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**HEALTH AND SAFETY PLAN FOR FIELD TASKS PERFORMED IN  
SUPPORT OF AN ENGINEERED WASTE MANAGEMENT FACILITY AT  
THE FEMP - OCTOBER 1991**

10/01/91

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Prepared by Stephen W. Duce and W. Lee Vittitow

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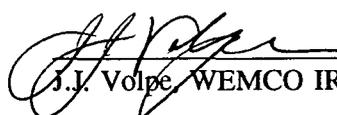
Prepared by Stephen W. Duce and W. Lee Vittitow

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NOTE: This plan and associated permits shall be reviewed with each worker and be posted at the work site at all times when work is being performed. Compliance with this requirement is evidenced by signature in Section No. 14.

EWMFHSP.MB2

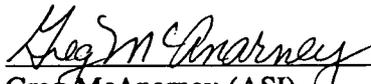
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## 1.0 HISTORY AND DESCRIPTION OF AREA

### Purpose of the Study

A study of the immediate environs on and around the Fernald Environmental Management Project (FEMP) property is to be conducted to obtain information that will be used in evaluating the viability of siting an Engineered Waste Management Facility (EWMF) at FEMP. The overall study includes field sampling, laboratory analyses, and related field tasks to support the evaluation/decision making process. Field sampling is scheduled to begin mid-November of 1991 and continue until June of 1992.

### Description of Area

Most of the siting study area is located within the FEMP property boundary, north and east of the production area. An additional area extending approximately 1000 ft beyond the FEMP/DOE property is also included in the study plan for ecological characterization. Figure 1 shows the study area in relation to the FEMP facility.

### Activities Performed or Uses of the Area

Historically this area has been used for a variety of purposes. A skeet shooting range was in existence nearly due east of the parking lots near the edge of the FEMP property boundary. An older facility administration building was in existence on the north side of the facility. The building was razed and buried in place. An incinerator was operated east of the facility near the property line. Radioactive materials and chemical waste were incinerated in the past at this facility. The outside walls of the incinerator were made of transite, an asbestos material.

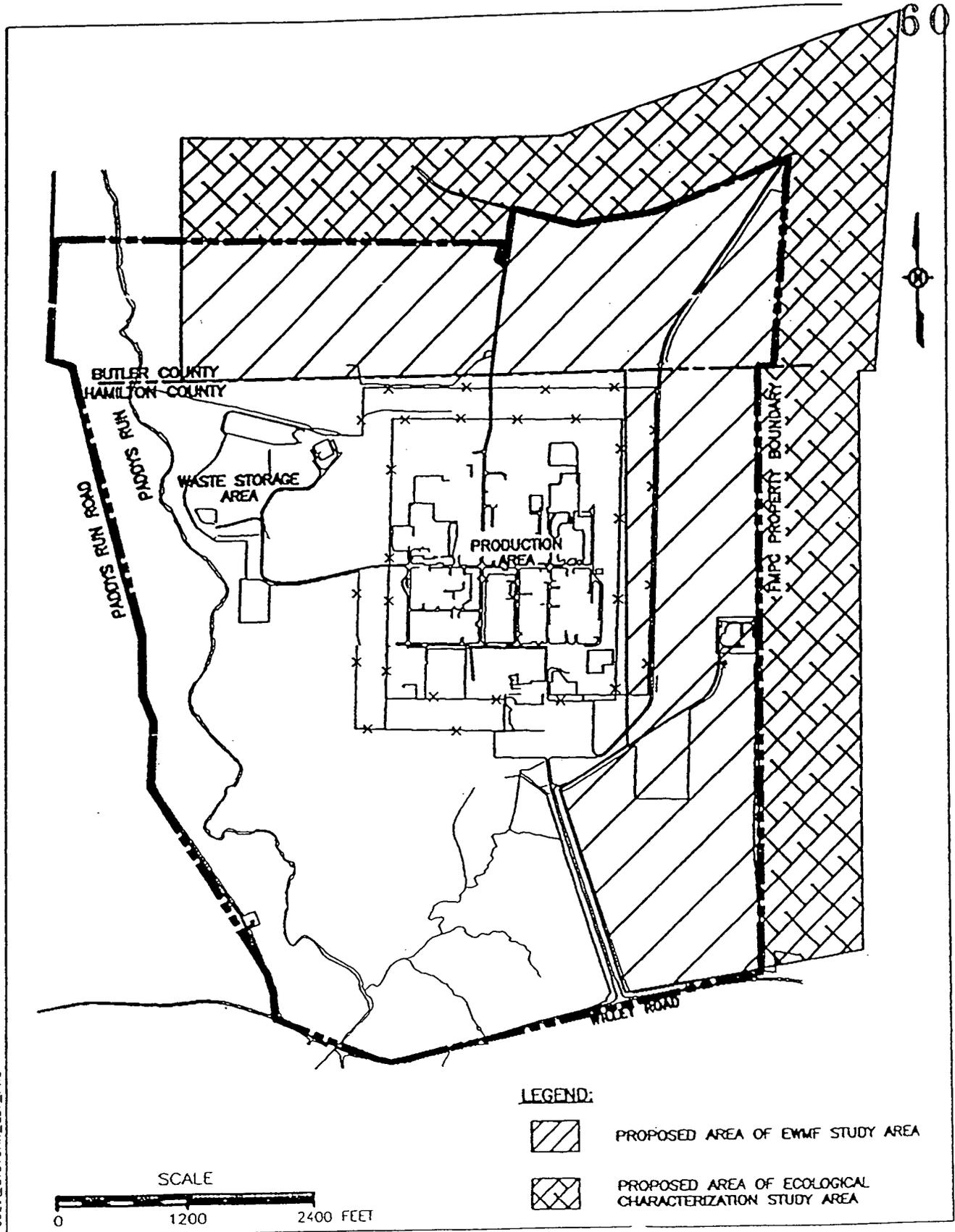
Currently, a large portion of this area is used for grazing of dairy cattle. A fence is used around many of the grazing areas to keep the cattle inside the grazing area. Underground utilities for gas, phone, and water/sewage run through the survey area. A fire training ground exists on the north side of the facility. In the past, fuel oil, motor/lubrication oils, paints and paint solvents, and other flammable materials were burned in this area. An active sewage treatment facility is on the east side of the facility study area. Overhead power lines are used to supply power to air monitoring stations within the study area. Overhead high-power utility lines also run through the site property on the east.

### Unusual Features

The main feature of this area is that it resides on a bench formed by geologic erosion of the river valley floor by the Miami River. This bench area has steep sides that could be difficult to traverse during inclement weather, i.e. rain, snow, or dew conditions. Additionally, there are swales that carry surface water runoff from the local area.

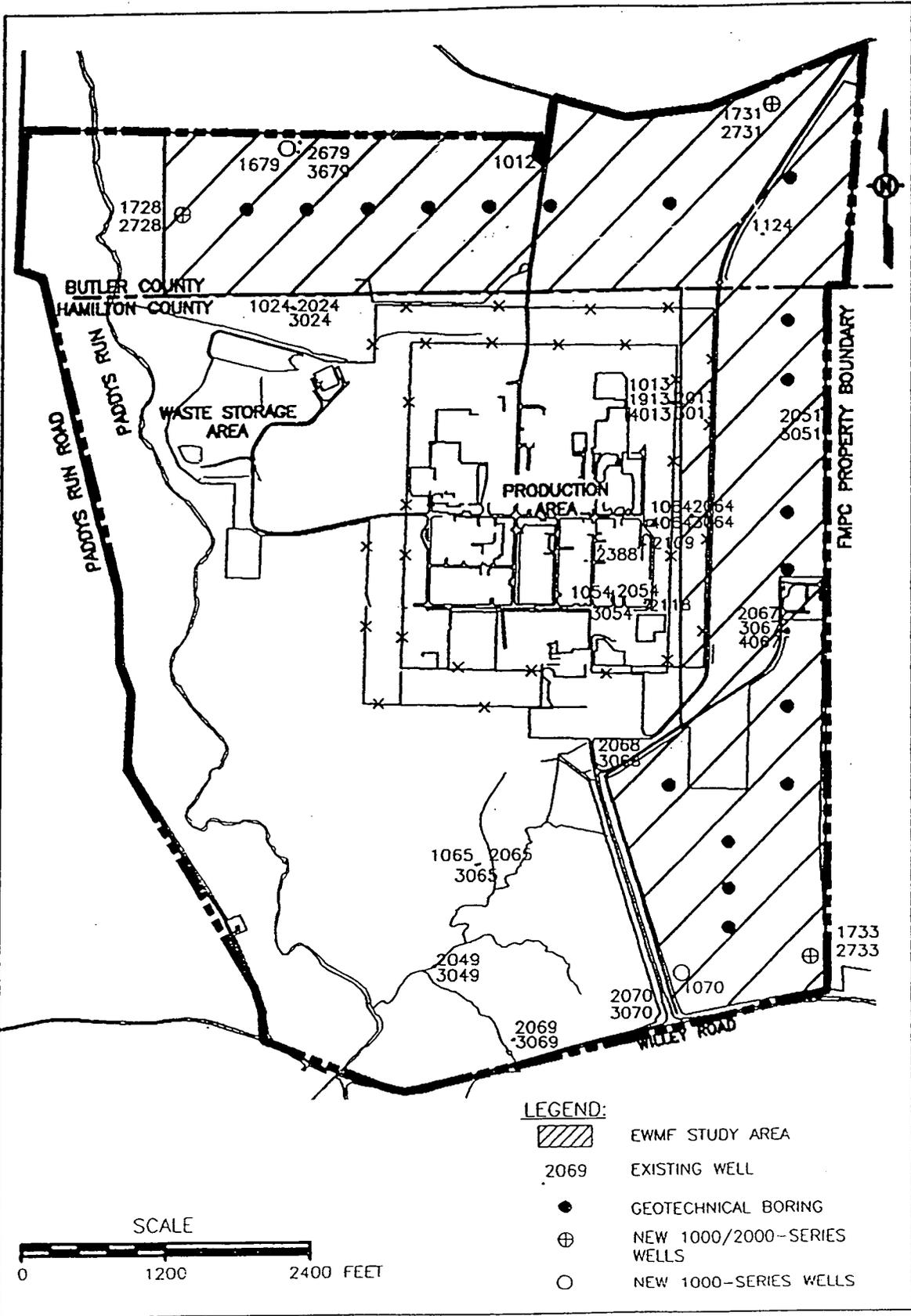
## 2.0 WORK AREA ORGANIZATION AND SITE ACCESS CONTROL

Due to the large sample area and the variety of work to be performed site identification and access control requirements will vary. The site Health and Safety Office (Stephen Duce) or his designee will act as the Health and Safety Officer (HSO) to provide oversight of all activities to ensure the requirements of this health and safety plan are allowed. The following describes the minimum site identification and control measures for each identified task. Figure 2 shows approximate locations of new wells and soil borings.



