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NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING

GEMSTONES REPORT

APRIL 27, 1988

COMMENTS SHOULD BE DIRECTED TO

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INTRODUCTION

This is one of a series of reports on the National Occupational Health Survey of Mining (NOHSM), which is being carried out by the National Institute for Occupational Safety and Health (NIOSH). This particular report provides NOHSM data for the Gemstones commodity, which was surveyed during June and July, 1984. Two Gemstones mines were surveyed. The NOHSM began in May, 1984, as an effort by NIOSH to obtain representative data related to occupational health from the mining industry. The data collected were similar to the information previously obtained in non-mining studies. Specifically, NOHSM data include:

- a. Occupational health program and policy information;
- b. An inventory of all health-related substances found on mine property; and
- c. A series of worksite observations which detail potential exposure to chemical and physical agents.

These data are being collected by surveyors who travel to each mine site. The survey sites have been chosen so as to provide a statistically valid representation of each commodity at the time of the NOHSM sample selection. With this representative sample, NIOSH can project survey data to the entire mining industry.

The NOHSM is being carried out primarily as a service to the Mine Safety and Health Administration (MSHA), and secondarily as a source of information for NIOSH investigators and other interested parties. MSHA plans to use the data for three purposes:

1. To set regulatory priorities and write improved health standards;
2. To improve compliance with existing standards; and
3. To identify and determine research needs and priorities.

This transfer of information to MSHA is mandated by Section 201 of the 1977 Federal Mine Safety and Health Amendments Act.

This report identifies potential exposures and provides the associated numbers of workers, the occupations of those workers, and the locations on the mine property where the potential exposures were observed. This information is categorized into seven tables: four concerning chemical agents; one concerning musculoskeletal overload conditions; one physical exposure conditions; and one welding processes. Estimated annual usage information is provided for chemical substances, both generic and tradenames.

For the Gemstones commodity, Table 1 contains nine chemicals which were found on mine property and are regulated by MSHA. During the two surveys, no chemicals were encountered which would be displayed in Table 2 (chemicals found on mine property that have a NIOSH recommended exposure limit but are not regulated by MSHA). Three chemicals were found which have no NIOSH or MSHA exposure limit (Table 3). Table 4 lists 99 tradename products to which workers in the Gemstones commodity were found to be potentially exposed. Table 5 describes potential exposures to noise, process related temperature and whole-body vibration, the only physical agents observed by the surveyor. Table 6 lists potential exposures to the following seven musculoskeletal conditions: sitting; standing; prone or supine lying; heavy lifting; finger and hands; neck and/or back; and the forearm, arm, and shoulder. Table 7 indicates the three welding processes: arc welding; shield metal arc welding; and oxyfuel gas cutting, which were observed to be used in the Gemstones commodity.

It is extremely important that the limitations of the reported data be recognized. The data do not in any way document exposures or exposure levels. The data only indicate potential exposures. The term "potential exposure" means the agent was observed to be present at one or more worksites in such a way that there was a possibility of workers being exposed to the agent.

Likewise, the usage data presented in some of the tables are only a guide to the projected magnitude of usage and should not be taken as precise information. The usage data are based on estimates provided by mine management. It is expected that these estimates have widely varying accuracy. Occasionally, an item may be represented as having an annual usage of zero with workers observed to be potentially exposed. This may occur because annual usage estimates are generally based on purchases of the 12 months immediately preceding a survey. Therefore, items purchased prior to that 12 month period may be represented as having a zero annual usage rate even though potential exposures were observed during the survey. Other zero annual usage occurrences could involve recyclable items such as some catalysts and desiccants, items such as paints and coatings which are applied prior to the 12 month period but which are present in the workplace in such a way as to present a potential exposure, and obsolete items which are no longer actively used on the property but to which employees could still be potentially exposed in the course of their work. Furthermore, all the estimates were rounded to the nearest whole number, with all quantities between 0 and 1 being reported as 1. Thus, extremely small usage levels may actually be lower than estimated. With this possible exception, NIOSH believes the relative magnitude to be appropriately represented.

Another limitation to be observed is the terminology associated with the commodity, occupation, and location. These terms were adapted directly from MSHA information and applied by NIOSH. NIOSH recognizes that other parties may prefer other commodity, occupation, or location terminology. The MSHA terms were used because of MSHA's close interest in the data.

A separate report will be prepared for each commodity surveyed as a part of the NOHSM. During each segment of the NOHSM, approximately 150 mining operations are surveyed as the sample from a number of selected commodities. A different set of commodities is surveyed during each segment.

NIOSH plans for use of these data in the future include:

- a. Encourage MSHA use of the data, as outlined above;
- b. Determine the ranges of exposure to various agents, as required by Section 201 of the 1977 Federal Mine Safety and Health Amendments Act;
- c. Assist in setting priorities for mine-related occupational health research; and
- d. Respond to questions from other parties regarding occupational health aspects of the mining industry.

