MILL QUARTZ | 1001556 | 16 | 049 | 2904 |
| ESTES MOUNTAIN MINES | 1001558 | 16 | 037 | 726 |
| CHARLES DICKENS | 1001559 | 16 | 037 | 1815 |
| BALTIMORE MINE | 1001569 | 16 | 039 | |
| | 1002000 | 16 | 003 | |
| | 1002001 | 16 | 037 | |
| | 1002002 | 16 | 037 | |
| | 1002003 | 16 | 059 | |
| | 1002004 | 16 | 059 | |
| | 1002005 | 16 | 079 | |
| | 1002006 | 16 | 079 | |
| | 1002007 | 16 | 085 | |
| QUARRY - 1 | 1100019 | 17 | 001 | 145200 |
| CHESTER QUARRY COMPANY | 1100031 | 17 | 157 | 72600 |
| VALMEYER #3 QUARRY & MILL | 1100036 | 17 | 133 | 726000 |
| ALTON MINE | 1100122 | 17 | 119 | 290400 |
| STOTZ QUARRY INC. | 1100213 | 17 | 157 | 60113 |
| MINERVA MINE NO. 1 | 1100791 | 17 | 069 | 145200 |
| BARNETT COMPLEX MINE | 1101599 | 17 | 151 | 2904 |
| H M SHAFT | 1101603 | 17 | 069 | 32670 |
| QUARRY - 3 | 1101707 | 17 | 001 | 101640 |
| SPIVEY MINE | 1101764 | 17 | 069 | 1815 |
| BIRK NO. 2A | 1102598 | 17 | 003 | 3485 |
| MOAD MINES | 1102608 | 17 | 003 | 5808 |
| THORNTON UNDERGROUND MINE NO. | 1102619 | 17 | 031 | 7260 |
| DENTON | 1102667 | 17 | 069 | 1452 |
| ELMHURST UNDERGROUND NO. 1 | 1102707 | 17 | 043 | 14520 |
| HENSON | 1102713 | 17 | 151 | 5445 |
| | 1103000 | 17 | 069 | |
| MARENGO MINE & MILL | 1200047 | 18 | 025 | 217800 |
| UNITED STATES GYPSUM CO | 1200427 | 18 | 101 | 290400 |
| SHOALS MINE | 1200429 | 18 | 101 | 290400 |
| LAPEL MINE AND MILL | 1201038 | 18 | 095 | 40656 |
| DERBY UNDERGROUND MINE | 1201397 | 18 | 123 | 18513 |
| DERBY SLOPE MINE | 1201423 | 18 | 123 | 363 |
| ECKERTY UNDERGROUND MINE | 1201713 | 18 | 025 | 21780 |
| INDIANA CAL-PRO INC. | 1201757 | 18 | 105 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|---------------------------------|---------|-------|--------|----------------|
| KENTUCKY AVENUE MINE & MILL | 1201762 | 18 | 097 | 3049 |
| AMES MINE | 1300014 | 19 | 169 | 21780 |
| DOUDS UNDERGROUND MINE | 1300018 | 19 | 177 | 217800 |
| FT DODGE MINE | 1300032 | 19 | 187 | 29040 |
| LINWOOD MINE & MILL | 1300097 | 19 | 163 | 196020 |
| MALCOM STONE CO MINE | 1300112 | 19 | 157 | 83490 |
| COLUMBUS JUNCTION UNDERGROUND | 1300194 | 19 | 115 | 39204 |
| YOUNG AMERICA MINE & MILL | 1300197 | 19 | 183 | 39204 |
| SPERRY MINE | 1300434 | 19 | 057 | 261360 |
| CLAYTON PLANT | 1300615 | 19 | 043 | 58080 |
| MOBERLY QUARRY | 1300862 | 19 | 079 | 32670 |
| DURHAM MINE | 1301225 | 19 | 125 | 29040 |
| WEBER MINE AND MILL | 1301262 | 19 | 105 | 29040 |
| RAYMOND MINE | 1301760 | 19 | 013 | 5808 |
| FERGUSON MINE | 1301924 | 19 | 127 | 2904 |
| WATERLOO SOUTH MINE | 1301926 | 19 | 013 | 290400 |
| BROMLEY MINE & MILL | 1400061 | 20 | 005 | 145200 |
| THOMPSON-STRAUSS QUARRIES | 1400159 | 20 | 209 | 108900 |
| VANLERBERG QY - UG | 1400161 | 20 | 091 | 290400 |
| HOLLAND MINE & MILL #1 | 1400172 | 20 | 091 | 116160 |
| SUN CITY MINE | 1400308 | 20 | 007 | 145200 |
| BLUE RAPIDS MINE & MILL | 1400309 | 20 | 117 | 163350 |
| INDEPENDENT SALT CO | 1400411 | 20 | 053 | 217800 |
| CAREY ROCK SALT MINE | 1400412 | 20 | 155 | 165528 |
| AMERICAN SALT MINE & MILL | 1400413 | 20 | 159 | 191664 |
| MIDLAND QUARRY MINE | 1400606 | 20 | 005 | 14520 |
| HOLLAND MINE #2 | 1400761 | 20 | 091 | 0 |
| LORING MINE | 1401282 | 20 | 103 | 21780 |
| TOBIN MINE & MILL | 1401323 | 20 | 091 | 12705 |
| TOBIN MINE & MILL #2 | 1401398 | 20 | 091 | 0 |
| | 1401600 | 20 | 099 | |
| MARION PLANT | 1500003 | 21 | 055 | |
| BOONESBORO QUARRY, INCORPORATED | 1500006 | 21 | 151 | |
| CAMP NELSON STONE CO, INC. | 1500010 | 21 | 079 | 1307 |
| CASEY STONE COMPANY | 1500012 | 21 | 045 | |
| CEDAR BLUFF MINE UNDERGROUND | 1500013 | 21 | 033 | |
| LEXINGTON UNDERGROUND NO.1 | 1500016 | 21 | 067 | 3086 |
| TIFTON RIDGE QUARRY | 1500019 | 21 | 065 | |
| GLENNS CREEK | 1500020 | 21 | 073 | 3086 |
| TYRONE U G MINE | 1500043 | 21 | 005 | |
| YELLOW ROCK MINE AND MILL | 1500048 | 21 | 129 | 2360 |
| MOUNT VERNON MINE & MILL | 1500051 | 21 | 203 | |
| CRESTWOOD MINE UG | 1500059 | 21 | 185 | |
| M J M MINE AND MILL | 1500061 | 21 | 175 | |
| PENDLETON COUNTY UNDERGROUND | 1500062 | 21 | 191 | 174240 |
| RIVERSIDE STONE MINE UG | 1500081 | 21 | 163 | |
| RAGLAND MINE & MILL | 1500086 | 21 | 085 | |
| RICHMOND ROAD QUARRY | 1500107 | 21 | 067 | 3086 |
| OKOLONA QUARRY | 1500108 | 21 | 111 | 436 |
| INDIAN CREEK UNDERGROUND | 1500111 | 21 | 109 | |
| CLOVER BOTTOM UNDERGROUND | 1500112 | 21 | 109 | |
| MILL CREEK STONE | 1500195 | 21 | 237 | 1997 |
| LOCKPORT PLANT | 1504479 | 21 | 103 | |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| LEXINGTON QUARRY COMPANY | 1506264 | 21 | 113 | |
| CABIN CREEK MINE | 1507101 | 21 | 161 | 4646 |
| | 1508000 | 21 | 055 | 76230 |
| | 1508001 | 21 | 055 | |
| | 1508002 | 21 | 057 | |
| | 1508003 | 21 | 139 | |
| | 1508004 | 21 | 139 | |
| | 1508005 | 21 | 139 | |
| | 1508006 | 21 | 139 | |
| | 1508007 | 21 | 171 | |
| WEEKS ISLAND STORAGE COMPLEX | 1600239 | 22 | 045 | 0 |
| BELLE ISLE | 1600246 | 22 | 101 | 52272 |
| COTE BLANCH MINE | 1600358 | 22 | 101 | 52272 |
| JEFFERSON ISLAND PLANT | 1600508 | 22 | 045 | 0 |
| AVERY ISLAND MINE AND REFINERY | 1600509 | 22 | 045 | 65340 |
| WEEKS ISLAND MINE AND MILL | 1600512 | 22 | 045 | 0 |
| WEEKS ISLAND MINE & MILL | 1600970 | 22 | 045 | 62073 |
| | 1602000 | 22 | 051 | |
| | 1602001 | 22 | 075 | |
| | 1602002 | 22 | 109 | |
| -5 MINE | 1700246 | 23 | 021 | 726 |
| | 1700500 | 23 | 009 | |
| | 1700501 | 23 | 029 | |
| BROWNING'S DEEP CREEK MINE | 1800037 | 24 | 023 | 14520 |
| SOUTH MINE HILL | 1800342 | 24 | 005 | 14520 |
| | 1800500 | 24 | 023 | 7260 |
| WHITE PINE COPPER DIVISION | 2000371 | 26 | 131 | 36300 |
| DETROIT MINE | 2000552 | 26 | 163 | 54450 |
| KENTWOOD MINE | 2001019 | 26 | 081 | 7260 |
| ROPES GOLD MINE | 2002574 | 26 | 103 | 1452 |
| | 2005000 | 26 | 053 | 2904 |
| | 2005001 | 26 | 071 | |
| | 2005002 | 26 | 053 | |
| ADRIAN MATERIALS MINE | 2300001 | 29 | 019 | 1452 |
| ALROK MINE & MILL | 2300007 | 29 | 095 | 290400 |
| NORTH CAVE MINE AND MILL | 2300028 | 29 | 097 | 50820 |
| CALLAWAY MINE & MILL | 2300032 | 29 | 095 | 0 |
| PLANT #1 UG MINE & MILL | 2300094 | 29 | 077 | 72600 |
| CARTHAGE MINE & MILL | 2300112 | 29 | 097 | 26136 |
| RUSH TOWER MN & ML | 2300130 | 29 | 099 | 11616 |
| KELLY MINE & MILL | 2300143 | 29 | 103 | 13068 |
| RANDOLPH MINE | 2300154 | 29 | 047 | 726000 |
| ROCK ACRES QUARRY UNDERGROUND | 2300182 | 29 | 095 | 65340 |
| PIXLEY MINE & PLANT | 2300201 | 29 | 095 | 290400 |
| SOUTHWEST LIME CO | 2300202 | 29 | 145 | 36300 |
| LEE'S SUMMIT QY 'U G' | 2300215 | 29 | 095 | 0 |
| WEILER MARBLE MINE | 2300227 | 29 | 184 | 17424 |
| FLETCHER | 2300409 | 29 | 179 | 130680 |
| PEA RIDGE MINE | 2300454 | 29 | 221 | 145200 |
| HAGMONT MINE AND MILL | 2300456 | 29 | 093 | 145200 |
| BUICK MINE | 2300457 | 29 | 093 | 217800 |
| FRANK R. MILLIKEN MINE & MILL | 2300458 | 29 | 179 | 217800 |
| VIBURNUM NO 28 MINE & MILL | 2300494 | 29 | 093 | 130680 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| VIBURNUM NO. 29 MINE | 2300495 | 29 | 093 | 0 |
| INDIAN CREEK MINE | 2300497 | 29 | 221 | 0 |
| BRUSHY CREEK | 2300499 | 29 | 179 | 145200 |
| PEERLESS MINE | 2300542 | 29 | 184 | 494960 |
| UNIMIN MINE AND MILL | 2300786 | 29 | 099 | 433400 |
| NORTHWEST MINE & MILL | 2300924 | 29 | 015 | 50820 |
| ASH GROVE MINE & MILL | 2301007 | 29 | 077 | 58080 |
| PACIFIC WORKS, UNDERGROUND MIL | 2301061 | 29 | 189 | 29040 |
| USAGE MINE & MILL | 2301174 | 29 | 029 | 50820 |
| BURLINGTON MINE | 2301405 | 29 | 173 | 21780 |
| MADISON MINE | 2301770 | 29 | 123 | 72600 |
| WEST FORK | 2301787 | 29 | 179 | 0 |
| VIBURNUM -35 MINE | 2301800 | 29 | 093 | 0 |
| CENTRAL STONE ST. LOUIS DIV. | 2301828 | 29 | 189 | 17424 |
| TABLE ROCK QUARRY -1 UNDERGROU | 2301834 | 29 | 213 | 8712 |
| | 2302500 | 29 | 017 | |