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Figure 1 EWMF Study Area



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Figure 2 Approximate locations of new wells and soil borings

A) Ecological Assessment

During this phase of the work, experienced professional field biologists will be walking over the area defined as 1000 ft. outside of the FEMP property boundary. No exclusion zone is required for this work. In this case, access to the site, defined as the immediate work area where the field biologists are, will be under the control of the Lead Biologist. Non-EWMF personnel will be identified by the biologist, who will assume the role of site supervisor, and acting in that role will determine what restrictions are appropriate to impose on "site visitors." At the end of each work day or whenever the biologists leave the site, each person leaving the site is required to be monitored with a beta-gamma survey meter to assure they are free of radioactive contamination. If contamination is found, the procedure in Section 11.0 will be followed.

B) Geologic/Hydrogeologic Sampling

During this phase of the work, eight groundwater monitoring wells are to be constructed. At each well location work zones will be identified as required by ASI procedure FPP 19.07, which requires the identification of exclusion, support, and contamination reduction zones as necessary. Each zone will be clearly identified by ribbons, flagging, or traffic cones. Visitors to the site will be restricted to outside of the support zone unless the site supervisor determines that access is allowed.

A FMPC Construction Environmental Safety and Health Work Survey form will be used to identify all applicable permits; such as Radiation Work Permit, Flame & Welding Permit, Penetration Permit, etc. All applicable permits will be posted at the work site according to FPP 19.07.

An exclusion zone will be established around the drilling rig which will have a minimum radius that approximates the height of the drilling mast and will be identified with banner tape, cones, or other easily recognized devices. The zone may be expanded by Health and Safety as conditions warrant. All areas that require the use of respiratory protection are included in the exclusion zone.

Entry to the exclusion zone will be limited to the drillers during drilling operations. During non-drilling operations, access to the exclusion zone will also include the lead geologist and health and safety personnel as needed. Anyone else desiring entry must first be approved by the lead geologist or his designee.

Personnel leaving an exclusion zone where radioactive materials were encountered are required to be monitored to ensure they are free of radiological contaminants.

Personnel who develop and sample the wells will follow FPP 19.07 to identify and post the area. Personnel exiting the posted area are required to monitor themselves. Type of monitors to use will be dictated by findings during the well installation phase. An ASI Health and Safety Technician will instruct the workers as to the monitoring requirements.

Water level measurement teams will follow FPP 19.07 for posting of the area.

C) Geotechnical Sampling

During this phase of the work, 18 soil borings are to be constructed. At each borehole location, work zones will be identified as required by ASI procedure FPP 19.07, which requires the identification of exclusion, support, and contamination reduction zones as necessary. Each zone will be clearly identified by ribbons, flagging, or traffic cones. Visitors to the borehole site will be restricted to outside of the support zone unless the site supervisor determines that access is allowed.

An exclusion zone will be established around the drilling rig which will have a minimum radius approximating the height of the drill mast and will be identified with banner tape, cones, or other easily recognized devices. The zone may be expanded by Health and Safety as conditions warrant. All areas that require the use of respiratory protection are included in the exclusion zone.

Entry to the exclusion zone will be limited to the drillers during drilling operations. During non-drilling operations, access to the exclusion zone will also include the lead geologist and health and safety personnel as needed. Anyone else desiring entry must first be approved by the lead geologist or his designee.

Personnel leaving an exclusion zone where radiocative materials were encountered are required to be monitored to ensure they are free of radiological contaminants.

#### D) Risk Assessment Sampling

During this phase of work, surface soil samples will be obtained. No work zones are required to prevent access to the work site. Personnel performing the work are required to restrict access to non-authorized personnel to the work area. Personnel performing surface soil sampling will be required to monitor themselves for radioactive contaminants using a beta-gamma survey meter prior to leaving the site.

Two replicate samples will be collected from nine trees in the wooded area to the west of the north entrance road. Twig and leaves will be collected using scissors. Samples will be screened and packaged on-site for off-site analysis. Personnel performing this sampling will be required to monitor themselves for radioactive contaminants using a beta-gamma survey meter prior to leaving the site.

#### E) Surface Radiation Field Measurements

During this phase of work, personnel will characterize emissions from beta and gamma emitters in surface soils. No work zones are required to prevent access to the work site. Personnel performing the work are required to restrict access to non-authorized personnel to the work area. Personnel performing surface radiation measurements will be required to monitor themselves for radioactive contaminants using a beta-gamma survey meter prior to leaving the site.

### 3.0 TASK ACTIVITIES/WORK PLAN

#### A) Ecological Assessment

Field biologists will walk over the study area and note general habitat types, dominant plant

species, approximate species abundances, and canopy height. Mammals, birds, and herpetofauna will be noted as they of signs of them are observed. Rocks and logs will be overturned to look for reptiles and amphibians. Wetlands and signs of wetlands will be noted. No samples will be obtained during this phase of work.

**B) Geologic/Hydrogeologic Sampling**

Eight groundwater wells are to be installed at five locations. Normal operations consistent with groundwater well installation will be performed (see Attachment 1). Well drilling equipment will be either a cable-tool or auger rig. During the installation of each well a field geologist will record all field measurements and well-construction information. Sampling and logging of the subsurface materials will be performed by a field geologist during drilling activities. Split-spoon samplers will be used to collect soils and samples will be prepared from each split spoon. Remaining sample material will be archived for future use. Samples being shipped off-site will be screened for radioactivity and volatile organics and packaged on-site.

Each well will have casing installed. Each completed well will be developed to ensure hydraulic communication with the aquifer. All development water will be collected and brought into the WEMCO process area for disposal.

Water levels will be monitored monthly thereafter. Prior to opening of a well cap, an HNu will be used to confirm the absence/presence of volatile organics. If a positive response is obtained from the HNu health and safety personnel will be contacted before proceeding.

**C) Geotechnical Sampling**

Eighteen borings will be made to a depth of approximately 30 feet on average. Drilling will be conducted using standard hollow-stem auger drilling techniques. Samples will be collected using thin wall Shelby tubes driven ahead of the auger. Each Shelby tube sample will be field screened for organics using an HNu and for radiation using a beta-gamma probe. Selected samples will be radiologically screened and packaged on-site for shipment to outside analyses laboratories. All remaining samples will be archived for future use.

**D) Risk Assessment Sampling**

Samples will be collected in conjunction with the geologic and geotechnical investigations. One surface soil sample will be collected within five feet of each boring using a sample spoon. Sample depth will be limited to within six inches of the surface. One subsurface soil sample will be collected from each boring. All samples will be radiologically screened and packaged on-site for shipment to outside analysis laboratories.

**E) Surface Radiation Field Measurements**

Radiation field surveys will be conducted by field personnel over-walking the study area. Surface contamination and exposure rates will be measured using portable radiation detection instrumentation. The survey will utilize a grid coordinate system to ensure that the radiation fields are well characterized.

## 4.0 HAZARD ASSESSMENTS

The following hazard identification is based on historical information obtained from WEMCO personnel, reports, and drawings; and on a walkover survey of the study area. Additional evaluation criteria were: a) the seasons of the year when work is to be performed, b) experience of similar work packages, and c) worker experience. Capital letters are used in back of each hazard to identify which hazards are pertinent to each task. "E" is used for Ecological Assessment, "H" is used for Geologic/Hydrogeologic Sampling, "G" is used for Geotechnical Sampling, "R" is used for Risk Assessment Sampling, "W" is used for water crews, and "S" is used for Surface Radiation Field Measurements.

Current well data indicate minimal to non-detectable concentrations of hazardous materials. To date air sampling data at well installations with known radioactive and hazardous materials have not shown airborne concentrations above background. The only exception to this is during the grouting operations when airborne dust exceeds silica limits. Interviews with facility personnel indicate little or no significant physical hazards. Review of environmental monitoring data indicate very low levels of radioactive surface contamination in the study area.

Measurements of electrical/magnetic field strength under the high voltage power lines are within acceptable limits. Visual inspection of the transite walls associated with the incinerator shows the transite to be in good repair. Therefore, the potential for exposure to asbestos is very minimal and no asbestos monitoring will be required.

In addition to this assessment, the field team routinely reassesses the hazards before starting work to assure that conditions have not changed. All newly identified hazards will be addressed with the ASI/IT Health and Safety professionals to determine the degree of hazard and if any changes to the safety plan are warranted.

## A) Physical Hazards

Many of the physical hazards listed below do not have monitoring requirements but instead rely on worker observation. In the area of flora, fauna, and environmental factors this is especially true. Workers need to be aware of potential hazard posed by physical factors and react appropriately, normally avoidance is the easiest method.

Operation of drill rigs (see Attachment 1)	H G R
Welding and grinding of well casing	H G R
Noise due to drilling and grinding operations	H G R
Heat stress (see Attachment 2)	E H G R S W
Cold stress (see Attachment 3)	E H G R S W
Heavy equipment operation	H G R
Slick surfaces around drill rigs (slips and falls)	H G
Slick surfaces in the environs of the study area (slips and falls)	E H G R S W
Tripping hazards due to deadfall of trees, mammal dens, fences, etc.	E R S

Dairy and other farm animals in grazing areas	E H G R S W
Local fauna: snakes, mammals, arachnids, insects, etc. (see Table 1)	E H G R S W
Local flora: poison ivy, poison oak, wood nettle	E H G R S W
Overhead power lines: high voltage transmission and 240 volt lines	E H G R S W
Underground utilities: gas, telephone, water, and sewage	H G
Fences around grazing animals: electric and barb wire	E S
Underground building rubble in old administration building area	H G R
Fuel for drill rigs and field equipment	H G R
Unspent ammunition from training exercises and from skeet shooting	E S
Poor housekeeping around the drilling sites	H G R

#### B) Chemical Hazards

Potential chemical hazards near and in the fire training area are: oil base paints, solvents, paint thinner, used motor oil, used lubrication oil, kerosene, gas, diesel fuel, etc.	H G R W
Fuel for drill rigs	H G R
Lead shot in the old skeet shooting range	E G R S
Chlorine fumes near the sewage treatment plant	E G R S
Appropriate MSDS forms are found in Section 15.	