Information beyond that presented in this report has been collected during the NOHSM. All of the information not protected by trade secret claims is available to the public upon detailed written request. Other categories of available information include:

- a. Management policies related to occupational health;
- b. Duration of potential exposures;
- c. Operations associated with potential exposures;
- d. Controls employed with potential exposures; and
- e. Results of bulk dust analyses for silica, metals, and fibers.

Interested parties should direct their requests to:

Project Officer
National Occupational Health Survey of Mining
NIOSH
Division of Respiratory Disease Studies
944 Chestnut Ridge Road, Room 140
Morgantown, WV 26505-2888

TABLE DEFINITIONS

AGENT NAME	(1)	(2)	(3)	(4)	(5)	(6)
	# WORKERS POTENTIALLY EXPOSED (OBSERVED)	# WORKERS POTENTIALLY EXPOSED (PREDICTED)	% WORKERS POTENTIALLY (PREDICTED)	PREDICTED ANNUAL USAGE	OCCUPATIONS	LOCATIONS

Column (1) represents the total number of workers in occupations within this commodity in which a potential exposure to an agent was observed or identified through questioning of mine management or workers. This number only includes workers from the NOHSM sample sites. A "potential exposure" means the agent was observed to be present at the worksite in such a way that there was a possibility of workers being exposed to the agent. The potential exposures do not imply any exposure level, nor do they imply the absence or presence of controls.

Column (2) represents the number of workers within this commodity predicted to be potentially exposed to each agent. This number reflects a projection to this entire commodity, based on data obtained at NOHSM sample sites.

Column (3) represents the percentage of workers within this commodity predicted to be potentially exposed to each agent. Column (3) is obtained by dividing column (2) by the projected total population of workers in the commodity.

Column (4) represents the number of gallons (GAL) or the number of pounds (LBS) of each chemical that NIOSH has estimated to be used per year. This number is obtained from projections based on estimates of usage provided by mine management, and should only be used in determining the order of magnitude of usage. It should not be used as a precise figure. This number reflects a projection to this entire commodity, based on data obtained at NOHSM sample sites. In some cases, where usage data was unavailable, a "*" appears in this column.

Column (5) contains the occupations observed to have a potential for exposure to this agent. In each occupation, the percentage of workers with a potential for exposure to the agent is given in parentheses. This number only includes data obtained at NOHSM sample sites.

Column (6) contains the locations where workers were observed to have a potential for exposure to this agent at the NOHSM sample sites. The percentage of workers in each listed location with a potential exposure to the agent is given in parentheses. This number only includes data obtained at NOHSM sample sites.

TABLE 1, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

MSHA REGULATED CHEMICALS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
ACETYLENE	9	9	11	138,230 GALS.	010 SURFACE MILL (22%)
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					
ARGON	6	6	8	88,865 GALS. 1,500 LBS.	005 SURFACE SHOP (67%)
(5) OCCUPATIONS					
604 MECHANIC (75%)					
CHLORINE	2	2	3	150 LBS.	009 SURFACE MISC (20%)
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (40%)					
PROPANE	10	10	13	360 GALS. 1,000 LBS.	006 SURFACE CRUSHING (67%) 009 SURFACE MISC (60%)
(5) OCCUPATIONS					
079 CRUSHER OPTR (67%)			879 BAGGING OR PACKING WRKR (100%)		

TABLE 1, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

MSHA REGULATED CHEMICALS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
NITRIC ACID	1	1	1	1 GALS.	009 SURFACE MISC (10%)
(5) OCCUPATIONS					
649 ADMN, SUPERVISORY, MGT PERSNL (100%)					
OXALIC ACID	1	1	1	2 LBS.	
(5) OCCUPATIONS					
649 ADMN, SUPERVISORY, MGT PERSNL (100%)					
SODIUM HYDROXIDE	8	8	10	1 GALS. 120,000 LBS.	
(5) OCCUPATIONS					
179 BALL, ROD, PEBBLE MILL OPTR (100%)		679 FLOTATION/CONCTR OPTR (27%)			010 SURFACE MILL (20%)
SULFURIC ACID	11	11	14	60,001 GALS.	
(5) OCCUPATIONS					
179 BALL, ROD, PEBBLE MILL OPTR (100%)		514 LABORATORY TECHNICIAN (60%)			

(CONTINUED NEXT PAGE)

TABLE 1, PAGE 3 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

MSHA REGULATED CHEMICALS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
SULFURIC ACID (CONTINUED)	11	11	14	60,001 GALS.	010 SURFACE MILL (27%)
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (27%)					
METHYL ACETYLENE-PROPADIENE MIXTUR E	6	6	8	200 GALS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					005 SURFACE SHOP (67%)

CHEMICALS FOUND ON MINE PROPERTY THAT HAVE A NIOSH RECOMMENDED EXPOSURE LIMIT BUT ARE NOT REGULATED BY MSHA

COMMODITY NAME: GEMSTONES			
CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)
			(4) PREDICTED ANNUAL USAGE

NO DATA FOR THIS TABLE IN THIS COMMODITY

TABLE 3, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED
TO BE TRADE SECRET.