| | 2302501 | 29 | 189 | |
| SHOEMAKER | 2400145 | 30 | 027 | 72600 |
| WARM SPRINGS MINE | 2400146 | 30 | 077 | 72600 |
| DABBITT MINE | 2400174 | 30 | 089 | 19602 |
| VALLEY VIEW MINE | 2400241 | 30 | 057 | 1452 |
| FLATHEAD | 2400284 | 30 | 047 | 0 |
| MOULTON MINE | 2400448 | 30 | 013 | 1452 |
| SPOTTED HORSE MINE, INC. | 2400512 | 30 | 027 | 1452 |
| SILVER BUTTE | 2400551 | 30 | 053 | 1452 |
| POLARIS MINE | 2400686 | 30 | 001 | 1452 |
| KELLY MN COMPLEX VARIOUS MNS | 2400710 | 30 | 093 | |
| STAR MINE | 2400748 | 30 | 013 | 2904 |
| SILVER KING MINE | 2400942 | 30 | 039 | 2904 |
| LOTTA TUNNEL | 2401055 | 30 | 043 | 1452 |
| DRUMLUMMON MINE | 2401079 | 30 | 049 | 2904 |
| ELKHORN MINE | 2401140 | 30 | 001 | 2904 |
| JARDINE MINE | 2401145 | 30 | 067 | |
| BLACK PINE MINE | 2401147 | 30 | 039 | 40874 |
| EAST PACIFIC MINE | 2401221 | 30 | 007 | 1452 |
| ALAMEDA | 2401256 | 30 | 057 | 2904 |
| GOLDEN JUBILEE | 2401358 | 30 | 039 | 2904 |
| BLUE BIRD MINE | 2401423 | 30 | 053 | 0 |
| NELLIE GRANT | 2401441 | 30 | 043 | 0 |
| TROY PROJECT | 2401467 | 30 | 053 | 76230 |
| STILLWATER PROJECT | 2401490 | 30 | 095 | 2904 |
| MOHAUK MINE | 2401492 | 30 | 067 | |
| HALEY MINE | 2401493 | 30 | 049 | |
| LIBERTY MINE | 2401516 | 30 | 045 | |
| B AND H MINE | 2401519 | 30 | 057 | 1452 |
| IRON MASK MINE | 2401529 | 30 | 007 | 1452 |
| GOLDEN DAWN MINE | 2401535 | 30 | 001 | 2904 |
| SPOKANE HILL MINE | 2401540 | 30 | 007 | |
| BUCKEYE MINES | 2401541 | 30 | 057 | 0 |
| HOPE MINES | 2401549 | 30 | 039 | 1452 |
| GENERAL CUSTER | 2401550 | 30 | 007 | 1452 |
| MATTIE V | 2401560 | 30 | 063 | 0 |
| STILLWATER PGM RESOURCES MINE | 2401562 | 30 | 097 | |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|-----------------------------|---------|-------|--------|----------------|
| MATLETON MINE | 2401581 | 30 | 057 | 0 |
| GREY JOCKEY MINE | 2401587 | 30 | 001 | 218 |
| GRUBSTAKE MINE & MILL | 2401588 | 30 | 057 | 0 |
| CANNIVAN GULCH PROJECT | 2401590 | 30 | 001 | 0 |
| GOLD CROWN | 2401591 | 30 | 049 | 2904 |
| GOLDEN ANCHOR | 2401602 | 30 | 077 | 726 |
| CHAR TAN | 2401604 | 30 | 007 | |
| JOE DANDY | 2401605 | 30 | 007 | 1452 |
| JAY GOULD MINE | 2401606 | 30 | 049 | 0 |
| ELK CREEK MINE | 2401607 | 30 | 063 | 2904 |
| SPUHLER MINE & MILL | 2401617 | 30 | 057 | |
| LOTTIE MINE | 2401629 | 30 | 057 | |
| DOROTHY -1 | 2401630 | 30 | 057 | 726 |
| RIDGEWAY MINE | 2401631 | 30 | 057 | 2904 |
| FRENCH CREEK MINE | 2401632 | 30 | 001 | |
| GOLDEN AGE | 2401634 | 30 | 043 | |
| NICK AND DICK MINE | 2401635 | 30 | 049 | 1452 |
| LILLY MINE | 2401636 | 30 | 007 | |
| BROADWAY VICTORY | 2401639 | 30 | 057 | |
| BEAL MINE | 2401642 | 30 | 093 | 0 |
| GOLD BUG | 2401649 | 30 | 061 | 0 |
| GRUBSTAKE MINE CLAIM | 2401651 | 30 | 089 | 726 |
| TABOR NO. 1 | 2401653 | 30 | 057 | 2904 |
| NEVER SWEAT | 2401655 | 30 | 057 | 2904 |
| ELKHORN MINE | 2401657 | 30 | 043 | |
| TABOR NO. 2 - MILLIE BLY | 2401658 | 30 | 057 | 2904 |
| TABOR NO. 3 - NEW WINNETHA | 2401659 | 30 | 057 | 2904 |
| TABOR NO. 4 - KEYHOLE | 2401660 | 30 | 057 | 2904 |
| TABOR NO. 5 - ST. JOHN | 2401661 | 30 | 057 | 2904 |
| SILVER RIDGE | 2401662 | 30 | 001 | 2904 |
| BI METALLIC | 2401664 | 30 | 043 | 0 |
| BELMONT | 2401665 | 30 | 049 | |
| MONTREAL MINE | 2401667 | 30 | 093 | 2904 |
| | 2401706 | 30 | 057 | 2904 |
| | 2402000 | 30 | 049 | |
| | 2402001 | 30 | 049 | |
| | 2402002 | 30 | 077 | |
| | 2402003 | 30 | 077 | |
| | 2402004 | 30 | 077 | |
| | 2402005 | 30 | 089 | |
| | 2402006 | 30 | 095 | |
| | 2402007 | 30 | 097 | |
| WEeping WATER MINE AND MILL | 2500017 | 31 | 025 | 580800 |
| WEeping WATER MINE AND MILL | 2500020 | 31 | 025 | 29040 |
| TEXASGULF INC | 2500554 | 31 | 025 | 145200 |
| WEeping WATER NORTH MINE | 2500934 | 31 | 025 | 21780 |
| WEeping WATER SOUTH MINE | 2500998 | 31 | 025 | 0 |
| NEW DISCOVERY | 2600052 | 32 | 023 | 1452 |
| CROWELL FLUGRSPAR MINE | 2600091 | 32 | 023 | 1452 |
| MAKIE PERLITE MINE | 2600117 | 32 | 017 | 1452 |
| BAY STATE | 2600209 | 32 | 033 | 1452 |
| GOOSEBERRY MINE | 2600249 | 32 | 029 | 1452 |
| EMERSON MINE | 2600340 | 32 | 017 | 29040 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|-------------------------|---------|-------|--------|----------------|
| TYBO MINE | 2600513 | 32 | 023 | 1452 |
| THOMAS W | 2600561 | 32 | 015 | 1452 |
| WARD | 2600576 | 32 | 033 | 10164 |
| BARCELONA | 2600597 | 32 | 023 | 0 |
| NEVADA SCHEELITE | 2600614 | 32 | 021 | 1452 |
| INDEPENDENCE | 2600826 | 32 | 015 | 1452 |
| SUTTON II | 2600964 | 32 | 027 | 1452 |
| WELLS TUNGSTEN MINE | 2600985 | 32 | 007 | 1452 |
| HELLIE GRAY MINE | 2601136 | 32 | 023 | 1452 |
| CASELTON MINE | 2601146 | 32 | 017 | 29040 |
| LITTLE JUPITER MINE | 2601260 | 32 | 027 | 1452 |
| VICTORIA UNIT | 2601317 | 32 | 007 | 1452 |
| TEMPIUTE METALS CO MINE | 2601436 | 32 | 017 | 1452 |
| VIVIAN TUNNEL | 2601498 | 32 | 007 | 1452 |
| STERLING MINE | 2601503 | 32 | 023 | 1452 |
| NEW SAVAGE MINE | 2601522 | 32 | 029 | 1452 |
| DIAMOND MINE | 2601524 | 32 | 011 | 1452 |
| HILLSIDE | 2601533 | 32 | 015 | 1452 |
| TRUE BLUE | 2601553 | 32 | 015 | 1452 |
| GREY EAGLE MINE | 2601575 | 32 | 015 | 1452 |
| IDA MINE | 2601587 | 32 | 019 | 1452 |
| MOHO MINE | 2601593 | 32 | 021 | 1452 |
| TONOPAH EXTENSION | 2601604 | 32 | 023 | 0 |
| MINERVA MINE | 2601605 | 32 | 033 | 1452 |
| BIG COMSTOCK MINE | 2601608 | 32 | 029 | 1452 |
| CHALLENGE | 2601614 | 32 | 021 | 1452 |
| FALCON | 2601628 | 32 | 007 | 1452 |
| KLONDIKE | 2601632 | 32 | 015 | 1452 |
| ESMERALDA | 2601633 | 32 | 007 | 1452 |
| 16 TO 1 MINE | 2601638 | 32 | 009 | 29040 |
| ADELAIDE MINE | 2601647 | 32 | 013 | 0 |
| FENCEMAKER | 2601650 | 32 | 027 | 1452 |
| SILVER CONNOR | 2601656 | 32 | 011 | 1452 |
| MOHAWK MINE | 2601662 | 32 | 005 | 1452 |
| INDIAN QUEEN | 2601669 | 32 | 021 | 1452 |
| POTOSI | 2601684 | 32 | 021 | 1452 |
| BUCKSKIN OPERATIONS | 2601685 | 32 | 005 | 1452 |
| BELL MINE | 2601689 | 32 | 021 | 1452 |
| RIDDLE | 2601702 | 32 | 007 | 1452 |
| RAND MINE | 2601703 | 32 | 003 | 1452 |
| MAYBERRY MINE | 2601707 | 32 | 023 | 1452 |
| SOUTH COMSTOCK MINE | 2601711 | 32 | 019 | 1452 |
| J P MINE | 2601715 | 32 | 033 | 1452 |
| LUCKY BOY MINE | 2601719 | 32 | 021 | 1452 |
| MARY MINE | 2601722 | 32 | 009 | 1452 |
| NEW YORK SHAFT | 2601727 | 32 | 015 | 1452 |
| TRANSVALL MINE | 2601731 | 32 | 023 | 1452 |
| MAYFLOWER MINE | 2601732 | 32 | 023 | 1452 |
| LITTLE SUMMIT | 2601747 | 32 | 021 | 1452 |
| ARGUS | 2601750 | 32 | 021 | 0 |
| LIVE YANKEE | 2601754 | 32 | 021 | 1452 |
| SANGER MINE | 2601755 | 32 | 009 | 1452 |
| TRAMP MINE | 2601756 | 32 | 023 | 1452 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| RAVEN MINE | 2601767 | 32 | 013 | 1452 |
| JUNIATA \AKA CHESCO' | 2601770 | 32 | 021 | 1452 |
| MOHAWK II MINE | 2601773 | 32 | 009 | 0 |
| EAGLE TUNGSTEN MINE | 2601785 | 32 | 021 | 1452 |
| GEORGENE | 2601788 | 32 | 021 | 1452 |
| | 2602500 | 32 | 001 | |
| | 2602501 | 32 | 007 | |
| | 2602502 | 32 | 013 | |
| | 2602503 | 32 | 013 | |
| | 2602504 | 32 | 013 | |
| | 2602505 | 32 | 013 | |
| | 2602506 | 32 | 013 | |
| | 2602507 | 32 | 015 | |
| | 2602508 | 32 | 017 | |
| | 2602509 | 32 | 017 | |
| | 2602510 | 32 | 021 | |
| | 2602511 | 32 | 021 | |
| | 2602512 | 32 | 023 | |
| | 2602513 | 32 | 023 | |
| | 2602514 | 32 | 023 | |
| | 2602515 | 32 | 027 | |
| | 2602516 | 32 | 027 | |
| | 2602517 | 32 | 027 | |
| | 2602518 | 32 | 033 | |
| | 2602519 | 32 | 033 | |
| | 2602520 | 32 | 033 | |
| STERLING MINE & MILL | 2800393 | 34 | 037 | 49005 |
| GROUND HOG UNIT | 2900157 | 35 | 017 | |
| NASH DRAW | 2900166 | 35 | 015 | 18150 |
| HOBBS POTASH FACILITY | 2900170 | 35 | 015 | 108900 |
| PCA MINE AND MILL | 2900173 | 35 | 015 | 145200 |
| AMAX MINE AND MILL | 2900174 | 35 | 015 | 108900 |