E H G R S W

#### C) Radiological Hazards

Surface soil contamination (total uranium) is at or slightly above background in the study area ranging from 3 to 9 pCi/g with background being approximately 2 to 4 pCi/g. One exception to this is north (approximately 150 feet) of the old incinerator where activity is about 80 pCi/g.

Direct shine from old incinerator is approximately 50 uR/h at the fence.

Airborne contamination as measured in the 1989 and 1990 environmental monitoring program is at background levels in the study area for all radionuclides.

Radon in the study area is in the 0.6 to 0.9 pCi/l range with background ranging from 0.4 to 0.6 pCi/l.

Subsurface water in the study area has approximately 1 pCi/l of U. The proposed EPA drinking water standard is 30 pCi/l, therefore, the subsurface water represents a minimal radiological hazards.

## 5.0 STANDARD OPERATION PROCEDURES

Sample collection, well installation, well development, and water level measurements will be performed in accordance with the "Engineered Waste Management Facility Sampling and Analysis Plan," U.S. DOE, August, 1991. Methods are also described in the Remedial Investigation/Feasibility Work Plan and in the

## RI/FS Quality Assurance Program Plan.

Operation of drill rigs for installation of wells and borings will be performed by Penn Drill personnel assigned to the task and will follow the guidance in Attachment 1.

### 6.0 EDUCATION AND TRAINING

Project field personnel shall engage in field activities until they have been trained to a level commensurate with their job function, responsibilities and the degree of anticipated hazards. The following worker categories specify required pre-training.

#### A) Worker Category

1. General site worker: 40-hour OSHA, 24-hour supervised field training, 8-hour refresher as needed, WEMCO safety training: OSHA and You, Fire Extinguisher, General Safety (typical personnel under this requirement: drillers, driller helpers, lead geologist, sampling technicians, water level measurement technicians, and health and safety technicians)
2. Occasional site worker: 24-hour OSHA, 8-hour field training, 8-hour refresher as needed, WEMCO safety training: OSHA and You, Fire Extinguisher, General Safety (typical personnel under this requirement: field survey personnel and site project managers)
3. Site supervisor: same as 1 plus 8-hour supervisor training (typical personnel are lead geologist, lead biologist, other field supervisory personnel, etc.)
4. Ecological study personnel: same as 2.

#### B) Safety Meeting

1. All personnel working on the EWMF field investigation work will attend a "Kick Off" safety meeting which will review scope of work, review the requirements and hazards listed in this health and safety plan, and document their training by signature in this document. The Kick Off meeting will be conducted by a Health and Safety representative. Separate Kick Off meetings will be performed with well development and water level measurement crews at a later date. Personnel new to the site will be informed of all applicable information given in the initial Kick Off meeting.
2. A Tailgate Safety Meeting will be conducted daily during work periods. Meeting time will be prior to the start of daily work tasks. Meeting topics and attendees will be documented on a Tailgate Safety Meeting form. Topic areas that can be addressed in a meeting are:
  - work operations
  - personal protective clothing
  - air monitoring data
  - hazard communication
  - hearing conservation

- monitoring results
  - hazard identification
  - operational safety
  - physical stress
  - emergency procedures
  - communications
  - housekeeping
  - general safety topics
  - special topics as assigned by ASI/IT Health and Safety
3. Visitors to the site will be trained to a commensurate level to this health and safety plan prior to obtaining access, i.e., within the work zone, to any well drilling or boring site.
4. Visitors to the study area where ecological studies, radiation field survey studies, and surface soil sampling will be advised of the potential hazards and necessary precautions to be followed prior to being allowed to stay in the immediate work area of field personnel, i.e., the study region being covered during the days activities.

TABLE 1  
ANIMAL HAZARDS  
INSECTS, ARACHNIDS, AND CENTIPEDES

Organism	Description	Habitat	Problem	Severity	Protection
Assassin Bug	Usually gray with well-developed wings. Has a "cogwheel" crest on the thorax which is distinctive.	Tree trunks and grassy vegetation.	Stabs with mouth parts. Mildly venomous.	Can cause secondary infections and anaphylactic reactions vector for chagas disease.	Avoidance. If one lands on you, do not swat it. Instead, brush it off quickly.
Bees	Generally has yellow and black stripes and two pair of wings.	Hollow logs, underground nest, old buildings	Stings when annoyed. Leaves venom sac in victim.	If person is allergic nausea, shock, unconsciousness, or constriction of the airway, can result. Death may result.	Be careful and watch where you walk. Wear head netting and cover exposed skin. Avoid areas where bees are swarming. Avoid wearing sweet fragrances and bright clothing. Move slowly or stand still if bees are swarming about you.
Brown Recluse Spider	Eight long legs, light yellow to brown in color. Has distinctive fiddle shaped mark on back.	Old trash piles debris, rough ground, under old boards, etc.	Bite may be painless. Victim rarely sees the spider.	After two to eight hours, pain may be noticed followed by blisters, swelling, hemorrhaging or ulcerations. Possible rash, nausea, jaundice, chills, fever, cramps or joint pain.	Check inside shoes or clothing if left outside. Wear gloves when looking under objects. Use caution in old buildings.
Black Widow Spider	Dark brown to glossy black. Red or yellow hour glass marking on underside.	Vacant rodent holes under stones, logs in long grass, brush piles, hollow stumps.	Bites cause local redness. Pain is immediate. Larger muscles become rigid. Usually becomes difficult to talk.	Venom is more toxic than a rattle snake's but given in smaller amounts. Approximately 5% of bites result in death.	Wear gloves when working in areas where black widows might be.

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TABLE 1  
ANIMAL HAZARDS  
INSECTS, ARACHNIDS, AND CENTIPEDES

Organism	Description	Habitat	Problem	Severity	Protection
Centipedes	Fast-moving and wormlike with fairly long legs. Only one pair of legs per body segment.	Under logs, old boards, stones, etc.	Venomous with large fangs to inject venom. Can kill mice.	Severe pain followed by redness and swelling. Can cause necrosis or tissue ulceration.	Wear gloves if looking under rocks, boards or logs.
Chiggers	Red velvety covering and oval body. Very tiny approximately 1/20 of an inch long.	High grass or weeds	Attaches to victim by inserting mouthparts into a hair follicle. Injects a digestive fluid that causes cells to disintegrate on which it feeds.	Causes swelling and considerable irritation. May transmit serious diseases.	Apply insect repellent to clothing and skin. Spray or dust infested areas.
Hornets	One inch long with some body hair. Abdomen is mostly black.	Round, paperlike nest hanging from trees, shrubs or under eaves of buildings.	One nest may contain up to 100,000 hornets which will attack in force at the slightest provocation.	Severe pain, allergic reactions similar to bees.	Do not come near or disturb nest, if one investigates you, do not move.
Mosquito	Small dark fragile body with transparent wings. From 1/8 to 1/4 inch long	Where water is available for breeding.	Bites and sucks blood. Itching and swelling result.	Can transmit encephalitis and other diseases. Scratching causes secondary infections.	Use plenty of insect repellent. Wear mosquito head net and gloves. Stay in windy areas.
Ticks	Oval shape with a small head. Brown or gray in color. Sizes range from 1/4 inch to 3/4 inch. Species are dog ticks, deer ticks, wood ticks and seed ticks	Shrubs, grass and trees.	Will attach to the skin and suck blood. Secondary infection is a real problem.	Vector for rocky mountain spotted fever, Q fever, tularemia, Colorado tick fever and Lyme disease.	Cover exposed areas of the body. Use insect repellent. Remove ticks attached to clothing, check neck and hair areas. Take hot showers and use soap.

L. Vittitow  
SAMPLING.HSP  
May 29, 1991

TABLE 1  
 ANIMAL HAZARDS  
 INSECTS, ARACHNIDS AND CENTIPEDES (Continued)

Organism	Description	Habitat	Problem	Severity	Protection
wasp	Very thin waist. Color can be black, yellow or orange with stripes.	Underground nest. Paperlike honey comb nest in abandoned buildings, hollow trees, etc.	Stings. Some species will attack if you get too close to the nest.	Severe pain, allergic reactions similar to bees. Can be fatal.	Avoid nest. Do not swat at them.

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L. Vittitow  
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 May 29, 1991

TABLE 1  
ANIMAL HAZARDS  
ANNELIDS AND REPTILES

Organism	Description	Habitat	Problem	Severity	Protection
Common Water Leech	Body is segmented, suckers on the anterior and posterior end, moves by looping movement like an inch worm. One to four inches long.	Ponds, lakes and quiet streams	Attaches to the skin and sucks blood.	Mostly a nuisance. Can cause secondary infections.	Stay out of the water or use waders. Always check yourself for leeches after getting out of the water. Remove by touching with a hot match or shave off with a knife point. Use betadine on wound.
Common Snapping Turtle	Can grow to 18.5 inches long and weigh up to 86 pounds.	Slow moving streams and ponds foraging along the bottom or floating on the surface	Bites with powerful jaws and scratches with claws. These turtles are very quick.	A large turtle can break a broom handle. They can break a finger and they do not let go even if you cut the head off. Secondary infections from bite or claw wounds.	Avoid snapping turtles. Leave them alone.
Copperhead Snake	Generally one to three feet long with chestnut brown hourglass markings on the back. The belly is white and the head is copperish or pinkish in color. It has cat-like slit eyes and a heat sensing pit organs between the eyes and nostrils. The head is triangular shaped and the vent scute (scale) is not segmented.	Behind or underneath rocks, pipes, wood piles or boards	Bites with long, hinged front fangs, which can deliver 40-70 mg of hemotoxic venom.	The estimated LD <sub>50</sub> dose for man is 100 mg	Learn to recognize a copperhead and avoid their habitat. Wear heavy leather high-top boots.
Eastern Timber Rattle Snake	Size ranges from 3.5 feet to 5 feet in length. Has a thick body and a triangular shaped head. The eyes are split like a cat's. There is a wide color variation, which includes a dark and light phase. The tail terminates in series of buttons which gives the rattle snakes its name.	Generally found in rocky areas either sunning itself on a rock or coiled under a rock ledge	Bites with front fangs, which can be 13 mm long. Can deliver 100 to 200 mg of hemotoxic venom.	The estimated LD <sub>50</sub> dose for man is 75 to 100 mg.	Learn to recognize rattle snake habitat. Do not stick your hands into places you cannot see into. Wear heavy leather high-top boots and or snake leggings.