CHEMICALS FOUND ON MINE PROPERTY THAT HAVE NO NIOSH RECOMMENDATION OR MSHA EXPOSURE LIMIT

COMMODITY NAME: GEMSTONES

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
KEROSENE	12	12	15	500 GALS.	
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)			367 SHOVEL OPTR (100%)		004 SURFACE MINE (100%)
376 TRUCK DRIVER (100%)			378 MOBILE CRANE OPTR (100%)		
619 WELDER (100%)					
02 FUEL OIL	20	20	25	378,309 GALS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (67%)			334 WAGON DRILL OPTR (100%)		006 SURFACE CRUSHING (67%) 004 SURFACE MINE (100%) 010 SURFACE MILL (10%)
367 SHOVEL OPTR (100%)			376 TRUCK DRIVER (100%)		
378 MOBILE CRANE OPTR (100%)			619 WELDER (100%)		
679 FLOTATION/CONCTR OPTR (27%)					
LEADED GASOLINE	6	6	8	1,000 GALS.	
(5) OCCUPATIONS					
879 BAGGING OR PACKING WRKR (100%)					009 SURFACE MISC (60%)

TABLE 4, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
AIRCO WELDING PRODUCTS					
6011	6	6	8	300 LBS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					005 SURFACE SHOP (67%)
7018	6	6	8	300 LBS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					005 SURFACE SHOP (67%)
ALLIED CORPORATION ALLIED CHEMICAL					
SODA ASH LIGHT	4	4	5	500,000 LBS.	
(5) OCCUPATIONS					
579 SLURRY, MIXING OR PUMPING WRKR (100%)					010 SURFACE MILL (10%)
AMERICAN CYANAMID COMPANY					
SUPERFLOC 1128	8	8	10	1,980 GALS.	
(5) OCCUPATIONS					
579 SLURRY, MIXING OR PUMPING WRKR (100%)					010 SURFACE MILL (20%)
679 FLOTATION/CONCTR OPTR (27%)					

TABLE 4, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
AMERICAN GAS AND CHEMICAL CO LTD	6	6	8	5 GALS.	010 SURFACE MILL (15%)
TSI 301					
(5) OCCUPATIONS					
604 MECHANIC (75%)					
AMERICAN HOESTECH					
ATOMIZED FERROSILICON 15	9	9	11	40,000 LBS.	010 SURFACE MILL (22%)
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					
BAY STATE ABRASIVES DRESSER					
C-60-L11-V32FA #36744	5	5	6	4 LBS.	004 SURFACE MINE (42%)
(5) OCCUPATIONS					
619 WELDER (100%)					
BOWMAN DISTRIBUTION, BARNES GROUP INC.					
A24RB TYPE27 21763 CUT-OFF WHE EL	6	6	8	60 LBS.	010 SURFACE MILL (15%)
(5) OCCUPATIONS					
604 MECHANIC (75%)					

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TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
BELT DRESSING 21905 AEROSOL	8	8	10	150 LBS.	
OCCUPATIONS					
604 MECHANIC (75%)			679 FLOTATION/CONCTR OPTR (13%)		010 SURFACE MILL (20%)
ENGINE DEGREASER NO 21927	6	6	8	1 GALS.	
OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)
GRINDING WHEELS	6	6	8	60 LBS.	
OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)
RUST PENETRANT #21924	6	6	8	20 GALS.	
OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)

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TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
SUPER STEAM CONCENTRATE	8	8	10	5 GALS.	
(5) OCCUPATIONS					
602 ELECTRICIAN (40%)			604 MECHANIC (75%)		010 SURFACE MILL (20%)
THREAD SEALER 21972	6	6	8	1 GALS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					005 SURFACE SHOP (67%)
WELDING ANTI-SPATTER AEROSOL	6	6	8	75 LBS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					005 SURFACE SHOP (67%)
CARBORUNDUM					
HMS FERRO SILICON 200 MESH REG ULAR	9	9	11	40,000 LBS.	
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					010 SURFACE MILL (22%)

TABLE 4, PAGE 5 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
D&L THOMAS EQUIPMENT CORP					
SUPER DRILL BIT AND COUPLING L UBE	2	2	3	2 GALS.	004 SURFACE MINE (17%)
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)					

DAYTON ELECTRIC MFG CO

2X984-A INDUSTRIAL GRAY AEROSO L	2	2	3	2 LBS.	(6) LOCATIONS
(5) OCCUPATIONS					010 SURFACE MILL (5%)
602 ELECTRICIAN (40%)					

DREW CHEMICAL CORPORATION

AMERGEL 100 ANTIFOAM	13	13	16	1,980 GALS.	(6) LOCATIONS
(5) OCCUPATIONS					010 SURFACE MILL (32%)
179 BALL, ROD, PEBBLE MILL OPTR (100%)			679 FLOTATION/CONCTR OPTR (60%)		

DUBOIS CHEMICALS, A DIVISION OF CHEMED CORPORATION

ACTUSOL T-776	6	6	8	10 GALS.	(6) LOCATIONS
(5) OCCUPATIONS					010 SURFACE MILL (15%)
604 MECHANIC (75%)					