| MISSISSIPPI CHEMICAL CORPORATI | 2900175 | 35 | 015 | 36300 |
| CONTINENTAL UNDERGROUND COMPLE | 2900233 | 35 | 017 | 36300 |
| OLD BECK | 2900268 | 35 | 023 | |
| HUMMINGBIRD | 2900270 | 35 | 049 | 5445 |
| SAN PEDRO MINE | 2900294 | 35 | 049 | 2904 |
| SEC 24 14N 10W | 2900537 | 35 | 031 | |
| SEC 30 14N 9W & 29 1 | 2900538 | 35 | 031 | |
| SEC 30 WEST | 2900539 | 35 | 031 | |
| SECTION 33 | 2900541 | 35 | 031 | |
| SEC 35 MINE | 2900542 | 35 | 031 | |
| SEC 36 - UG | 2900543 | 35 | 031 | |
| JOHNNY M SHAFT | 2900560 | 35 | 031 | |
| L-BAR URANIUM OPERATIONS | 2900565 | 35 | 061 | 78408 |
| ANN LEE | 2900569 | 35 | 031 | |
| NORTHEAST CHURCHROCK MINE | 2900573 | 35 | 031 | |
| SANDSTONE MINE | 2900575 | 35 | 031 | |
| SECTION 27 | 2900579 | 35 | 031 | |
| SEC. 23 | 2900590 | 35 | 031 | |
| SEC. 25 MINE | 2900591 | 35 | 031 | |
| SEC. 29 & 32 | 2900593 | 35 | 031 | |
| ENOS JOHNSON | 2900602 | 35 | 045 | |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| CENTER SHAFTS | 2900752 | 35 | 017 | 3630 |
| LINCHBURG MINE | 2900757 | 35 | 053 | |
| MILL GEN SHOPS OFF WORK | 2900776 | 35 | 031 | |
| SEC 17 14N 9W | 2900778 | 35 | 031 | |
| SECTION 19 | 2900781 | 35 | 031 | |
| CHURCHROCK NO. 1 | 2900782 | 35 | 031 | |
| IMC CARLSBAD | 2900802 | 35 | 015 | 127050 |
| LEA MINE AND REFINERY | 2901147 | 35 | 025 | 90750 |
| P-10 | 2901214 | 35 | 061 | |
| QUESTA MINE | 2901267 | 35 | 055 | 43560 |
| RUBY NO. 1 & 2 | 2901364 | 35 | 031 | |
| MT. TAYLOR | 2901375 | 35 | 061 | 0 |
| MARQUEZ SHAFT | 2901597 | 35 | 031 | 6534 |
| MARIANO LAKE MINE | 2901598 | 35 | 031 | 0 |
| SECTION 13 MINE | 2901606 | 35 | 031 | |
| | 2901637 | 35 | 000 | 1815 |
| SECTION 12 | 2901683 | 35 | 031 | |
| NOSE ROCK MINE NO. 1 | 2901688 | 35 | 003 | |
| OLD CHURCHROCK MINE | 2901726 | 35 | 031 | |
| TODILTO MINE #2 PIEDRA TRISTE | 2901729 | 35 | 031 | |
| NOSE ROCK NO. 2 MINE \SECTION | 2901730 | 35 | 031 | |
| SECTION 10 MINE | 2901743 | 35 | 031 | |
| SECTION 14 MINE | 2901744 | 35 | 031 | |
| RUBY NO. 3 AND NO. 4 MINE | 2901766 | 35 | 031 | |
| GREAT REPUBLIC | 2901770 | 35 | 051 | 5808 |
| CHURCHROCK NO. 1 EAST | 2901775 | 35 | 031 | |
| EAST CAMP | 2901776 | 35 | 017 | 5445 |
| MARJERY MINE | 2901777 | 35 | 051 | 6534 |
| GOLD KING-IMPERIAL | 2901778 | 35 | 017 | 3267 |
| CROWNPOINT SECTION 24 | 2901790 | 35 | 031 | |
| MINA AMIGOS MINING COMPANY | 2901802 | 35 | 017 | 5445 |
| LEE MINE | 2901831 | 35 | 031 | |
| WHITE OAKS | 2901836 | 35 | 027 | |
| BLACK HAWK | 2901839 | 35 | 051 | 5445 |
| SILVER CONTACT #8 | 2901840 | 35 | 027 | 6534 |
| LITTLE GRANITE | 2901844 | 35 | 051 | 4356 |
| WASTE ISOLATION PILOT PLANT \W | 2901857 | 35 | 015 | 0 |
| P-13 MINE | 2901862 | 35 | 061 | 0 |
| NJ-45 MINE | 2901863 | 35 | 061 | 0 |
| HERMOSA | 2901866 | 35 | 051 | 5445 |
| ST. CLOUD MINE | 2901869 | 35 | 051 | 52272 |
| BLACK HAWK MINE | 2901877 | 35 | 017 | 4356 |
| | 2901999 | 35 | 015 | 43560 |
| | 2902000 | 35 | 015 | |
| | 2902001 | 35 | 015 | |
| | 2902002 | 35 | 017 | |
| | 2902003 | 35 | 017 | |
| | 2907004 | 35 | 017 | |
| | 2907005 | 35 | 029 | |
| | 2907006 | 35 | 029 | |
| | 2907007 | 35 | 029 | |
| | 2907008 | 35 | 043 | |
| | 2907009 | 35 | 051 | |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|-------------------------------|---------|-------|--------|----------------|
| | 2907010 | 35 | 051 | |
| | 2907011 | 35 | 053 | |
| BALMAT NO. 2 MINE | 3000591 | 36 | 089 | 54450 |
| OAKFIELD MINE | 3000593 | 36 | 037 | 108900 |
| NO. 1 MINE AND NO. 1 MILL | 3000611 | 36 | 089 | 72600 |
| WILLSBORO WALLASTONITE MINE & | 3000644 | 36 | 031 | 72600 |
| RETSEF MINE UG | 3000662 | 36 | 051 | 4864200 |
| CARGILL SALT CAYUGA | 3000663 | 36 | 109 | 726000 |
| BALMAT MINE NO 3 | 3001184 | 36 | 089 | 54450 |
| BALMAT MINE NO 4 AND MILL | 3001185 | 36 | 089 | 54450 |
| HYATT PROPERTY | 3001688 | 36 | 089 | 79860 |
| WIGHT MINE | 3002236 | 36 | 089 | 29040 |
| NO 4 MINE AND NO 3 MILL | 3002245 | 36 | 049 | 29040 |
| PIERREPONT PROPERTY | 3002577 | 36 | 089 | 3630 |
| | 3003000 | 36 | 089 | |
| CRANBERRY MINE & MILL | 3100209 | 37 | 011 | |
| NANCY JORDAN NO. 5 | 3100222 | 37 | 039 | |
| | 3100400 | 37 | 099 | |
| | 3100401 | 37 | 181 | |
| JONATHAN MINE | 3300047 | 39 | 119 | 1452000 |
| IRONDALE | 3300484 | 39 | 081 | 145200 |
| THE STONE CREEK BRICK CO.MINE | 3300563 | 39 | 157 | 1307 |
| | 3301349 | 39 | 153 | 1452000 |
| MORTON SALT FAIRPORT MINE | 3301993 | 39 | 085 | 1452000 |
| CLEVELAND MINE | 3301994 | 39 | 035 | 1306800 |
| | 3302000 | 39 | 000 | 1452000 |
| NEW TECH NO. 1 | 3303897 | 39 | 115 | 1452 |
| ARKHOLA MILL - | 3400003 | 40 | 021 | 0 |
| MARBLE CITY OPERATIONS | 3400282 | 40 | 135 | 108900 |
| BALD MOUNTAIN MINE | 3500387 | 41 | 001 | 2904 |
| ARGONAUT MINE | 3500670 | 41 | 001 | 1452 |
| COUGAR MINE | 3502386 | 41 | 023 | 1452 |
| BLACK BEAR MN & ML | 3502537 | 41 | 033 | |
| RUTH MINE AND MILL | 3502692 | 41 | 047 | |
| GREENBACK MINE | 3502806 | 41 | 033 | 1452 |
| IRON DYKE MINE | 3502868 | 41 | 001 | 2178 |
| YELLOWHORN | 3502971 | 41 | 033 | 2904 |
| CRACKER CREEK | 3503010 | 41 | 001 | 16335 |
| GOLDEN STAR MINE | 3503033 | 41 | 039 | |
| CORNUCOPIA MINE | 3503038 | 41 | 001 | 1452 |
| IBEX MINE | 3503039 | 41 | 023 | 2178 |
| ROBERT EMMETT MINE | 3503071 | 41 | 001 | 1452 |
| CHAMPION MINE | 3503076 | 41 | 039 | 1452 |
| RAINBOW MINE | 3503080 | 41 | 033 | 726 |
| AZURITE MINE | 3503084 | 41 | 025 | 1452 |
| QUICKSILVER FALLS #1 | 3503091 | 41 | 005 | 1452 |
| KAYLOR MINE #3 & PLANT | 3600033 | 42 | 005 | 72600 |
| PECK FARM UG | 3600124 | 42 | 111 | 14520 |
| BLUE STONE UG QUARRY & MILL | 3600131 | 42 | 129 | 72600 |
| | 3600155 | 42 | 051 | 1452 |
| BELLEFONTE MINE AND MILL | 3600183 | 42 | 027 | 36300 |
| PLEASANT GAP MINE | 3600238 | 42 | 027 | 10870 |
| BELL MINE AND BELLEFONTE MILL | 3600263 | 42 | 027 | 36300 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| WINFIELD LIME & STONE MINE AND | 3600274 | 42 | 019 | 7260 |
| CONTINENTAL CLAY PRODUCTS CO. | 3600406 | 42 | 005 | 43560 |
| DREXEL MINE & MILL | 3600609 | 42 | 005 | 3630 |
| HANLEY #4A MINE & MILL | 3600630 | 42 | 065 | 27225 |
| FRIEDENSVILLE MINE & MILL | 3602627 | 42 | 077 | 145200 |
| THOMASVILLE MINE 2 AND 3 | 7603432 | 42 | 133 | 72600 |
| UG MINE & MILL | 3604403 | 42 | 005 | 7260 |
| LAKE LYNN LABORATORY | 3606929 | 42 | 051 | 29040 |
| | 3608000 | 42 | 019 | |
| | 3608001 | 42 | 007 | |
| | 3608002 | 42 | 019 | |
| | 3608003 | 42 | 005 | |
| | 3608004 | 42 | 000 | |
| | 3608005 | 42 | 007 | |
| | 3608006 | 42 | 005 | |
| | 3608007 | 42 | 011 | 0 |
| | 3608008 | 42 | 071 | |
| HOMESTAKE MINE | 3900055 | 46 | 081 | 90750 |
| GILT EDGE MINE | 3900902 | 46 | 081 | 3630 |
| JUNIPER MINE | 3901241 | 46 | 103 | 0 |
| SPOKANE | 3901275 | 46 | 033 | |
| BOSCOBELL-DOUBLE STANDARD | 3901279 | 46 | 081 | 3920 |
| BOB INGERSOLL MINE | 3901280 | 46 | 103 | 0 |
| | 3901500 | 46 | 033 | |
| THETA PIKE MINE | 4000020 | 47 | 119 | 98010 |
| ANDERSON PLANT | 4000022 | 47 | 051 | 72600 |
| CRAB ORCHARD MINE | 4000087 | 47 | 035 | |
| JEFFERSON CITY MINE | 4000137 | 47 | 089 | |
| COY MINE | 4000166 | 47 | 089 | |
| YOUNG MINE | 4000168 | 47 | 089 | |
| IMMEL MINE | 4000170 | 47 | 093 | |
| NEW MARKET MINE | 4000606 | 47 | 089 | |
| JEFFERSON CITY ZINC UNDERGROUN | 4000607 | 47 | 089 | |
| CHEROKEE MINE | 4000704 | 47 | 139 | |
| CALLOWAY MINE | 4000707 | 47 | 139 | |
| BOYD MINE | 4000708 | 47 | 139 | |
| ELMWOOD-GORDONSVILLE MINE | 4000864 | 47 | 159 | |
| BEAVER CK MINE | 4001751 | 47 | 089 | |
| LUTTRELL UNDERGROUND MINE | 4002113 | 47 | 173 | 36300 |
| CARTHAGE ZINC MINE | 4002213 | 47 | 159 | 0 |
| NO.3 UNDERGROUND MINE | 4002772 | 47 | 173 | 21780 |
| | 4003000 | 47 | 049 | |
| | 4003001 | 47 | 057 | |
| | 4003002 | 47 | 067 | |
| | 4003003 | 47 | 073 | |