Organism	Description	Habitat	Problem	Severity	Protection
Coyotes	Large gray or reddish gray canids which look like a small german shepherd dog. Long yellowish legs with a dark vertical line on the lower foreleg. Tail is bushy with a black tip. Belly and throat area is white.	Dens are found in riverbanks and drainage slopes. Brushy areas.	Rabid animals	Bites can transmit rabies to humans.	Leave coyotes alone. If you run, they will chase you, so don't. Have a big stick or rock available.
Red Fox	Small and dog like. Has elliptical pupils, white underside, throat and chin. Upper coat is rusty-reddish and the tail is long with a white tip. Ears are pointed and the lower legs are black.	Wooded areas, brushlands, cultivated areas	Rabid animals	Bites can transmit rabies to humans.	Leave foxes alone.
Feral Dogs	Domestic dogs which have gone back to the wild. They are of many breeds. Usually weary of humans.	Farmland, forest	Wild dogs hunt in packs. If food is scarce or a human looks vulnerable, they have been known to attack.	People have been killed by wild dog packs. Note that most dog attacks are by pets.	Running will trigger a chase response from dogs. A human will not out run a dog pack. The best defense is avoidance. Defenses include mace spray, a spray bottle filled with ammonia or a good walking stick. If possible, climb a tree and wait for help.
Feral Cats	Domestic cats that have gone back to the wild. They are of many breeds.	Farmland, forest	Fearsome fighters if cornered. Bites and scratches.	Can transmit rabies, cat-scratch fever, toxoplasmosis and hookworms.	Leave cats alone. Do not pickup a wild kitten.
Skunks	The striped skunk is black with two broad white stripes on the back and a thin white strip down the center of the face. Large bushy tail tipped with white. They waddle when they walk.	Found all over the U.S.	Defensive spray, chief carrier of rabies in the U.S.	Spray has a strong fetid odor. Can cause a temporary loss of vision and intense burning pain. Bites can transmit rabies to humans.	Stay away from skunks. Their spray has a range of 10 to 15 feet. If you should come across a skunk, stand still until it leaves.

## 7.0 MEDICAL SURVEILLANCE

All personnel working on the EWMF field study program will be required to have a current physical and a medical summary form on file in the ASI/IT Health and Safety department files prior to any field work covered within the scope of the EWMF Sampling and Analysis Plan. The medical summary must contain a medical physician's assessment and disposition statement which contains wording to the effect that the individual is medically capable and authorized to wear a respirator and personal protective equipment, and that the individual can work at a hazardous work site.

Any medical restriction noted on a persons medical summary form will be compiled with until such time as new documentation rescinding the restriction is received by the ASI/IT chief of Health and Safety or his designee.

## 8.0 MONITORING

### A) Physical Hazards

Noise monitoring due to drill rig operation and grinding will be performed initially to determine time weighted average (TWA) noise levels using a noise dosimeter. Periodic remonitoring will be required when a different drill rig is used or when noise levels increase over that previously monitored. **Action Levels:** >85 dBA TWA or >140 dBA impact noise. **Action:** hearing protection required.

Heat stress monitoring will be performed when daytime temperatures exceed 80° F. A WGBT Heat Stress Monitor HS-371 will be used to determine effective temperature and work/rest periods will be determined. **Action Levels:** Core or deep body temperature  $\geq 99^{\circ}$  F. **Action:** take more frequent breaks, additional fluid intake, and more frequent monitoring.

Cold stress monitoring will be performed when daytime temperatures are less than 40° F. a Taylor wind chill meter or thermometer and wind speed indicator will be used to determine effective chill temperature. **Action Levels:** Cooling rate of 1750 W/m<sup>2</sup> or when wind chill charts indicate a temperature less than -20° F. **Action:** protect exposed extremities from cold, take frequent breaks to warm the individual, consume warm fluids.

Electromagnetic field exposure will be monitored prior to the start of any field operations. Areas of monitoring will be under overhead power lines, near transformers, or other large electrical equipment. An ELF radiation survey meter (50-60Hz) will be used to measure all exposure rates. **Action Levels:** E field >25 kv/m, H field >1 mT or 0.1 mT for pacemaker wearers. **Action:** withdraw from the area.

Underground utilities will be identified by the Ohio Protection Services (phone 800-362-2764). No action limits are applicable to this item other than no ground penetration will be allowed within 15 feet of any identified underground utility.

### B) Chemical Hazards

Volatile organics will be monitored using an HNu or equivalent meter on an intermittent basis

during the drilling of any well or boring. Monitoring will be done in the breathing zone, at the borehole and on the Shelby tubes to determine the presence of volatile organics. An HNu will be used to monitor the well and head space, and worker breathing zone prior to development, sampling, and measurement of a well. **Action Level:** detection to 10 ppm in breathing zone. **Action:** withdraw from the area or use APR's with an organic vapor/acid gas/HEPA filter cartridge.

Chlorine vapors will be monitored using Drager Tubes specific for chlorine (0.3 to 5.0 ppm range) when work is to be performed in the immediate vicinity of the waste treatment facility. **Action Level:** 0.5 ppm. **Action:** use of APR's with organic vapor/acid gas/HEPA filter cartridge.

#### C) Radiological Hazards

Radiological hazards will be monitored using a beta/gamma survey meter (HP 210 probe or equivalent) on an intermittent basis during the drilling of any well or boring, water sampling, water level measurement, and during any personnel frisking. Monitoring will be done at the borehole and on Shelby tubes to determine the presence of radioactive contaminants. A pre-job survey of the well and boring locations will be performed using a Micro-R meter and a beta/gamma survey meter to detect areas having high surface contamination levels. **Action Level:** >2 mR/h or >5000 cpm beta/gamma. **Action:** withdraw from the area and contact ASI/IT Health and Safety personnel.

Airborne particulate radioactivity samples will be taken with breathing zone air sample pumps (2 lpm) if surface soil contamination exceeds 10% of the action level. **Action Level:** surface soil contamination >5000 cpm/100 cm<sup>2</sup>.

Full face respirators with a particulate cartridge will be worn if air sampling data indicate airborne activity > 2 E-12 uci/ml.

Radon will not be monitored for as existing environmental monitoring data shows that concentrations are significantly below regulatory limits.

## 9.0 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Level D clothing will be required as a minimum for all field personnel collecting samples within the FEMP property boundary. Level D clothing is basically a work uniform and provides no protection against chemicals. Level D is intended for use on sites where the risk from chemical contaminants is very low to non-existent. **Level D clothing is not street clothes!** Level D clothing consists of:

- safety shoes
- safety glasses or goggles (safety glasses ANSI Z87.1 approved)
- coveralls
- work gloves
- hard hat (when in drilling exclusion zone)

Hearing protection will be required when noise levels exceed 85 dBA TWA for any field operation or impact noise exceeds 140 dBA.

For cold weather, appropriate personal clothing should be worn to protect against exposure to the elements. In this situation, oversize Tyvek will be used as an outer coverall meeting the requirement of Level D clothing. Hard hat liners will be provided by Health and Safety personnel upon request.

Personnel walking over the area outside of the FEMP property shall be required to wear safety shoes and safety glasses for eye protection.

If monitoring results indicate readings to any chemical greater than 50% of the PEL or radiological contaminant at 10% or greater of the Action Limit, Level C clothing will be required. Level C clothing consists of :

- hard hat
- face shield (optional)
- air purifying respirator with appropriate filter cartridges (HEPA filter for particulate and combination particulate-organic vapor/acid gas for particulates and chemical vapors)
- disposable outer coverall (Tyvek, Saranex, or equivalent)
- Inner gloves (latex or nitrile)
- Outer chemical resistant gloves
- Chemical resistant boots
- Outer disposable booties (latex)

## 10.0 SAFETY EQUIPMENT

All field teams will be required to have available two methods for communication with FEMP site and ASI/IT. Normally this requirement will be satisfied by the use of a Cellular Phone and a two-way radio operating on the same frequency as the FEMP site radio frequency.

A fire extinguisher will be required for all drilling operations. During welding or grinding operations, the fire extinguisher shall be off the drill rig and in close proximity to the individual standing fire watch.

An emergency eyewash is required at drilling sites.

All drilling and boring operation sites will be posted to the requirements of ASI procedure FPP 19.07 Work Site Identification and Posting.

Personal decontamination supplies will be required for personnel operating the drilling rigs to be used for removal of any chemical or radiological contamination.

Equipment decontamination supplies will be required at each sample location or collection site where sampling equipment is to be decontaminated prior to any further sampling work. These supplies consist of collection basins, appropriate decontamination agents, plastic bags for collection of solid wastes, and collection drums for liquid wastes.

A safety harness is required for any person climbing the drill rig mast.

## 11.0 DECONTAMINATION PROCEDURES

On well sites or boring sites, a decontamination area will be set up for the removal of possible contamination of personnel, PPE as required for the removal of Level C clothing, and equipment. Dry decontamination will consist of the removal of the outer protective clothing (Tyvek, booties, gloves, respirator, etc.). Plastic bags will be used to collect the generated waste and used respirators. The bags of waste are to be handled according to ASI procedure FPP 19.06. Used respirators will be returned to the WEMCO respirator cleaning facility.

All field personnel will be required to monitor themselves for radioactive and organic contamination as required in this plan using an HP 210 probe or equivalent for beta/gamma and an HNu or equivalent for organics. In the event of skin contamination, notify an ASI/IT Health and Safety person who will come to the site and assist in getting the contamination removed. If a Health and Safety person is not available, the affected area is to be covered and the individual involved is to report to WEMCO HPs for decontamination. Skin contamination is to be removed only by ASI/IT Health and Safety or WEMCO HP.

Chemical contamination will be removed by washing with soap and water and rinsing the affected area. These steps will continue until monitoring results are negative.

Equipment will be decontaminated as required by the EWMF sampling plan, or the RI/FS QAPP. If the decontamination is to be performed in the field, an area will be set up where this is to take place. A ground cloth will be required to collect any spillage of the decontamination agents. Appropriate containers will be used to wash, rinse and dry the equipment such that all liquid is collected. Waste liquids are to be collected in a container and held until turned over to WEMCO for final disposition. Dry wastes are to be handled according to ASI procedure FPP 19.06. Personnel performing the decontamination shall wear gloves, aprons, and safety glasses or face shields or respirators as required.