TABLE 4, PAGE 6 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
LECTRO SAF #02837	2	2	3	5 GALS.	010 SURFACE MILL (5%)
(5) OCCUPATIONS					
602 ELECTRICIAN (40%)					

EASTMAN KODAK COMPANY

KODAK PHOTO-FLO 200 SOLUTION	3	3	4	1 GALS.	(6) LOCATIONS
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (40%)		649 ADMN, SUPERVISORY, MGT PERSNL (100%)			009 SURFACE MISC (30%)

FLEXOVIT

A24130T GRINDING WHEEL	6	6	8	15 LBS.	(6) LOCATIONS
(5) OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)
9"-230MM A24130T	5	5	6	18 LBS.	(6) LOCATIONS
(5) OCCUPATIONS					
619 WELDER (100%)					004 SURFACE MINE (42%)

TABLE 4, PAGE 7 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED
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TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
GENERAL ELECTRIC COMPANY					
SILICONE II CLEAR	2	2	3	300 GALS.	
(5) OCCUPATIONS					
388 SCALPER-SCREEN OPTR (100%)					010 SURFACE MILL (5%)

GENERAL ELECTRIC COMPANY SILICONE PRODUCTS DIVISION

RTV SILICONE RUBBER ADHESIVE	13	13	16	100 LBS.	(6) LOCATIONS
(5) OCCUPATIONS					
394 CARPENTER (100%)			602 ELECTRICIAN (60%)		005 SURFACE SHOP (11%)
679 FLOTATION/CONCTR OPTR (60%)					010 SURFACE MILL (29%)

GRAYMILLS CORP

HANDI-KLEEN	6	6	8	10 GALS.	(6) LOCATIONS
(5) OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)

GULF OIL CORPORATION

ATF TYPE F	6	6	8	100 GALS.	(6) LOCATIONS
(5) OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)

TABLE 4, PAGE 8 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
KEROSENE	6	6	8	500 GALS.	009 SURFACE MISC (60%)
(5) OCCUPATIONS					
879 BAGGING OR PACKING WRKR (100%)					
10W-20W-30	4	4	5	20 GALS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (67%)					006 SURFACE CRUSHING (67%)
15W/40	6	6	8	20 GALS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)
IDEAL INDUSTRIES INC					
YELLOW 77	2	2	3	1 GALS.	
(5) OCCUPATIONS					
602 ELECTRICIAN (40%)					010 SURFACE MILL (5%)

TABLE 4, PAGE 9 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
YELLOW 77 AEROSOL	3	3	4	6 LBS.	
OCCUPATIONS					
602 ELECTRICIAN (60%)					010 SURFACE MILL (7%)

INDEPENDANT CEMENT CORPORATION

MASONRY CEMENT	1	1	1	200 LBS.	
OCCUPATIONS					
394 CARPENTER (100%)					005 SURFACE SHOP (11%)

TYPE I PORTLAND CEMENT

TYPE I PORTLAND CEMENT	1	1	1	2,000 LBS.	
OCCUPATIONS					
394 CARPENTER (100%)					005 SURFACE SHOP (11%)

KENDALL REFINING COMPANY

ATF TYPE F	6	6	8	100 GALS.	
OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)

TABLE 4, PAGE 10 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
GEAR LUBE 80W-85W-140	2	2	3	50 LBS.	010 SURFACE MILL (5%)
(5) OCCUPATIONS					
388 SCALPER-SCREEN OPTR (100%)					
L-427 GREASE #567-7867	14	14	18	500 LBS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (67%)		388 SCALPER-SCREEN OPTR (100%)			006 SURFACE CRUSHING (67%)
679 FLOTATION/CONCTR OPTR (13%)		879 BAGGING OR PACKING WRKR (100%)			010 SURFACE MILL (10%)
					009 SURFACE MISC (60%)
SAE 15W-40	6	6	8	250 GALS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					010 SURFACE MILL (15%)
5W-20 TURBINE AND HYDRAULIC OI	12	12	15	75 GALS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)		879 BAGGING OR PACKING WRKR (100%)			010 SURFACE MILL (15%)
					009 SURFACE MISC (60%)

TABLE 4, PAGE 11 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
KERR-MCGEE CHEMICAL CORPORATION					
SODA ASH 58% NA2O MINIMUM DENS E	4	4	5	500,000 LBS.	010 SURFACE MILL (10%)
OCCUPATIONS					
579 SLURRY, MIXING OR PUMPING WRKR (100%)					
LAMONT LABS, INC					
LAN-O-KREME	24	24	30	150 LBS.	
OCCUPATIONS					
079 CRUSHER OPTR (67%)		388	SCALPER-SCREEN OPTR (100%)		006 SURFACE CRUSHING (67%)
514 LABORATORY TECHNICIAN (40%)		602	ELECTRICIAN (40%)		010 SURFACE MILL (29%)
604 MECHANIC (75%)		679	FLOTATION/CONCTR OPTR (13%)		009 SURFACE MISC (80%)
879 BAGGING OR PACKING WRKR (100%)					
LAMOTTE CHEMICAL					
4259-G	3	3	4	1 GALS.	
OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					010 SURFACE MILL (7%)