| | 4003004 | 47 | 139 | |
| | 4003005 | 47 | 159 | |
| | 4003006 | 47 | 169 | |
| | 4003007 | 47 | 169 | |
| | 4003008 | 47 | 189 | |
| CALCIUM CARBONATE DIVISION J.M | 4100055 | 48 | 053 | 54450 |
| VAN HORN WHITE MARBLE MINE | 4100995 | 48 | 109 | 21780 |
| GRAND SALINE OPERATIONS | 4101776 | 48 | 467 | 58080 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| HOCKLEY MINE | 4102478 | 48 | 201 | 29040 |
| BONANZA MINE & MILL | 4102782 | 48 | 229 | 14520 |
| SHAFTER MINE | 4102905 | 48 | 377 | 7260 |
| | 4104000 | 48 | 043 | |
| | 4104001 | 48 | 157 | |
| | 4104002 | 48 | 377 | |
| LIME | 4200003 | 49 | 049 | 4356 |
| TRIXIE | 4200147 | 49 | 049 | 29040 |
| ONTARIO MINE | 4200150 | 49 | 043 | 29040 |
| LOST SHEEP MINE | 4200158 | 49 | 023 | 0 |
| DEER TRAIL MINE | 4200260 | 49 | 031 | 2904 |
| HAPPY JACK MINE | 4200273 | 49 | 037 | 108900 |
| REDMOND CLAY & SALT MINE & MIL | 4200297 | 49 | 041 | 2904 |
| PANDORA | 4200470 | 49 | 037 | 108900 |
| RIM | 4200472 | 49 | 037 | 108900 |
| WILSON SILVERBELL MINE | 4200473 | 49 | 037 | 108900 |
| MI AMORCITA MINE | 4200481 | 49 | 037 | 2904 |
| SNOW SHAFT | 4200503 | 49 | 015 | 108900 |
| WOOD MINE | 4200507 | 49 | 037 | 2904 |
| FARMERS KNOB | 4200577 | 49 | 017 | 2904 |
| THORNBURG MEMORIAL | 4200624 | 49 | 019 | 108900 |
| SHINARUMP | 4200626 | 49 | 019 | 29040 |
| FIREFLY MINE | 4200647 | 49 | 037 | 14520 |
| VANADIUM QUEEN MINE | 4200648 | 49 | 037 | 29040 |
| LISBON MINE | 4200677 | 49 | 037 | 54450 |
| CROWN POINT MINE | 4200761 | 49 | 049 | 0 |
| LASAL MINE | 4200769 | 49 | 037 | 87120 |
| MARKEY | 4200784 | 49 | 037 | 14520 |
| BONANZA HILL | 4200854 | 49 | 047 | 14520 |
| B-38 SHAFT | 4200862 | 49 | 047 | 14520 |
| LITTLE BONANZA HILL | 4200876 | 49 | 047 | 14520 |
| SNOWBALL MINE | 4201068 | 49 | 037 | 108900 |
| HARRISON NO. 1 | 4201146 | 49 | 047 | 14520 |
| LUCKY STRIKE MINE | 4201150 | 49 | 017 | 29040 |
| CARR FORK OPERATIONS | 4201153 | 49 | 045 | 54450 |
| RELIEF MINE | 4201159 | 49 | 049 | 0 |
| CALLIHAM MINE | 4201164 | 49 | 037 | 2904 |
| SAGE | 4201194 | 49 | 037 | 2904 |
| MINERALS WEST INC | 4201196 | 49 | 037 | 2904 |
| BONANZA NO. 8-A | 4201200 | 49 | 047 | 14520 |
| SAHARA MINE | 4201249 | 49 | 015 | 2904 |
| SPRING LAKE TUNNEL | 4201264 | 49 | 049 | 0 |
| JOHN MINE | 4201341 | 49 | 019 | 2904 |
| PATTI ANN MINE | 4201348 | 49 | 037 | 0 |
| MAMMOTH MINE | 4201349 | 49 | 023 | 0 |
| POLAR MESA | 4201376 | 49 | 019 | 14520 |
| NORTH ORE SHOOT EXTENSION PROJ | 4201392 | 49 | 035 | 0 |
| STRAWBERRY MINE | 4201404 | 49 | 037 | 2904 |
| PROBE MINE | 4201422 | 49 | 015 | 54450 |
| SOUTH HECLA MINE | 4201424 | 49 | 035 | 1452 |
| VIPONT MINE | 4201430 | 49 | 003 | 2904 |
| BI-CENTENNIAL | 4201438 | 49 | 019 | 58080 |
| DUNN MINE | 4201443 | 49 | 037 | 2904 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|------------------------------|---------|-------|--------|----------------|
| INDEPENDENT #4 SHAFT | 4201446 | 49 | 041 | 14520 |
| BLUE CAP MINE | 4201453 | 49 | 037 | 0 |
| PINE RIDGE NO. 2 | 4201468 | 49 | 037 | 0 |
| BLACK GNAT MINE | 4201500 | 49 | 047 | 14520 |
| VELVET MINE | 4201527 | 49 | 037 | 108900 |
| LITTLE EVA MINE | 4201533 | 49 | 019 | 2904 |
| FRISCO MINE | 4201540 | 49 | 037 | 2904 |
| B-I GONAWAY MINE | 4201547 | 49 | 037 | 1452 |
| HECLA SHAFT | 4201568 | 49 | 037 | 29040 |
| STRAIGHT CREEK MINE | 4201608 | 49 | 017 | 1452 |
| ESCALANTE SILVER MINE | 4201613 | 49 | 021 | 29040 |
| THE CUB MINE | 4201623 | 49 | 037 | 2904 |
| GRAY DAWN MINE | 4201635 | 49 | 037 | 1815 |
| SINBAD | 4201676 | 49 | 015 | 2904 |
| SKINNY MINE | 4201679 | 49 | 019 | 2904 |
| LASAL NUMBER 2 MINE | 4201689 | 49 | 019 | 363 |
| ORO DEL REY | 4201690 | 49 | 023 | 2904 |
| JOKER | 4201699 | 49 | 037 | 2904 |
| BUFFALO MINE | 4201705 | 49 | 045 | 2904 |
| LITTLE JOE MINE | 4201708 | 49 | 057 | 0 |
| CHIEF NO. 2 | 4201709 | 49 | 023 | 2904 |
| LITTLE EMMA # 7 | 4201712 | 49 | 047 | 14520 |
| BONANZA #12 | 4201716 | 49 | 049 | 14520 |
| BURGIN MINE APEX NO. 2 SHAFT | 4201719 | 49 | 049 | 0 |
| S AND S MINING COMPANY | 4201722 | 49 | 035 | 363 |
| OPHIR MINE | 4201732 | 49 | 021 | 0 |
| REDROCK MINE | 4201741 | 49 | 037 | 29040 |
| IRON BLOSSOM MINE | 4201742 | 49 | 049 | 1452 |
| INDEPENDENT NO. 5 SHAFT | 4201743 | 49 | 047 | 14520 |
| WILD HORSE MINE | 4201744 | 49 | 047 | 11616 |
| LEONORA NO. 1 | 4201766 | 49 | 001 | 0 |
| COTTONWOOD NO. 1 | 4201770 | 49 | 047 | 11616 |
| SAMSON NO. 2 | 4201772 | 49 | 047 | 10164 |
| HARRISON NO. 10 | 4201773 | 49 | 047 | 11616 |
| B-42 SHAFT | 4201774 | 49 | 047 | 8712 |
| WAGONHOUND MINE | 4201775 | 49 | 047 | 8712 |
| LITTLE EMMA #5 | 4201776 | 49 | 047 | 8712 |
| | 4202500 | 49 | 001 | |
| | 4202501 | 49 | 001 | |
| | 4202502 | 49 | 001 | |
| | 4202503 | 49 | 009 | |
| | 4202504 | 49 | 035 | |
| | 4202505 | 49 | 035 | |
| | 4202506 | 49 | 035 | |
| | 4202507 | 49 | 045 | |
| | 4202508 | 49 | 045 | |
| | 4202509 | 49 | 045 | |
| | 4202510 | 49 | 047 | |
| | 4202511 | 49 | 049 | |
| IMPERIAL MINE QUARRY | 4300042 | 50 | 021 | 145200 |
| ENGELHARD MIN & CHEM | 4300078 | 50 | 015 | 54450 |
| WINDHAM MINE | 4300079 | 50 | 025 | 18150 |
| HAMMONDSVILLE MINE | 4300080 | 50 | 027 | 54450 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------------------|---------|-------|--------|----------------|
| LUDLOW MINES - UNDERGROUND | 4300181 | 50 | 027 | 14520 |
| KIMBALLTON MINE | 4400040 | 51 | 071 | 29040 |
| KIMBALLTON MINE AND MILL | 4400082 | 51 | 071 | 29040 |
| COVE MINE | 4401926 | 51 | 173 | 14520 |
| | 4402100 | 51 | 005 | |
| | 4402101 | 51 | 173 | |
| | 4402102 | 51 | 197 | |
| | 4402103 | 51 | 009 | |
| | 4402103 | 51 | 169 | |
| | 4402500 | 51 | 009 | |
| | 4402501 | 51 | 109 | |
| REPUBLIC UNIT | 4500365 | 53 | 019 | 72600 |
| PEND OREILLE MINE AND MILL | 4500366 | 53 | 051 | 54450 |
| WASH ZINC UNIT | 4502040 | 53 | 065 | 2904 |
| MOUNT TOLMAN PROJECT | 4502169 | 53 | 019 | C |
| GOLDEN VALLEY | 4502358 | 53 | 019 | 2904 |
| TWISP VIEW MINE -1 | 4502655 | 53 | 047 | 2904 |
| DAMON MINE | 4502843 | 53 | 033 | 2904 |
| M D O I -1 MINE & MILL | 4502867 | 53 | 007 | 2904 |
| DEER TRAIL | 4502914 | 53 | 065 | 34848 |
| BARITE QUEENE | 4502926 | 53 | 065 | 2904 |
| ORAZADA MINE | 4502931 | 53 | 065 | 2904 |
| BBB REEF MINE | 4502961 | 53 | 007 | 2904 |
| LUCKY BREAK MINE | 4502963 | 53 | 059 | 2904 |
| | 4503000 | 53 | 037 | |
| | 4503001 | 53 | 061 | |
| | 4503002 | 53 | 065 | |
| AGGRE MN & PLT | 4600009 | 54 | 083 | 36300 |
| GREER MINE AND MILL | 4600016 | 54 | 061 | 217800 |
| DECKERS CREEK MINE AND MILL | 4600029 | 54 | 061 | 72600 |
| GLOBE MINE - 1 | 4600148 | 54 | 029 | 87120 |
| MINE NO 1 & PLANT | 4601563 | 54 | 077 | 108900 |
| NO. 6 MINE AND GRINDING PLANT | 4603363 | 54 | 025 | 7260 |
| | 4605000 | 54 | 033 | |
| BAY CITY SILICA | 4701146 | 55 | 093 | 2904 |
| | 4702000 | 55 | 000 | |
| SUNRISE MINE & MILL | 4800144 | 56 | 031 | 27225 |
| INORGANIC CHEM DIV WESTVACO | 4800152 | 56 | 037 | 39204 |
| BIG ISLAND MN & REF | 4800154 | 56 | 037 | 39204 |
| ALCHEM MINE | 4800155 | 56 | 037 | 39204 |
| WYOMING SODA ASH OPERATIONS | 4800639 | 56 | 037 | 39204 |
| BILL SMITH | 4800837 | 56 | 009 | 1452 |
| LUCKY MC MINE UNDERGROUND | 4800855 | 56 | 013 | 2904 |
| BUFFALO SHAFT | 4800946 | 56 | 009 | 0 |
| SHEEP MOUNTAIN OPERATIONS | 4800969 | 56 | 013 | 36300 |
| GOLDEN EAGLE MINE | 4801051 | 56 | 009 | 36300 |
| NORTH TISDALE GRAVITY DRAINAGE | 4801147 | 56 | 019 | 0 |
| FEDERAL-AMERICAN PARTNERS UNDE | 4801179 | 56 | 013 | 27225 |
| TENNECO SODA ASH PROJECT | 4801295 | 56 | 037 | 39204 |
| MINERAL HILL MINE AND MILL | 4801322 | 56 | 011 | 0 |
| BIG EAGLE UNDERGROUND MINE | 4801330 | 56 | 013 | 25410 |
| LISBON MINE | 4801356 | 56 | 003 | 1452 |
| SHIRLEY BASIN UNDERGROUND NO. | 4801368 | 56 | 007 | 1452 |