## 12.0 EMERGENCY PLANS

WEMCO has an established Emergency Response Plan and organization and this will be utilized for any emergency. The WEMCO program includes emergency medical service, fire suppression service, and security on all shifts, seven days a week. ASI/IT personnel will not attempt: a) a confined-space rescue, b) to fight significant fires, c) to control significant chemical spills, or d) to stop significant releases. When necessary, contact CONTROL by radio or by calling 738-6511 on the phone system.

In the event of an accident or injury, Bruce Myers (ASI) will be contacted (mobile 1 646-9504 or office 738-9221) who will then contact the WEMCO AEDO by phone (738-6431). In the event that Bruce cannot be reached, the lead geologist or field leader will call the AEDO and inform him of the situation status. Written reporting requirements will be directed by the AEDO.

### 12.1 Injuries

In the event of injuries, site personnel will try to minimize the consequences as directed by WEMCO Medical when possible. The process of determining what is appropriate to do requires that each situation be evaluated on a case-by-case basis.

#### A) Minor Injuries

Minor injuries (sprains, strains, and cuts) are expected to be taken to WEMCO Medical for first

aid. Field treatment will be limited to pressure bandaging to control bleeding. All injured personnel will report to WEMCO Medical in a timely manner for final treatment and evaluation of injuries, and all injuries will be reported to ASI/IT project health and safety (Stephen Duce).

#### B) Serious Injuries

WEMCO CONTROL will be notified immediately of any serious injury by radio or calling 738-6511. The ASI/IT crew will use standard first aid procedures to stabilize the bleeding and or treat for shock pending arrival of WEMCO response personnel. CPR should be administered only by person currently certified in CPR. Prior to performing CPR, the rescuer should consider what caused the victim to collapse. Chemicals around the nose and mouth can endanger the rescuer. Additionally the rescuer should use latex gloves and a pocket mask resuscitator with a one way valve or filter, when available, to minimize exposure to contagious pathogens.

#### C) Chemical Splashes

##### Eyes

Move the victim to an uncontaminated area. Hold the victim's eyes open and flush eyes for 15 minutes with water or isotonic saline. The natural response to eye pain is to close the eyes. The rescuer must keep eyes open to remove chemicals from under the eyelids. The flushing solution can cause extreme discomfort if it is too hot or too cold; try to maintain solution near body temperature.

Additionally:

- Notify CONTROL
- Request an ambulance
- Location of injured employee
- Tell CONTROL the name of the chemicals, if known
- Tell CONTROL what was done to treat the patient(s)
- Tell how many patients to expect

##### Skin

Skin contamination can involve less hazardous chemicals (methanol) or strongly hazardous chemicals (strong acids). Treatment for skin contamination should take into account the concentration and effects of the chemical(s) involved. As a general rule, the following steps should be performed. Move the victim to an uncontaminated location. Remove contaminated clothing and wash the affected skin areas. Flush the skin for 15-30 minutes and notify Medical.

#### D) Injuries Complicated by Contamination

Radio CONTROL or call 738-6511. All injuries within the process area will be assumed to involve contamination until proven otherwise by WEMCO. Injuries complicated by chemical contamination will be evaluated after considering the hazards associated with the contamination. In most instances, the site contamination is of concern only if long-term exposures occur. In these instances, the injury will be given the highest priority and contamination will be reduced as soon

as practical.

Injuries of personnel contaminated with acutely toxic chemicals will be treated so as to minimize the hazard to both the rescuer and the victim. If the rescuer cannot safely attempt rescue, he/she should not attempt it.

E) General Procedures for Injuries

- The victim should be moved into an uncontaminated area and given a preliminary decontamination.
- Preliminary decontamination generally consists of flushing with water to dilute and remove most of the chemical. It also includes removal of contaminated clothing.
- As soon as the chemical hazard has been reduced to an acceptable level, the rescuer should stabilize the victim. More thorough decontamination can be performed at a later time.
- Care should be taken to minimize the spread of contaminant through runoff.
- Notify WEMCO CONTROL of:
  - The chemical involvement
  - Any field instrument readings
  - Extent of injuries
  - What treatment has been performed (including decontamination)
  - Number of victims
  - Your location
  - Telephone number
- CALLER HANGS UP LAST. The dispatcher is trained to be calm and ask for the appropriate information in the order that it appears on his/her form. In some instances, the facility may be complex and require additional information such as cross streets or an escort from the entrance to the site.
- If rescuer calls the hospital, notify the emergency room and the ambulance service of the chemical involvement so that they can prepare for the arrival.

## 12.2 CHEMICAL/RADIOLOGICAL RELEASES AND SPILL CONTAINMENT

The proposed operations pose a possibility for spilling or releasing hazardous materials. Potentially spillable materials include gasoline and methanol. There is also a possibility that the boring itself may release pressurized, reactive, or highly volatile materials. If a minor spill of methanol or gasoline (<1 gal) occurs, ASI/IT will take steps to control or clean the release such as shoveling contaminated soil into a drum. If a large release in the form of a spill greater than one gallon, or a vapor cloud is observed, ASI/IT personnel will immediately withdraw at least 300 feet upwind or offwind and notify WEMCO emergency services.

Radio CONTROL or call 738-6511. CONTROL will dispatch the necessary personnel to handle the situation. If possible, the following information should be included in the notification:

- Cause of release, if known
- Location of release

- Chemical identity
- Quantity involved
- If radioactive material is involved
- If materials are leaving the area as a vapor/gas
- If fire is involved
- The number of known exposures or injuries (if any)

Additional information may be requested such as:

- What has been/is being done to minimize the hazard
- Degree of hazard to responders based on caller's knowledge of the contaminants

### 12.3 FIRE HAZARDS

Radio CONTROL or call 738-6511. Fire hazard operations include field activities such as drilling containers of pyrophoric materials, using flammable decontamination solutions, etc. Report all fires before making any effort to control or fight the fire. All uncontrolled fires will be reported to WEMCO, and the fire brigade requested before attempting any fire suppression activity. Small fires which appear to be controllable by field personnel will be controlled only if the safety of the field personnel is not jeopardized.

### 12.4 ADVERSE WEATHER

Work will be stopped if lightning, heavy or persistent rain, or other adverse weather conditions are in the area. This includes any weather conditions whose impact is judged to be detrimental by the drill crew, ASI/IT field staff, or appropriate Health and Safety representatives.

## 2.5 EMERGENCY TELEPHONE NUMBERS AND POINTS OF CONTACT

Ambulance:	(513) 738-6511	Radio
Hospital:	(513) 738-6511	CONTROL
Fire:	(513) 738-6511	CONTROL

## POINTS OF CONTACT

ASI/IT

	Work	Home	Radio
Bill Kwoka, H&S (WMD)	(615) 483-1274		
Alvin Luttrell, V.P. (WMD)	(615) 483-1274		
John Wood, Project Director	(513) 738-3100		
Bruce Myers, Field Manager	(513) 738-9221		1-646-9504
Stephen Duce, H.P., HSO	(513) 738-3100		
Lee Vittitow, Sr. IH	(513) 738-3100		
Greg McAnarney, H&S (Corp.)	(505) 828-0959		

WEMCO

Utility Engineer	(513) 738-6295	202
Industrial Hygiene	(513) 738-6207	357
Radiation Safety	(513) 738-6889	355
Fire and Safety	(513) 738-6235	303

ADDITIONAL HELP NUMBERS

Center for Disease Control	(404) 633-5313
Chemtrec	(800) 424-9300
CMA Chemical Referral Center	(800) 262-8200
DOT Hazardous Materials Information	(202) 366-4488
Emergency Planning and Community Right-to-Know	(800) 535-0202
Federal Emergency Management Agency	(817) 898-9104
National Response Center Hotline	(800) 424-8802
Occupational Safety and Health Administration	(800) 582-1708
American Chemical Society	(202) 872-4600
Substance Identification	(800) 848-6538
National Safety Council	(312) 527-4800

## HOSPITALS

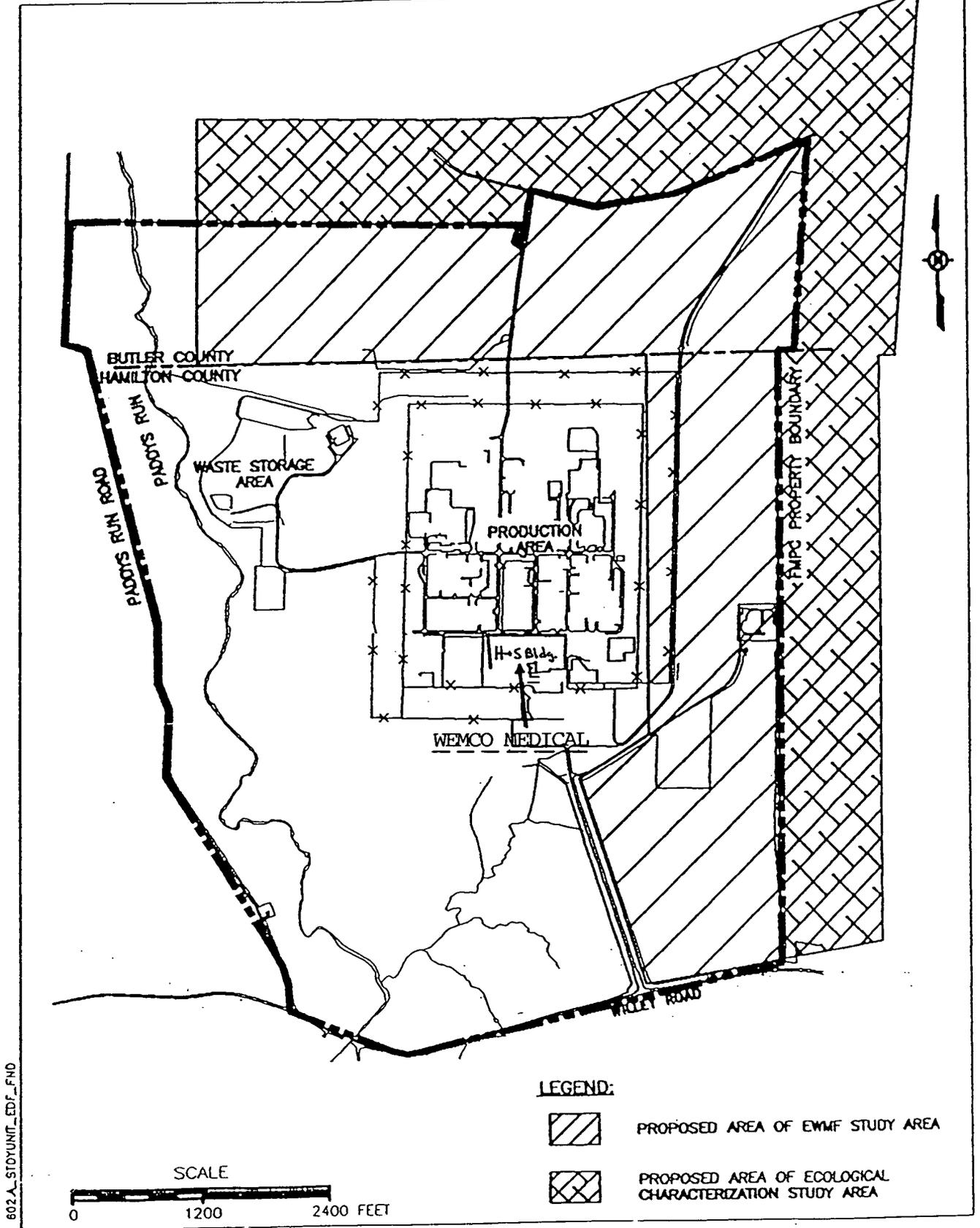
The nearest medical facility is the WEMCO medical department. It is the primary choice for on-site injuries. First aid and ambulance service is available at the WEMCO medical department. Radio or call 6511 to contact CONTROL. WEMCO maintains an emergency response capability which includes an ambulance and EMT trained personnel. The WEMCO ambulance will transport the injured workers to the nearest hospital if necessary.