TABLE 4, PAGE 12 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
4410-H	3	3	4	1 GALS.	010 SURFACE MILL (7%)
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					
4450-G	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					
4451-S	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					
4487-M	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					

TABLE 4, PAGE 13 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	COMMODITY NAME: GEMSTONES			PREDICTED ANNUAL USAGE	(6) LOCATIONS
	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)		
4797-G	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					010 SURFACE MILL (7%)
4798-G	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					010 SURFACE MILL (7%)
6405-G	3	3	4	1 GALS.	
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)					010 SURFACE MILL (7%)
MARVEL OIL COMPANY INC					
MYSTERY OIL	6	6	8	2 GALS.	
(5) OCCUPATIONS					
879 BAGGING OR PACKING WRKR (100%)					009 SURFACE MISC (60%)

TABLE 4, PAGE 14 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES				
MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE
MOBIL OIL CORPORATION				
ATF 220	10	10	13	495 GALS.
(5) OCCUPATIONS				(6) LOCATIONS
334 WAGON DRILL OPTR (100%)			376 TRUCK DRIVER (100%)	004 SURFACE MINE (83%)
378 MOBILE CRANE OPTR (100%)			619 WELDER (100%)	
DELVAC 1110	5	5	6	220 GALS.
(5) OCCUPATIONS				(6) LOCATIONS
619 WELDER (100%)				004 SURFACE MINE (42%)
DELVAC 1310	5	5	6	0 GALS.
(5) OCCUPATIONS				(6) LOCATIONS
619 WELDER (100%)				004 SURFACE MINE (42%)
DTE BB	5	5	6	55 GALS.
(5) OCCUPATIONS				(6) LOCATIONS
619 WELDER (100%)				004 SURFACE MINE (42%)

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
DTE OIL HEAVY MEDIUM	7	7	9	55 GALS.	
(5) OCCUPATIONS					
618 GREASER; OILER (100%)		619 WELDER (100%)			010 SURFACE MILL (5%) 004 SURFACE MINE (42%)
DTE 26	7	7	9	165 GALS.	
(5) OCCUPATIONS					
618 GREASER; OILER (100%)		619 WELDER (100%)			010 SURFACE MILL (5%) 004 SURFACE MINE (42%)
MOBIL GEAR 629	9	9	11	2,200 GALS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (33%) 619 WELDER (100%)		618 GREASER; OILER (100%)			006 SURFACE CRUSHING (33%) 010 SURFACE MILL (5%) 004 SURFACE MINE (42%)
MOBILGEAR 634	7	7	9	220 GALS.	
(5) OCCUPATIONS					
618 GREASER; OILER (100%)		619 WELDER (100%)			010 SURFACE MILL (5%) 004 SURFACE MINE (42%)

TABLE 4, PAGE 16 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED
TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
MOBILTAC E OPEN GEAR COMPOUND AEROSOL	4	4	5	36 LBS.	010 SURFACE MILL (10%)
(5) OCCUPATIONS					
179 BALL, ROD, PEBBLE MILL OPTR (100%)					
MOBILTAC 77	7	7	9	2,000 LBS.	
(5) OCCUPATIONS					
618 GREASER; OILER (100%)		619 WELDER (100%)			010 SURFACE MILL (5%) 004 SURFACE MINE (42%)
MOBILUX EP 2	25	25	31	360 LBS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (33%)		334 WAGON DRILL OPTR (100%)			006 SURFACE CRUSHING (33%)
376 TRUCK DRIVER (100%)		378 MOBILE CRANE OPTR (100%)			004 SURFACE MINE (42%)
579 SLURRY, MIXING OR PUMPING WRKR (100%)		602 ELECTRICIAN (60%)			010 SURFACE MILL (44%)
618 GREASER; OILER (100%)		679 FLOTATION/CONCTR OPTR (60%)			
1030	5	5	6	220 GALS.	
(5) OCCUPATIONS					
619 WELDER (100%)					004 SURFACE MINE (42%)

TABLE 4, PAGE 17 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	
1120	7	7	9	110 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
618 GREASER; OILER (100%)		619 WELDER (100%)			010 SURFACE MILL (5%) 004 SURFACE MINE (42%)
1130	17	17	21	440 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
334 WAGON DRILL OPTR (100%)		367 SHOVEL OPTR (100%)			010 SURFACE MILL (12%)
376 TRUCK DRIVER (100%)		378 MOBILE CRANE OPTR (100%)			004 SURFACE MINE (100%)
602 ELECTRICIAN (60%)		618 GREASER; OILER (100%)			
619 WELDER (100%)					
1140	12	12	15	110 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
334 WAGON DRILL OPTR (100%)		367 SHOVEL OPTR (100%)			004 SURFACE MINE (100%)
376 TRUCK DRIVER (100%)		378 MOBILE CRANE OPTR (100%)			
619 WELDER (100%)					
1330	5	5	6	165 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
619 WELDER (100%)					004 SURFACE MINE (42%)