| MINE NAME | MINE-ID | STATE | COUNTY | SHELTER SPACES |
|--------------------|---------|-------|--------|----------------|
| | 4802000 | 56 | 023 | |
| MIKADO MINE & MILL | 5000362 | 02 | 185 | 1452 |
| RYAN LODE | 5000365 | 02 | 090 | 0 |
| | 5000421 | 02 | 201 | 2178 |
| | 5001230 | 02 | 999 | 3630 |
| FERN MINE | 5001306 | 02 | 090 | 1452 |
| INDEPENDENCE MINE | 5001309 | 02 | 170 | |
| GOLD STANDARD MINE | 5001311 | 02 | 999 | 2904 |
| GRANT MINE & MILL | 5001314 | 02 | 185 | 2904 |
| CLEARY ADIT | 5001396 | 02 | 090 | 1452 |
| SUMMIT MINE | 5001401 | 02 | 185 | 2904 |
| LITTLE SQUAW MINE | 5001402 | 02 | 185 | 1452 |
| ALASKA APOLLO MINE | 5001421 | 02 | 010 | 1452 |
| | 5001423 | 02 | 999 | 1452 |
| | 5001425 | 02 | 999 | 1452 |
| | 5002000 | 02 | 185 | |
| | 5002002 | 02 | 090 | |
| | 5002003 | 02 | 170 | |
| | 5002004 | 02 | 122 | |
| | 5002005 | 02 | 231 | |
| | 5002006 | 02 | 231 | |
| | 5002007 | 02 | 231 | |
| | 5002008 | 02 | 110 | |
| | 5002009 | 02 | 231 | |
| | 5002010 | 02 | 110 | |
| | 5002011 | 02 | 220 | |
| | 5002012 | 02 | 280 | |
| | 5002013 | 02 | 130 | |
| | 5002014 | 02 | 201 | |
| | 5002015 | 02 | 130 | |
| | 5002016 | 02 | 130 | |
| | 5002017 | 02 | 050 | |