If WEMCO ambulances are unavaible for any reason, CONTROL will call for a community ambulance. The lead geologist should confirm that an ambulance has been called. Location of the WEMCO Medical Department can be seen in Figure 3.

## 13.0 AMENDMENTS

This Health and Safety Plan is based on information available at the time of preparation. Unexpected conditions may arise which require reassessment of safety procedures. It is important that personnel protective measures be thoroughly assessed by the supervisor in charge and that an ASI/IT Health and Safety representative prior to and during the planned task activities. Unplanned activities and/or changes in the hazard status shall require a review of and may require changes in this plan.

Changes in the anticipated hazard status or unplanned activities are to be submitted as an amendment to this Health and Safety Plan. All changes and amendments shall be approved by the plan author, ASI/IT Health and Safety, and WEMCO IRS&T.



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**LEGEND:**



PROPOSED AREA OF EWMF STUDY AREA



PROPOSED AREA OF ECOLOGICAL CHARACTERIZATION STUDY AREA

**SCALE**

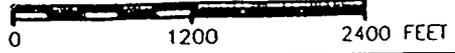


Figure 3 Route to WEMCO Medical





15.0 ATTACHMENTS



**12.0 DRILL RIG OPERATIONS****12.1 Drilling Hazards****12.1.1 Underground Hazards**

No ground penetration employing heavy equipment is permitted until WMCO IRS&F personnel have determined that underground utilities, as listed below, are not present:

- Electricity
- Gas
- Sewer
- Telephone (metallic and fiberoptical cables)
- Water
- Steam
- Cavities
- Storage tanks

**12.1.2 Overhead Hazards**

Always maintain the following distances/clearances:

- 10 feet from a 50 KV or less line
- 20 feet from a 50 to 345 KV line
- 34 feet from a 345 to 750 KV line
- Buildings (25 foot clearance needed to raise boom)
- Tree limbs (25 foot clearance needed to raise boom)

**12.1.3 Noise**

Noise can exceed the levels set by OSHA during certain operations such as driving a split spoon. Hearing protection shall be worn any time noise levels exceed 85 dBA over a time weighted-average.

**12.1.4 Miscellaneous Hazards**

- Lightning
- Rain on cathead
- Weak cables, ropes or hydraulic lines
- Loose fitting clothing which tends to snag on the rotating auger
- Volclay contains crystalline silica which can cause silicosis
- Ice hazards
- Tornadoes

**12.2 General Procedures****12.2.1 Safety Responsibilities**

No one but the drillers should be within four feet of the rotating auger. Monitoring should be performed during periods of auger change or when the auger is stopped.

The drilling crew is responsible for maintaining the drill rig and stopping work if unsafe conditions develop. The designated health and safety personnel are expected to be familiar with the chemical and radiological hazards associated with the site operations, but are not experts in drill rig operations. If they notice something that appears to be a hazard, they will notify the drillers so that the drillers can assess the condition. Action (or lack of) taken will be documented. The safety personnel will also assure that:

- The drilling crew demonstrates to the field team that the kill switch is functional, showing its location. No drilling is to be permitted if the kill switch is not operational or if the field crew is not familiar with its location and operation.
- A minimum of two persons will be present at the drill rig at all times of operation.
- Respiratory protection and protective clothing will be worn when the conditions mandate it. It is true that PPE impairs the operator's vision of activities and that heavy gloves and SCBA tanks can make normal operations, such as turning a valve or picking up tools, more difficult to perform. In Level A suits the heat-load buildup from hard work can become dangerous if not properly monitored. For these reasons it is not practical to use Level A protection for all operations, nor is it necessary. But the worker should remember that some of these operations involve materials which are called hazardous for a reason. Although these hazards are listed in the Health and Safety Plan and are known to the managers, the ultimate responsibility for using the proper PPE lays with the individual, who will be the one to pay the ultimate price.
- That at least five feet of clearance is maintained on all sides of the drill rig for emergency egress.

#### 12.2.2 PPE

PPE should include:

Hard hat  
Eye protection such as safety glasses or goggles  
Safety boots  
Hearing protection  
Gloves



#### 14.0 HEAT STRESS

Heating of the body occurs from three sources:

1. Radiant heating from heat sources or sunlight
2. Convective heating from contact with a warmer object or liquid
3. Metabolic heating caused by activity

Cooling occurs through three mechanisms:

1. Respiration: the air we exhale is warm; as the body overheats, the respirations become more rapid.
2. Radiation: heat is released at the surface of the skin; as the body overheats, the superficial blood vessels dilate and allow more heat to be lost.
3. Evaporation: perspiration is released to the skin surface and evaporates; the skin is cooled by evaporative cooling.

PPE reduces the body's ability to shed excess heat through radiation and evaporation of sweat. PPE (for chemicals) can also act like a greenhouse and collect radiant heat.

These facts mean that heat stress can be a serious problem to hazardous waste site workers. The following discussion is intended to familiarize personnel with the symptoms of heat stress.

Heat stress is a progressive condition. Its mildest form is a slight elevation of body temperature. Normal body temperature is generally near 98.6°F. Working in high temperatures may elevate the temperature to 100-101°F. By the time the body temperature reaches 101°F, the worker generally has a headache. This is not a serious condition and can be treated through increased rest periods and cool fluid intake. The worker should not be allowed to work until the body temperature has been reduced to below 99°F.

If work continues when the first symptoms occur, the person may develop heat cramps. Heat cramps are brought about by long exposure to heat. The outside temperature does not have to be much higher than the "normal" environment. The person perspires heavily, often drinking large quantities of water. As the sweating continues, salts are lost by the body bringing about painful muscle cramps.

**Treatment:** Any worker with a heat-related illness or emergency will be immediately transported to the WMC medical department for medical evaluation. The worker should be given rest, cool fluids, and removed from work for at least the remainder of the day. The person is likely to have an increased susceptibility to heat for the next few days.

### 14.1 Heat Exhaustion

Heat exhaustion symptoms include a near-normal body temperature and profuse sweating. The body temperature may reach 103°F. Victims of heat exhaustion have cold, wet, pale, clammy skin and can feel lethargic, dizzy, and/or nauseous.

**Treatment:** Remove the person from field work. Have the person rest in a cool area such as an air conditioned car or shaded area. Provide cool liquids to drink. Avoid beverages which contain caffeine or alcohol. Do not allow the person to go back to work for at least one or two days.

### 14.2 Heat Stroke

Heat stroke is a life-threatening condition. The person's body temperature-regulating mechanism fails and the body can not rid itself of excess heat. Heat stroke symptoms include high body temperatures and HOT DRY SKIN. Most cases of heat stroke are reported on hot humid days.

**Treatment:** Heat stroke victims must be transported to a hospital for immediate treatment. The individual must not be allowed to drive since cases are on record where the victim's condition worsens, lapsing into unconsciousness and death. Heat stroke victims are not to return to field work without the physician's consent.

### 14.3 Prevention of Heat Stress-Induced Illness

Become acclimatized to heat for several days whenever possible. Work in the cooler portions of the day. Early morning and evening hours are cooler.

Take frequent breaks and consume at least one pint of cool fluid every hour. Replenish electrolytes through the consumption of diluted drinks. The body loses more water than electrolytes. Concentrated salt, electrolyte, or juices can make you more susceptible to heat stress.

#### 14.3.1 Monitoring

Heat stress monitoring should be performed whenever temperatures exceed 80°F and respiratory protection is required. Oral temperatures and pulse rates will be taken at the end of each break. Elevated temperatures or elevated pulse rates will be handled as follows:

Oral Temp.: less than 99°:	Continue work
Oral Temp: 99-100.3°F	Reduce rate of work or take more frequent breaks; consume more cool fluids.

Oral Temp: > 100.4°F

Remove from work until  
temperature reduced to  
99°F or less.

Pulse Rate: > 110 bpm

Remove from work until  
pulse rate falls below  
110 beats per minute.

If the body temperature exceeds 100.4°F, or the pulse rate exceeds 110 bpm at rest, the person must not continue to work. These precautions have been found to prevent most heat related illnesses.

Occasionally, high heat conditions combined with poor eating, sleeping, and drinking habits have resulted in heat stroke occurring in less than 20 minutes.

Additional information on heat related illnesses is presented in Table 7.