TABLE 4. PAGE 18 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
15-40	7	7	9	110 GALS.	004 SURFACE MINE (58%)
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)			619 WELDER (100%)		
423	5	5	6	0 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
619 WELDER (100%)					004 SURFACE MINE (42%)
80W 90	14	14	18	400 LBS.	
(5) OCCUPATIONS					(6) LOCATIONS
079 CRUSHER OPTR (33%)			334 WAGON DRILL OPTR (100%)		006 SURFACE CRUSHING (33%)
367 SHOVEL OPTR (100%)			376 TRUCK DRIVER (100%)		004 SURFACE MINE (100%)
378 MOBILE CRANE OPTR (100%)			619 WELDER (100%)		
NALCO CHEMICAL COMPANY					
7810 ANTIFOAM	9	9	11	1,320 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
679 FLOTATION/CONCTR OPTR (60%)					010 SURFACE MILL (22%)

TABLE 4, PAGE 19 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
NORTON					
6/4-314X2X5/8-11 A16-Q4BH	5	5	6	12 LBS.	004 SURFACE MINE (42%)
(5) OCCUPATIONS					
619 WELDER (100%)					
PEARL ABRASIVE CO					
A24R 4X5/32X5/8	6	6	8	30 LBS.	010 SURFACE MILL (15%)
(5) OCCUPATIONS					
604 MECHANIC (75%)					
PILOT CHEMICAL COMPANY					
ARISTONATE 460	2	2	3	1 LBS.	006 SURFACE CRUSHING (33%)
(5) OCCUPATIONS					
079 CRUSHER OPTR (33%)					
ARISTONATE 500-M	7	7	9	54,000 LBS.	010 SURFACE MILL (17%)
(5) OCCUPATIONS					
514 LABORATORY TECHNICIAN (60%)			679 FLOTATION/CONCTR OPTR (27%)		

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
PROCTOR AND GAMBLE					
COMET	1	1	1	1 LBS.	009 SURFACE MISC (10%)
(5) OCCUPATIONS					
413 JANITOR (100%)					
SPIC AND SPAN	1	1	1	15 LBS.	009 SURFACE MISC (10%)
(5) OCCUPATIONS					
413 JANITOR (100%)					
RADIATOR SPECIALTY COMPANY					
FIRE QUICK STARTING FLUID AERO SOL	7	7	9	24 LBS.	004 SURFACE MINE (58%)
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%) 376 TRUCK DRIVER (100%)		367 SHOVEL OPTR (100%) 378 MOBILE CRANE OPTR (100%)			
RSR CORPORATION					
C-55 COUPLING GREASE	2	2	3	5 LBS.	004 SURFACE MINE (17%)
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)					

TABLE 4, PAGE 21 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED
TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
SC JOHNSON AND SON INC					
PLEDGE	1	1	1	1 LBS.	
(5) OCCUPATIONS					
413 JANITOR (100%)					009 SURFACE MISC (10%)
SCM CORPORATION					
CA-80 CONTACT CEMENT	1	1	1	1 GALS.	
(5) OCCUPATIONS					
394 CARPENTER (100%)					005 SURFACE SHOP (11%)
SPRAY PRODUCTS CORPORATION					
HOT SHOT STARTING FLUID	7	7	9	12 LBS.	
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)				367 SHOVEL OPTR (100%)	
376 TRUCK DRIVER (100%)				378 MOBILE CRANE OPTR (100%)	004 SURFACE MINE (58%)
TELEDYNE MCKAY					
HARD SURFACING WIRE	5	5	6	80 LBS.	
(5) OCCUPATIONS					
619 WELDER (100%)					004 SURFACE MINE (42%)

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
STAINLESS STEEL WIRE	5	5	6	40 LBS.	004 SURFACE MINE (42%)
OCCUPATIONS					
619 WELDER (100%)					
6013	9	9	11	100 LBS.	
OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					010 SURFACE MILL (22%)
7018	14	14	18	500 LBS.	
OCCUPATIONS					
619 WELDER (100%)			679 FLOTATION/CONCTR OPTR (60%)		004 SURFACE MINE (42%) 010 SURFACE MILL (22%)
TEXACO INC					
CRATER 2X FLUID	6	6	8	1,600 LBS.	
OCCUPATIONS					
378 MOBILE CRANE OPTR (100%)			619 WELDER (100%)		004 SURFACE MINE (50%)

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
ROCK DRILL LUBE 46	2	2	3	110 GALS.	
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)					004 SURFACE MINE (17%)

TEXIZE

GLASS PLUS	1	1	1	1 GALS.	
(5) OCCUPATIONS					
413 JANITOR (100%)					(6) LOCATIONS
					009 SURFACE MISC (10%)

THE LINCOLN ELECTRIC CO

7018	6	6	8	100 LBS.	
(5) OCCUPATIONS					
604 MECHANIC (75%)					(6) LOCATIONS
					005 SURFACE SHOP (67%)

THE LINCOLN ELECTRIC COMPANY

6013	9	9	11	200 LBS.	
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					(6) LOCATIONS
					010 SURFACE MILL (22%)