APPENDIX B:
Mine Sheltering Capability Report

MINE SHELTERING CAPABILITY REPORT

| STATE | COUNTY | DRIFT MINE SPACES | OTHER MINE SPACES | POST-RELOCATION POPULATION | PERCENTAGE SHELTERED IN DRIFT MINE SPACES | PERCENTAGE SHELTERED IN OTHER MINE SPACES |
|------------|----------------|-------------------------|-------------------------|-------------------------------|--|--|
| ALABAMA | FRANKLIN | 29040 | 0 | 53363 | 54.4 | 0 |
| ARIZONA | COCHISE | 79860 | 72600 | 296847 | 26.9 | 24.5 |
| ARIZONA | GILA | 21780 | 116160 | 167768 | 13.0 | 69.2 |
| ARIZONA | GRAHAM | 0 | 72600 | 95837 | 0 | 84.6 |
| ARIZONA | GREENLEE | 7260 | 7260 | 53091 | 13.7 | 13.7 |
| ARIZONA | MOHAVE | 72600 | 0 | 223643 | 32.5 | 0 |
| ARIZONA | PIMA | 25410 | 7260 | 67576 | 37.6 | 10.7 |
| ARIZONA | PINAL | 87120 | 163350 | 288743 | 30.2 | 56.6 |
| ARIZONA | SANTA CRUZ | 0 | 7260 | 96545 | 0 | 7.5 |
| ARIZONA | YAVAPAI | 21780 | 7260 | 210341 | 10.4 | 3.5 |
| ARIZONA | YUMA | 14520 | 0 | 81261 | 17.9 | 0 |
| ARKANSAS | IZARD | 515460 | 0 | 18812 | 0 | 0 |
| CALIFORNIA | ALAMEDA | 7260 | 0 | 681509 | 1.1 | 0 |
| CALIFORNIA | BUTTE | 6712 | 2904 | 332734 | 2.6 | 9 |
| CALIFORNIA | CALAVERAS | 11616 | 29040 | 35724 | 32.5 | 81.3 |
| CALIFORNIA | EL DORADO | 15972 | 0 | 188417 | 6.5 | 0 |
| CALIFORNIA | INYO | 31944 | 234135 | 91423 | 34.9 | 256.1 |
| CALIFORNIA | KERN | 11616 | 2904 | 676404 | 1.7 | 4 |
| CALIFORNIA | LOS ANGELES | 2904 | 0 | 314782 | 0.9 | 0 |
| CALIFORNIA | MADERA | 0 | 2904 | 188462 | 0 | 1.5 |
| CALIFORNIA | MARIPOSA | 2904 | 0 | 41853 | 6.9 | 0 |
| CALIFORNIA | MONO | 5808 | 0 | 63576 | 9.1 | 0 |
| CALIFORNIA | NEVADA | 5808 | 0 | 105257 | 5.5 | 0 |
| CALIFORNIA | PLACER | 2904 | 0 | 160761 | 1.8 | 0 |
| CALIFORNIA | PLUMAS | 8712 | 0 | 0 | 0 | 0 |
| CALIFORNIA | RIVERSIDE | 27588 | 0 | 1846644 | 1.5 | 0 |
| CALIFORNIA | SAN BERNARDINO | 23595 | 0 | 839813 | 2.8 | 0 |
| CALIFORNIA | SAN DIEGO | 17424 | 0 | 2130178 | 0.8 | 0 |
| CALIFORNIA | SHASTA | 2904 | 0 | 330513 | 0.9 | 0 |
| CALIFORNIA | SIERRA | 40656 | 21780 | 9370 | 433.9 | 232.4 |
| CALIFORNIA | TRINITY | 5808 | 0 | 0 | 0 | 0 |
| CALIFORNIA | TUOLUMNE | 2904 | 0 | 111169 | 2.6 | 0 |
| CALIFORNIA | VENTURA | 2904 | 0 | 890364 | 0.3 | 0 |
| COLORADO | ARAPAHOE | 0 | 1815 | 8463 | 0 | 21.4 |
| COLORADO | BOULDER | 6171 | 10890 | 175664 | 3.5 | 6.2 |
| COLORADO | CHAFFEE | 1452 | 0 | 40116 | 3.6 | 0 |
| COLORADO | CLEAR CREEK | 21054 | 69696 | 20889 | 100.8 | 333.6 |
| COLORADO | CONEJOS | 2904 | 0 | 26739 | 10.9 | 0 |
| COLORADO | CUSTER | 1452 | 0 | 3944 | 36.8 | 0 |
| COLORADO | DOLORES | 11324 | 0 | 6361 | 178.0 | 0 |
| COLORADO | EAGLE | 3775 | 163350 | 54737 | 6.9 | 298.4 |
| COLORADO | GARFIELD | 38478 | 0 | 84995 | 45.3 | 0 |
| COLORADO | GILPIN | 5445 | 5626 | 9536 | 57.1 | 59.0 |
| COLORADO | GRAND | 1452 | 0 | 38181 | 3.8 | 0 |
| COLORADO | GUNNISON | 9182 | 0 | 40658 | 22.6 | 0 |
| COLORADO | HINSDALE | 9438 | 0 | 0 | 0 | 0 |
| COLORADO | JEFFERSON | 1356 | 29040 | 151357 | 2.9 | 19.2 |
| COLORADO | LAKE | 56265 | 58606 | 33424 | 168.3 | 175.9 |
| COLORADO | LA PLATA | 8712 | 0 | 85184 | 10.2 | 0 |
| COLORADO | MESA | 43560 | 2904 | 245510 | 17.7 | 1.2 |
| COLORADO | MINERAL | 94017 | 0 | 1994 | 0 | 0 |
| COLORADO | MOFFAT | 2904 | 0 | 42478 | 6.8 | 0 |
| COLORADO | MONTZUMA | 2904 | 0 | 61693 | 4.7 | 0 |
| COLORADO | MONTEZUMA | 123419 | 2904 | 77948 | 158.3 | 3.7 |
| COLORADO | OURAY | 53251 | 0 | 7096 | 750.4 | 0 |
| COLORADO | PARK | 14157 | 3630 | 25467 | 55.6 | 14.3 |
| COLORADO | PUEBLO | 2904 | 0 | 24222 | 12.5 | 0 |