TABLE 7.  
SIGNS AND SYMPTOMS OF HEAT RELATED ILLNESS

Condition	Signs/Symptoms
Heat rash	Results from continuous exposure to heat or humid air.
Heat cramps	Caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include muscle spasms, pain in the hands, feet, and abdomen
Heat exhaustion	Occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include pale, cool, moist skin heavy sweating, dizziness, nausea, fainting
Heat stroke	The most serious heat related illness. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include red, hot, usually dry skin, lack of/or reduced perspiration, dizziness and confusion, strong, rapid pulse, coma.

#### The Heat Stress Monitor<sup>1</sup>

Heat stress will be monitored by the H&S field technician using a Metrosonics hs-371 Heat Stress Monitor/Logger when conditions warrant. The heat stress monitor is based on the Wet Bulb Globe Temperature Index (WBGT). The WBGT values are calculated by using the following calculations:

1. For work outdoors with a solar load:  

$$WBGT = 0.7 \text{ NWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$
2. For work indoors without a solar load:  

$$WBGT = 0.7 \text{ NWB} + 0.3 \text{ GT}$$

NWB = Natural Wet-Bulb Temperature  
 DB = Dry-Bulb Temperature  
 GT = Globe Temperature

TABLE 7  
(CONTINUED)

The work load category may be calculated by ranking each job into light, medium, or heavy categories for metabolic heat on the basis of the work being performed:

1. Light work (up to 200 kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work.
2. Moderate work (200-350 kcal/hr or 800-1400 Btu/hr): e.g., walking about with moderate lifting and pushing.
3. Heavy work (350-500 kcal/hr or 1400-2000 Btu/hr): e.g., pick and shovel work.

#### Exposure Limits

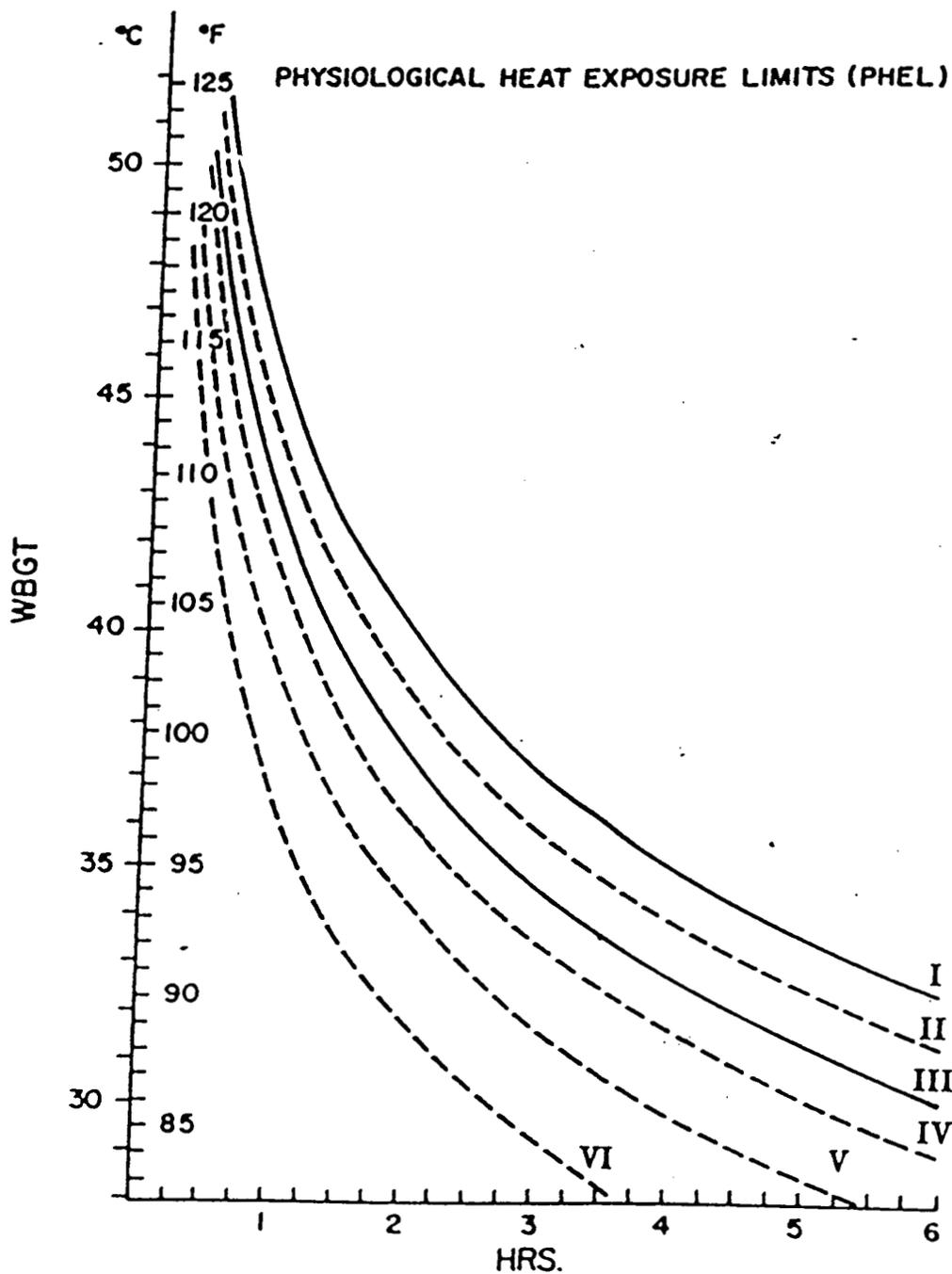
See Figure 2.

#### Alerting Mechanism

The primary means for alerting work crews of dangerous heat stress conditions will be the area heat stress monitor. Other methods include contacting the health and safety office by telephone (738-3100), or by weather radio.

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<sup>1</sup>For additional information on clothing correction factors and TLV see: ACGIH, 1990-1991, "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," American Conference of Governmental Industrial Hygienists, Cincinnati, OH, pgs. 87-94.



Curve I ("A") for  $t_{wm}$  MR  $88.5 \text{ W}\cdot\text{m}^{-2}$ ; Curve II for  $t_{wm}$  MR  $100.0 \text{ W}\cdot\text{m}^{-2}$ ; Curve III ("B") for  $t_{wm}$  MR  $111.7 \text{ W}\cdot\text{m}^{-2}$ ; Curve IV for  $t_{wm}$  MR  $123.3 \text{ W}\cdot\text{m}^{-2}$ ; Curve V for  $t_{wm}$  MR  $134.9 \text{ W}\cdot\text{m}^{-2}$ ; and, Curve VI ("C") for  $t_{wm}$  MR  $146.5 \text{ W}\cdot\text{m}^{-2}$ .

FIGURE 2. HEAT STRESS EXPOSURE CHART

PHEL Curves For Intermittent Work-Rest

Physical Activity **	Work O <sub>2</sub> Consump. (L·min <sup>-1</sup> )	No. Minutes Work/No. Minutes Rest				
		10/50	20/40	30/30	40/20	50/10
Standing	0.50	---	---	---	---	I
Average Light Work	0.75	---	I	II	III	IV
Upper Light to Lower Moderate Work	1.00	---	II	IV	VI	---
Average Moderate Work	1.25	I	III	VI	---	---
Upper Moderate to Lower Heavy Work	1.50	II	V	---	---	---
Average Heavy Work	1.75	II	VI	---	---	---
Upper Heavy to Lower Very Heavy Work	2.00	III	---	---	---	---
Average Very Heavy Work	2.25	IV	---	---	---	---
Upper Very Heavy Work	2.50	IV	---	---	---	---

\*\* As indicated in Table 5 of ASHRAE Handbook of Fundamentals.

FIGURE 2 (CONTINUED).

FIGURE 2 (CONTINUED).

EPRI STAY TIMES

Ranges of stay times in minutes (or "h" for hours) for different WBGTs (and Botsball readings) in °C and °F by combinations of clothing ensemble and metabolism

WBGT (Botsball) °C	WBGT (Botsball) °F	Wool Clothes Metabolism		Cotton Coveralls Metabolism			Double Cottons Metabolism			Cottons plus Plastics Metabolism				
		Low	Mod High	Low	Mod High	Low	Mod High	Low	Mod High	Low	Mod High			
50 (47)	122 (116)	15-30	0-10	5-15	0-5	5-15	5-15	5-15	5-15	15-20	5-15	15-20	5-15	15-20
48 (45)	118 (112)	20-45	5-15	15-30	5-10	15-30	5-10	10-20	10-20	15-30	10-20	15-30	15-30	20-45
46 (43)	115 (109)	20-45	5-20	20-45	5-15	20-45	5-15	15-30	15-30	15-30	15-30	15-30	20-45	20-45
44 (41)	111 (105)	30-60	10-25	30-60	10-25	20-45	5-20	20-45	5-15	20-45	0-10	15-30	15-30	0-10
42 (39)	108 (102)	45-90	15-30	45-90	15-30	30-60	5-20	45-90	5-20	20-45	5-15	20-45	20-45	5-15
40 (37)	104 (99)	60-90	15-45	60-90	15-45	45-90	10-25	60-90	10-25	30-60	5-20	20-45	20-45	5-20
38 (35)	100 (95)	90-120	20-45	90-120	20-45	60-90	15-45	90-120	15-30	45-90	15-30	30-60	30-60	10-25
36 (33)	97 (92)	211-4h	30-60	211-4h	30-60	90-120	25-45	90-120	15-45	60-90	15-30	45-90	45-90	15-30
34 (31)	93 (88)	311-8h	45-90	311-8h	45-90	2h-4h	30-60	2h-4h	15-45	90-120	20-45	60-90	60-90	15-45
32 (29)	90 (85)	ML	90-120	3h-8h	60-100	3h-8h	25-50	3h-8h	25-50	2h-4h	30-60	90-120	90-120	20-45
30 (27)	86 (81)	ML	2h-4h	ML	1h-2h	ML	30-90	ML	30-90	3h-8h	45-90	2h-4h	2h-4h	30-60
28 (26)	82 (78)	ML	2h-4h	ML	1h-4h	1h-3h	1h-3h	ML	1h-3h	ML	90-120	3h-8h	3h-8h	45-90
26 (24)	79 (75)	ML	4h-8h	ML	ML	3h-8h	3h-8h	ML	3h-8h	ML	2h-4h	ML	ML	90-120
24 (22)	75 (71)	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	2h-4h
22 (20)	72 (68)	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	2h-4h
20 (18)	68 (64)	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML
<20	<68	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML

SOURCE: "Metrosonics hs-371," Heat Stress Monitor Manual Rev. F, West Henrietta, NY, pg. 6.