TABLE 4, PAGE 24 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	7018
	14	14	18	100 LBS.	
(5) OCCUPATIONS					(6) LOCATIONS
619 WELDER (100%)		679 FLOTATION/CONCTR OPTR (60%)			004 SURFACE MINE (42%) 010 SURFACE MILL (22%)
THE RIDGE TOOL COMPANY					
NU-CLEAR THREAD CUTTING OIL	2	2	3	4 GALS.	
(5) OCCUPATIONS					(6) LOCATIONS
602 ELECTRICIAN (40%)					010 SURFACE MILL (5%)
UNION CARBIDE					
HARD SURFACING WIRE	5	5	6	40 LBS.	
(5) OCCUPATIONS					(6) LOCATIONS
619 WELDER (100%)					004 SURFACE MINE (42%)
UNITEC ABRASIVES INC					
A24N 4X1/4X5/8	5	5	6	12 LBS.	
(5) OCCUPATIONS					(6) LOCATIONS
619 WELDER (100%)					004 SURFACE MINE (42%)

TABLE 4, PAGE 25 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
UNITED STATES BORAX AND CHEMICAL CORPORATION	28	28	35	240 LBS.	006 SURFACE CRUSHING (33%) 004 SURFACE MINE (100%) 010 SURFACE MILL (34%)
HAND CLEANER #00355	28	28	35	240 LBS.	
(5) OCCUPATIONS					
079 CRUSHER OPTR (33%)					
367 SHOVEL OPTR (100%)					
378 MOBILE CRANE OPTR (100%)					
618 GREASER; OILER (100%)					
679 FLOTATION/CONCTR OPTR (60%)					
VALVOLINE OIL COMPANY					
ANTI-FREEZE AND COOLANT	7	7	9	350 GALS.	
(5) OCCUPATIONS					
334 WAGON DRILL OPTR (100%)					
376 TRUCK DRIVER (100%)					
514 LABORATORY TECHNICIAN (60%)					
619 WELDER (100%)					
367 SHOVEL OPTR (100%)					
378 MOBILE CRANE OPTR (100%)					
WD-40					
WD-40 AEROSOL	2	2	3	1 LBS.	
(5) OCCUPATIONS					
602 ELECTRICIAN (40%)					
(6) LOCATIONS					
010 SURFACE MILL (5%)					

TABLE 4, PAGE 26 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED
TO BE TRADE SECRET.

TRADENAME PRODUCTS FOUND ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

MANUFACTURE'S NAME AND TRADENAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(6) LOCATIONS
WD-40 COMPANY					
WD-40 AEROSOL	17	17	21	36 LBS.	
(5) OCCUPATIONS					
602 ELECTRICIAN (60%)			619 WELDER (100%)		004 SURFACE MINE (42%)
679 FLOTATION/CONCTR OPTR (60%)					010 SURFACE MILL (29%)

TABLE 5, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

PHYSICAL AGENT CONDITIONS IDENTIFIED ON MINE PROPERTY

COMMODITY NAME, GEMSTONES

	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)
PHYSICAL AGENT CONDITION	41	41	51
NOISE			

(5)
OCCUPATIONS

079 CRUSHER OPTR (100%)
334 WAGON DRILL OPTR (100%)
602 ELECTRICIAN (40%)
618 GREASER; OILER (100%)
879 BAGGING OR PACKING WRKR (100%)

179 BALL, ROD, PEBBLE MILL OPTR (100%)
388 SCALPER-SCREEN OPTR (100%)
604 MECHANIC (75%)
679 FLOTATION/CONCTR OPTR (73%)

(6)
LOCATIONS

006 SURFACE CRUSHING (100%)
004 SURFACE MINE (17%)
010 SURFACE MILL (66%)
009 SURFACE MISC (60%)

TEMPERATURE (PROCESS RELATED)

16 16 20

(5)

OCCUPATIONS

079 CRUSHER OPTR (67%)
602 ELECTRICIAN (60%)
679 FLOTATION/CONCTR OPTR (27%)

514 LABORATORY TECHNICIAN (60%)
618 GREASER; OILER (100%)

(6)
LOCATIONS

006 SURFACE CRUSHING (67%)
010 SURFACE MILL (29%)

WHOLE BODY VIBRATION

46 46 58

(5)

OCCUPATIONS

079 CRUSHER OPTR (33%)
367 SHOVEL OPTR (100%)
378 MOBILE CRANE OPTR (100%)
579 SLURRY, MIXING OR PUMPING WRKR (100%)
604 MECHANIC (75%)
679 FLOTATION/CONCTR OPTR (100%)

179 BALL, ROD, PEBBLE MILL OPTR (100%)
376 TRUCK DRIVER (100%)
514 LABORATORY TECHNICIAN (60%)
602 ELECTRICIAN (100%)
618 GREASER; OILER (100%)

(6)
LOCATIONS

006 SURFACE CRUSHING (33%)
004 SURFACE MINE (42%)
010 SURFACE MILL (95%)

TABLE 6, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

MUSCULOSKELETAL OVERLOAD CONDITIONS IDENTIFIED ON MINE PROPERTY

COMMODITY NAME: GEMSTONES

	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)
MUSCULOSKELETAL CONDITION	37	37	46
HEAVY LIFTING (CONTINUED)			