MINE SHELTERING CAPABILITY REPORT

| STATE | COUNTY | DRIFT MINE SPACES | OTHER MINE SPACES | POST-RELOCATION POPULATION | PERCENTAGE SHELTERED IN DRIFT MINE SPACES | PERCENTAGE SHELTERED IN OTHER MINE SPACES |
|----------|-------------|-------------------------|-------------------------|-------------------------------|--|--|
| COLORADO | RIO BLANCO | 5808 | 5952 | 22937 | 25.3 | 25.9 |
| COLORADO | RIO GRANDE | 1452 | 1452 | 34064 | 4.3 | 4.3 |
| COLORADO | SAGUACHE | 1452 | 0 | 8164 | 17.8 | .0 |
| COLORADO | SAN JUAN | 64468 | 0 | 3015 | ##### | .0 |
| COLORADO | SAN MIGUEL | 50457 | 34485 | 8219 | 613.9 | 419.6 |
| COLORADO | SUMMIT | 1452 | 5082 | 46901 | 3.1 | 10.8 |
| COLORADO | TELLER | 17424 | 39204 | 34457 | 50.6 | 113.8 |
| GEORGIA | GILMER | 41019 | 0 | 57535 | 71.3 | .0 |
| GEORGIA | MURRAY | 1270 | 0 | 67555 | 1.9 | .0 |
| GEORGIA | PICKENS | 101640 | 0 | 59362 | 171.2 | .0 |
| IDAHO | BONNER | 45012 | 0 | 51874 | 86.8 | .0 |
| IDAHO | CANAS | 5808 | 0 | ##### | ##### | ##### |
| IDAHO | CUSTER | 10164 | 0 | ##### | ##### | ##### |
| IDAHO | IDAHO | 46464 | 5808 | ##### | ##### | ##### |
| IDAHO | KOOTENAI | 8712 | 0 | ##### | ##### | ##### |
| IDAHO | LEMHI | 18876 | 0 | ##### | ##### | ##### |
| IDAHO | OHYHEE | 2904 | 0 | ##### | ##### | ##### |
| IDAHO | SHOSHONE | 23232 | 0 | 34333 | 67.7 | ##### |
| ILLINOIS | ADAMS | 246840 | 1148895 | ##### | ##### | ##### |
| ILLINOIS | ALEXANDER | 9292 | 0 | 108440 | 6.7 | .0 |
| ILLINOIS | COOK | 7260 | 0 | 168187 | 8.6 | .0 |
| ILLINOIS | DU PAGE | 14520 | 0 | ##### | ##### | ##### |
| ILLINOIS | HARDIN | 0 | 180774 | 21270 | ##### | .0 |
| ILLINOIS | MADISON | 290400 | 0 | 6017 | ##### | .0 |
| ILLINOIS | MONROE | 726000 | 0 | ##### | ##### | ##### |
| ILLINOIS | POPE | 0 | 9075 | ##### | ##### | ##### |
| ILLINOIS | RANDOLPH | 132495 | 0 | 64380 | 205.8 | .0 |
| INDIANA | CRAWFORD | 239580 | 0 | 18946 | ##### | .0 |
| INDIANA | MADISON | 39930 | 0 | 75115 | 53.2 | .0 |
| INDIANA | MARION | 2904 | 0 | ##### | ##### | ##### |
| INDIANA | MARTIN | 290400 | 290400 | 11180 | ##### | ##### |
| INDIANA | MONROE | 2904 | 0 | 242368 | 1.2 | .0 |
| INDIANA | PERRY | 18513 | 0 | 37210 | 49.8 | .0 |
| IOWA | BLACK HAWK | 296208 | 0 | ##### | ##### | ##### |
| IOWA | CLAYTON | 58080 | 0 | 36982 | 157.0 | .0 |
| IOWA | DES MOINES | 0 | 272250 | 8799 | .0 | ##### |
| IOWA | HAMILTON | 32670 | 0 | 31038 | 105.3 | .0 |
| IOWA | JONES | 36300 | 0 | 32756 | 110.8 | .0 |
| IOWA | LOUISA | 39930 | 0 | 18824 | 212.1 | .0 |
| IOWA | MARION | 29040 | 0 | 49703 | 58.4 | .0 |
| IOWA | MARSHALL | 2904 | 0 | 74057 | 3.9 | .0 |
| IOWA | POMERIEUX | 0 | 72600 | 35731 | .0 | 203.2 |
| IOWA | SCOTT | 196020 | 0 | 5098 | ##### | .0 |
| IOWA | STORY | 21780 | 0 | 124410 | 17.5 | .0 |
| IOWA | VAN BUREN | 217800 | 0 | ##### | ##### | ##### |
| IOWA | WASHINGTON | 39930 | 0 | 26591 | 150.2 | .0 |
| IOWA | WEBSTER | 29040 | 0 | 79885 | 36.4 | .0 |
| KANSAS | ATCHISON | 159720 | 0 | 51294 | 311.4 | .0 |
| KANSAS | BARBER | 145200 | 0 | 23687 | 613.0 | .0 |
| KANSAS | ELL SWORTH | 0 | 217800 | 12879 | .0 | ##### |
| KANSAS | JOHNSON | 419265 | 0 | ##### | ##### | ##### |
| KANSAS | LEAVENWORTH | 21780 | 0 | 5772 | 377.3 | .0 |
| KANSAS | MARSHALL | 0 | 246840 | 39743 | .0 | 621.1 |
| KANSAS | RENO | 0 | 166980 | 59797 | .0 | 279.2 |
| KANSAS | RICE | 0 | 192390 | 43837 | .0 | 438.9 |
| KANSAS | HYANDOTTE | 116160 | 0 | ##### | ##### | ##### |
| KENTUCKY | ANDERSON | 5082 | 0 | 36288 | 14.0 | .0 |