(5)

OCCUPATIONS

579 SLURRY, MIXING OR PUMPING WRKR (100%)	602 ELECTRICIAN (60%)
604 MECHANIC (75%)	619 WELDER (100%)
649 ADMN, SUPERVISORY, MGT PERSNL (100%)	679 FLOTATION/CONCTR OPTR (60%)
879 BAGGING OR PACKING WRKR (100%)	

(6)
LOCATIONS

004 SURFACE MINE (58%)
010 SURFACE MILL (54%)
009 SURFACE MISC (70%)

NECK AND/OR BACK

71

(5)

OCCUPATIONS

079 CRUSHER OPTR (33%)	179 BALL, ROD, PEBBLE MILL OPTR (100%)
334 WAGON DRILL OPTR (100%)	367 SHOVEL OPTR (100%)
376 TRUCK DRIVER (100%)	378 MOBILE CRANE OPTR (100%)
394 CARPENTER (100%)	413 JANITOR (100%)
579 SLURRY, MIXING OR PUMPING WRKR (100%)	602 ELECTRICIAN (60%)
604 MECHANIC (100%)	618 GREASER; OILER (100%)
619 WELDER (100%)	649 ADMN, SUPERVISORY, MGT PERSNL (100%)
679 FLOTATION/CONCTR OPTR (87%)	879 BAGGING OR PACKING WRKR (100%)

(6)
LOCATIONS

006 SURFACE CRUSHING (33%)
005 SURFACE SHOP (33%)
004 SURFACE MINE (100%)
010 SURFACE MILL (78%)
009 SURFACE MISC (80%)

PRONE OR SUPINE LYING

31

(5)

OCCUPATIONS

602 ELECTRICIAN (100%)	604 MECHANIC (75%)
619 WELDER (100%)	679 FLOTATION/CONCTR OPTR (60%)

(6)
LOCATIONS

004 SURFACE MINE (42%)
010 SURFACE MILL (49%)

TABLE 6, PAGE 3 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

MUSCULOSKELETAL OVERLOAD CONDITIONS IDENTIFIED ON MINE PROPERTY

COMMODITY NAME: GENSTONES

(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)
2	2	3

MUSCULOSKELETAL CONDITION

STANDING

(5)

OCCUPATIONS

367 SHOVEL OPTR (100%)

(6)

LOCATIONS

004 SURFACE MINE (17%)

SITTING

5

5

6

(5)

OCCUPATIONS

367 SHOVEL OPTR (100%)

378 MOBILE CRANE OPTR (100%)

(6)

LOCATIONS

004 SURFACE MINE (42%)

376 TRUCK DRIVER (100%)

TABLE 7, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN DATA CLAIMED TO BE TRADE SECRET.

WELDING POTENTIAL EXPOSURE

COMMODITY NAME: GEMSTONES

	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)		(6) LOCATIONS
WELDING PROCESS	14	14	18		
ARC WELDING					
(5) OCCUPATIONS					
619 WELDER (100%)			679 FLOTATION/CONCTR OPTR (60%)		004 SURFACE MINE (42%) 010 SURFACE MILL (22%)
SHIELD METAL ARC WELDING	6	6	8		
(5) OCCUPATIONS					
604 MECHANIC (75%)					(6) LOCATIONS
					005 SURFACE SHOP (67%)
OXYFUEL GAS CUTTING	9	9	11		
(5) OCCUPATIONS					
679 FLOTATION/CONCTR OPTR (60%)					(6) LOCATIONS
					010 SURFACE MILL (22%)

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9. Performing Organization Name and Address National Occupational Health Survey of Mining, NIOSH, Morgantown, West Virginia				10. Project/Task/Work Unit No.	
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15. Supplementary Notes					
16. Abstract (Limit: 200 words) Data on potential exposures chemical and physical agents was gathered for the National Occupational Health Survey of Mining for the gemstones commodity. Two gemstones mines were surveyed for this report. Nine chemicals were found on mine property for which regulations were imposed by the Mine Safety and Health Administration (MSHA). Three chemicals were found on site which had no NIOSH or MSHA exposure limits. Trade name products found on mine property were listed. Potential exposures to noise, process related temperature, and whole body vibration were noted. Seven musculoskeletal conditions were identified which could result in complications for the workers: sitting; standing; prone or supine lying; heavy lifting; finger and hands; neck and/or back; and the forearm, arm, and shoulder. Three welding processes were used in the sites: shield metal arc welding, arc welding, and oxyfuel gas cutting. Annual usage estimates were provided for generic and tradename chemicals.					
17. Document Analysis a. Descriptors					
b. Identifiers/Open-Ended Terms NIOSH-Publication, Mining-industry, Miners, Health-hazards, Equipment-operators, Heat-stress, Noise-exposure, Back-injuries, Musculoskeletal-system-disorders, Manual-lifting, Welders					
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