MINE SHELTERING CAPABILITY REPORT

| STATE | COUNTY | DRIFT MINE SPACES | OTHER MINE SPACES | POST-RELOCATION POPULATION | PERCENTAGE SHELTERED IN DRIFT MINE SPACES | PERCENTAGE SHELTERED IN OTHER MINE SPACES |
|-----------|-----------------|-------------------------|-------------------------|-------------------------------|--|--|
| KENTUCKY | FAYETTE | 6170 | 0 | | **** | **** |
| KENTUCKY | FRANKLIN | 3085 | 0 | 89637 | 3.4 | .0 |
| KENTUCKY | GARRARD | 1452 | 0 | 20899 | 6.9 | .0 |
| KENTUCKY | JEFFERSON | 363 | 0 | | **** | **** |
| KENTUCKY | JESSAMINE | 4719 | 0 | 50278 | 9.4 | .0 |
| KENTUCKY | LEE | 2359 | 0 | | **** | **** |
| KENTUCKY | MASON | 0 | 42560 | 26393 | .0 | 119.7 |
| KENTUCKY | OLDHAM | 3993 | 0 | | **** | **** |
| KENTUCKY | PENDLETON | 0 | 14549040 | 23985 | .0 | **** |
| KENTUCKY | WOLFE | 1996 | 0 | | **** | **** |
| LOUISIANA | IBERIA | 0 | 124146 | 60185 | .0 | **** |
| LOUISIANA | ST MARY | 0 | 108900 | 161177 | .0 | 206.3 |
| LOUISIANA | PISCATAQUIS | 0 | 726 | 20080 | .0 | 67.6 |
| MAINE | BALTIMORE | 14520 | 0 | 21855 | 66.4 | 3.6 |
| MARYLAND | GARRETT | 21780 | 0 | 116942 | 18.6 | .0 |
| MICHIGAN | GOGEBIC | 0 | 2904 | | **** | **** |
| MICHIGAN | KENT | 0 | 7260 | 68728 | .0 | 10.6 |
| MICHIGAN | MARQUETTE | 0 | 1452 | 49658 | .0 | 2.9 |
| MICHIGAN | ONTONAGON | 36200 | 0 | | **** | **** |
| MICHIGAN | HAYNE | 0 | 36300 | | **** | **** |
| MISSOURI | BENTON | 50820 | 0 | | **** | **** |
| MISSOURI | BOONE | 1452 | 0 | | **** | **** |
| MISSOURI | CAMDEN | 50820 | 0 | | **** | **** |
| MISSOURI | CLAY | 726000 | 0 | | **** | **** |
| MISSOURI | GREENE | 130680 | 0 | | **** | **** |
| MISSOURI | IRON | 0 | 508200 | 36634 | .0 | **** |
| MISSOURI | JACKSON | 646140 | 0 | | **** | **** |
| MISSOURI | JASPER | 76956 | 0 | 308539 | 24.9 | .0 |
| MISSOURI | JEFFERSON | 447216 | 0 | | **** | **** |
| MISSOURI | KNOX | 13068 | 0 | 16049 | 81.4 | .0 |
| MISSOURI | MADISON | 0 | 72600 | 30828 | .0 | 235.5 |
| MISSOURI | NEMTON | 26300 | 0 | 137454 | 26.4 | .0 |
| MISSOURI | RALLS | 21780 | 0 | 30916 | 70.4 | .0 |
| MISSOURI | REYNOLDS | 0 | 508200 | 21649 | .0 | **** |
| MISSOURI | STE GENEVIEVE | 743424 | 0 | 41611 | **** | .0 |
| MISSOURI | ST LOUIS | 50820 | 0 | 325 | **** | .0 |
| MISSOURI | TANEY | 8712 | 0 | 79633 | 10.9 | .0 |
| MISSOURI | WASHINGTON | 0 | 145200 | 41478 | .0 | 350.1 |
| MONTANA | BEAVERHEAD | 10527 | 0 | 21066 | 50.0 | .0 |
| MONTANA | BROADWATER | 5808 | 0 | | **** | **** |
| MONTANA | CASCADE | 0 | 4356 | | **** | **** |
| MONTANA | FERGUS | 72600 | 1452 | | **** | **** |
| MONTANA | GRANITE | 44286 | 2904 | 5341 | 829.2 | 54.4 |
| MONTANA | JEFFERSON | 1452 | 0 | 21225 | 6.8 | .0 |
| MONTANA | LEWIS AND CLARK | 7260 | 0 | 73104 | 9.9 | .0 |
| MONTANA | LINCOLN | 77682 | 0 | | **** | **** |
| MONTANA | MADISON | 29766 | 0 | 11812 | 252.0 | .0 |
| MONTANA | MISSOULA | 2904 | 0 | 105436 | 2.8 | .0 |
| MONTANA | POWELL | 73326 | 0 | 16458 | 445.5 | .0 |
| MONTANA | SANDERS | 20328 | 0 | | **** | **** |
| MONTANA | SILVER BOH | 2904 | 0 | 60 | **** | .0 |
| MONTANA | STILLWATER | 2904 | 0 | 12267 | 23.7 | .0 |
| NEBRASKA | CASS | 776820 | 0 | 50046 | **** | .0 |
| NEVADA | CLARK | 1452 | 0 | 218046 | .7 | .0 |
| NEVADA | DOUGLAS | 2904 | 0 | 60379 | 4.8 | .0 |
| NEVADA | ELKO | 8712 | 0 | | **** | **** |
| NEVADA | ESMERALDA | 4356 | 0 | | **** | **** |

NINE SHELTERING CAPABILITY REPORT

| STATE | COUNTY | DRIFT MINE SPACES | OTHER MINE SPACES | POST-RELOCATION POPULATION | PERCENTAGE SHELTERED IN DRIFT MINE SPACES | PERCENTAGE SHELTERED IN OTHER MINE SPACES |
|--------------|----------------|-------------------------|-------------------------|-------------------------------|--|--|
| NEVADA | EUREKA | 2904 | 0 | 2296 | 127.0 | .0 |
| NEVADA | HUMBOLDT | 1452 | 0 | 31036 | 4.7 | .0 |
| NEVADA | LANDER | 10164 | 0 | 4659 | 218.2 | .0 |
| NEVADA | LINCOLN | 2904 | 58090 | 52963 | 5.3 | 109.7 |
| NEVADA | LYON | 2904 | 0 | 16516 | 17.6 | .0 |
| NEVADA | MINERAL | 17424 | 0 | 5727 | 304.2 | .0 |
| NEVADA | MYE | 8712 | 4256 | 143048 | 6.1 | 3.0 |
| NEVADA | PERSHING | 4356 | 0 | 17150 | 25.4 | .0 |
| NEVADA | STOREY | 4356 | 0 | 5655 | 76.9 | .0 |
| NEVADA | WHITE PINE | 5808 | 0 | | #### | #### |
| NEW JERSEY | SUSSEX | 0 | 49005 | 722099 | .0 | 6.8 |
| NEW MEXICO | EDDY | 0 | 588060 | 103887 | .0 | 566.1 |
| NEW MEXICO | GRANT | 16153 | 57717 | 65259 | 24.8 | 88.4 |
| NEW MEXICO | LEA | 0 | 90750 | 127923 | .0 | 70.9 |
| NEW MEXICO | LINCOLN | 6534 | 0 | 23752 | 27.5 | .0 |
| NEW MEXICO | MCKINLEY | 0 | 13068 | 60551 | .0 | 21.6 |
| NEW MEXICO | SANTEE FE | 16698 | 0 | 141264 | 11.8 | .0 |
| NEW MEXICO | SIERRA | 96556 | 13068 | | #### | #### |
| NEW MEXICO | TAOS | 42560 | 0 | 50809 | 85.7 | .0 |
| NEW MEXICO | VALENCIA | 72600 | 78408 | 136060 | 46.5 | 50.2 |
| NEW MEXICO | UNKNOWN COUNTY | 0 | 3630 | | #### | #### |
| NEW YORK | ESSEX | 72600 | 0 | 126674 | 57.3 | .0 |
| NEW YORK | GENESEE | 0 | 108900 | 310518 | .0 | 35.1 |
| NEW YORK | LEWIS | 29040 | 0 | 117927 | 24.6 | .0 |
| NEW YORK | LIVINGSTON | 0 | 4900500 | 194148 | .0 | #### |
| NEW YORK | ST LAWRENCE | 348480 | 0 | 520423 | 67.0 | .0 |
| NEW YORK | TOMPKINS | 0 | 726000 | 504369 | .0 | 143.9 |
| OHIO | CUYAHOGA | 0 | 1306800 | | #### | #### |
| OHIO | LAKE | 0 | 1452000 | | #### | #### |
| OHIO | LAWRENCE | 1452000 | 0 | 15485 | #### | .0 |
| OHIO | MORGAN | 0 | 1452 | 46460 | .0 | 3.1 |
| OHIO | MUSKINGUM | 1452000 | 0 | 478666 | 203.3 | .0 |
| OHIO | SUMMIT | 1452000 | 0 | | #### | #### |
| OHIO | TUSCARAWAS | 1452 | 0 | 371788 | .4 | .0 |
| OKLAHOMA | SEGUOYAH | 108900 | 0 | | #### | #### |
| OREGON | BAKER | 24321 | 0 | 37486 | 64.9 | .0 |
| OREGON | CLACKAMAS | 1452 | 0 | | #### | #### |
| OREGON | GRANT | 3630 | 0 | | #### | #### |
| OREGON | HARNEY | 1452 | 0 | | #### | #### |
| OREGON | JOSEPHINE | 3630 | 0 | | #### | .0 |
| OREGON | LANE | 1452 | 0 | 127122 | 2.9 | .0 |
| PENNSYLVANIA | ARMSTRONG | 127050 | 0 | 93718 | 1.5 | .0 |
| PENNSYLVANIA | BUTLER | 7260 | 0 | 70425 | 180.4 | .0 |
| PENNSYLVANIA | CENTRE | 373890 | 0 | 248249 | 2.9 | .0 |
| PENNSYLVANIA | FAVETTE | 30492 | 36300 | 534332 | 70.0 | 6.8 |
| PENNSYLVANIA | JEFFERSON | 27225 | 0 | 631436 | 4.8 | .0 |
| PENNSYLVANIA | LEHIGH | 145200 | 0 | | #### | #### |
| PENNSYLVANIA | SOMERSET | 72600 | 0 | 249349 | 58.2 | .0 |
| PENNSYLVANIA | WESTMORELAND | 72600 | 0 | 80002 | 18.1 | .0 |
| PENNSYLVANIA | YORK | 72600 | 0 | 529957 | 13.7 | .0 |

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RESEARCH TRIANGLE INSTITUTE, Research Triangle Park, North Carolina

Work Unit 1611C

FEMA Contract No. ERM-C-0707

National Underground Mines Inventory

WRIGHT, N. D., W. CHESLIN, K. MANNES, S. YORK, III

October 1983 (Unclassified) 84 pages

The purpose of this study was to identify and, to the extent that data are available, to characterize the underground, non-coal mines in the United States and to assemble the data obtained into a national inventory of underground mines having the potential of providing lodging and shelter as a civil defense measure during a natural or man-made disaster. Data were collected from the Mine Safety and Health Administration, the U.S. Bureau of Mines, from discussions with mine inspectors, and from mine owners and operators during visits to six underground mines. The data collected were incorporated into a computerized underground mine data file at the FEMA/Olinet Computer Center.

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Work Unit 1611C

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