## 15.0 COLD STRESS

Cold stress will be an occupational hazard if project work takes place in the winter months. Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at negative 18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked with perspiration.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or initial frostbite: characterized by suddenly blanching or whitening of skin
- Superficial frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient
- Deep frostbite: tissues are cold, pale, and solid; extremely serious injury
- Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature; its symptoms are usually exhibited in five stages:
  - shivering
  - apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95°F
  - unconsciousness, glassy stare, slow pulse, and slow respiratory rate
  - freezing of the extremities
  - death

### 15.1 Prevention of Cold Stress Injuries

Thermal socks, long cotton or other thermal underwear, hard hat liners, glove liners, and other cold weather gear can aid in the prevention of hypothermia. Blankets, warm drinks (other than caffeinated coffee), and warm break areas are essential. The overall goal is to keep from getting wet. If workers do get wet, they should dry off and change clothes.

Cold stress training is appropriate for work at this site and can be carried out during the daily tailgate safety meeting.

### 15.1.1 The Windchill Meter

Windchill will be monitored by the H&S Field Technician using a Taylor Windchill meter or equivalent when conditions warrant.

### 15.1.2 Exposure Limits

See Windchill chart in Table 8.

### 15.1.3 Alerting Mechanism

The primary means of alerting work crews of dangerous windchill conditions will be the windchill meter on site. Other methods include contacting the health and safety office by telephone (738-3100), or by weather radio.

TABLE 8

Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)\*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
calm												
5	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
10	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
15	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
20	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
25	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
30	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
35	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
40	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	<i>LITTLE DANGER</i> In < hr with dry skin. Maximum danger of false sense of security			<i>INCREASING DANGER</i> Danger from freezing of exposed flesh within one minute.				<i>GREAT DANGER</i> Flesh may freeze within 30 seconds.				
Trenchfoot and immersion foot may occur at any point on this chart.												

\* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

**ATTACHMENT 4 MATERIAL SAFETY DATA SHEETS**

# Oxygen

## Material Safety

### Data Sheet

Industrial Gas Division  
Air Products and Chemicals, Inc.  
Allentown, PA 18195  
Tel: (215) 481-4911 • TWX 510-651-3686  
Cable-AIRPROD • Telex 847416  
Fax (215) 481-5900

**AIR**  
**PRODUCTS** 

EMERGENCY PHONE: 800-523-9374		IN PENNSYLVANIA: 800-322-9092	
ISSUE DATE	Issued: 13 April 1977	TRADE NAME AND SYNONYMS	CHEMICAL NAME AND SYNONYMS
REVISIONS	Rev: 1 February 1989	Oxygen, LOX (Liquid only), GOX (Gas only)	Oxygen
		FORMULA	CHEMICAL FAMILY
		O <sub>2</sub> MW: 32.00	Oxidizing gas CAS#7782-44-7

### HEALTH HAZARD DATA

#### THRESHOLD LIMIT VALUE

N/A. Oxygen is not listed as a carcinogen by NTP, IARC, or OSHA.

#### SYMPTOMS IF INGESTED, CONTACTED WITH SKIN, OR VAPOR INHALED

Oxygen is nontoxic under most conditions of use and is necessary to support life. Liquid oxygen or cold gas will freeze tissues and can cause severe cryogenic (extremely low temperature) burns.

#### TOXICOLOGICAL PROPERTIES

Oxygen is nontoxic under usual conditions of use. Breathing pure oxygen at one atmosphere, however, may produce cough and chest pains within 8-24 hours. Concentrations of 60% may produce these symptoms in several days. At two atmospheres symptoms occur in 2-3 hours.

Partial pressure of oxygen in excess of two atmospheres may produce a variety of central nervous system manifestations including tingling of fingers and toes, visual and hearing disturbances, abnormal sensations, impaired coordination, confusion, muscle twitching, and seizures resembling those of epilepsy. Severe hazards may be present when confusion and impaired judgment lead to operational errors.

Infants exposed to oxygen levels in excess of 35-40% may suffer permanent visual impairment or blindness due to retrolental fibroplasia.

#### RECOMMENDED FIRST AID TREATMENT

If cryogenic liquid or cold boil-off gas contacts a worker's skin or eyes, frozen tissues should be flooded or soaked with tepid water (105-115F; 41-46C). DO NOT USE HOT WATER. Burns which result in blistering or deeper tissue freezing should be seen promptly by a physician.

### FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	AUTO IGNITION TEMP	FLAMMABLE LIMITS	LEL	UEL
N/A	N/A	N/A	N/A	N/A
EXTINGUISHING MEDIA				ELECTRICAL CLASSIFICATION
N/A				GROUP N/A

#### SPECIAL FIRE FIGHTING PROCEDURES

Oxygen is nonflammable, but supports and VIGOROUSLY ACCELERATES COMBUSTION of flammables. To fight fires, shut off sources of oxygen and fight like conventional fire.

#### UNUSUAL FIRE AND EXPLOSION HAZARDS

Oxygen is nonflammable, but supports and VIGOROUSLY ACCELERATES COMBUSTION of flammables. Some materials which are noncombustible in air will burn in the presence of oxygen.

### PHYSICAL DATA

BOILING POINT (°F.)	FREEZING POINT (°F)		
@ 1 atm -297.3F (-183.0C)	@ 1 atm -361.8F (-218.8C)		
VAPOR PRESSURE (psia)	SOLUBILITY IN WATER		
N/A	@ 77F (25C), 1 atm 3.16% by volume		
VAPOR DENSITY (AIR = 1)	SPECIFIC GRAVITY (AIR = 1)	LIQUID DENSITY (lb/cu ft)	SPECIFIC GRAVITY (H <sub>2</sub> O = 1)
@ 70F (21.1C), 1 atm 0.08279	@ 68F (20C), 1 atm 1.10	@ boiling point, 1 atm 71.23	@ boiling point, 1 atm 1.14

#### APPEARANCE AND ODOR

Gaseous oxygen is colorless and odorless. Liquid oxygen is pale blue and odorless.

060050

**REACTIVITY DATA**

HETEROGENEOUS MIXTURE	UNSTABLE		CONDITIONS TO AVOID Materials which burn in air will burn violently in atmosphere richer than approx. 25% oxygen. Some materials will burn in pure oxygen which are nonflammable in air.
	STABLE	X	

COMPATIBILITY (Materials to avoid)  
flammables, especially petroleum products, asphalt, other volatile flammables.

HAZARDOUS DECOMPOSITION PRODUCTS  
None

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID None
	WILL NOT OCCUR	X	

**SPILL OR LEAK PROCEDURES**

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED  
Prevent liquid oxygen from contacting grease, oil, asphalt or combustibles. Ventilate area to evaporate and disperse oxygen. Flush area with large quantities of water. DO NOT ENTER areas of high oxygen concentration, which can saturate clothing and increase flammability. Avoid smoking and contact with sources of ignition after exposure to concentration of oxygen higher than the normal atmosphere.

WASTE DISPOSAL METHOD  
Allow liquid oxygen to evaporate in a well ventilated outdoor area. Vent oxygen gas to outside location. Disposal site should be remote from work areas, open flames or sources of ignition and combustibles. Flushing with water will increase the vaporization rate of the liquid. Do not attempt to dispose of residual oxygen in compressed gas cylinders. Return cylinders to Air Products with residual pressure, i.e. cylinder valve tightly closed and valve cap in place.

**SPECIAL PROTECTION INFORMATION**

RESPIRATORY PROTECTION (Specify type)

N/A

VENTILATION Prevent accumulation with natural or forced air.	LOCAL EXHAUST As necessary	SPECIAL None normally required
	MECHANICAL (General) As necessary	

PROTECTIVE GLOVES

(Liquid) Loose-fitting gloves of impermeable material, such as leather. (Gas) Leather work gloves are recommended when handling compressed gas cylinders.

FACE PROTECTION

(Liquid) Chemical goggles or safety glasses. (Gas) Safety glasses are recommended when handling high-pressure cylinders.

OTHER PROTECTIVE EQUIPMENT

N/A

**SPECIAL PRECAUTIONS\***

SPECIAL LABELING INFORMATION

Oxygen shipment must be in accordance with Department of Transportation (DOT) regulations using DOT "OXIDIZER" label. Consult DOT regulations for details on the shipment of hazardous materials.

SPECIAL HANDLING RECOMMENDATIONS

Prevent contact of liquid oxygen with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Cleanliness and compatibility of materials in contact with oxygen are essential especially internal parts of piping systems. Some elastomers (o-rings, valve seats, etc.) are not compatible with oxygen. Open oxygen valves slowly. Compressed gas cylinders contain oxygen at extremely high pressure and should be handled with care. Use a pressure-reducing regulator when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent back flow into storage containers. Avoid dragging, rolling, or sliding cylinders, even for a short distance. Use a suitable hand truck. For additional handling recommendations on compressed gas cylinders, consult Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Store liquid containers and cylinders in well ventilated areas. Do not store cylinders of oxygen within 20 ft. of flammable or combustible materials, especially oil or grease. Keep cylinders away from source of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Never lubricate valves or cylinder caps. Segregate full and empty cylinders. Storage areas should be free of combustible material. Avoid exposure to areas where salt or other corrosive chemicals are present. See Compressed Gas Association Pamphlet P-1 for additional storage recommendations.

SPECIAL PACKAGING RECOMMENDATIONS

Gaseous oxygen containers meet DOT specifications or American Society of Mechanical Engineers (ASME) codes. Liquid oxygen is stored in vacuum-insulated containers meeting DOT specifications or ASME codes.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Oxygen is not to be used as a substitute for compressed air. Applications such as cleaning, dusting, powering pneumatic tools, etc., are not safe due to lubricating oils and other materials present. Use only with equipment specifically designed and cleaned for oxygen service. Consult Compressed Gas Association Pamphlet G-4.1, "Cleaning Equipment for Oxygen Service," for details. Liquid oxygen is cryogenic liquid. Materials of construction must be selected for compatibility with extremely low temperatures. Avoid use of carbon steel and other materials which become brittle at low temperatures. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder filled without the permission of the owner is a violation of Federal Law. If oxygen concentrations exceeding 25% are suspected or can occur, use oxygen monitoring equipment to test for oxygen-enriched atmospheres.

\* Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that she is in full compliance.

# MATERIAL SAFETY DATA SHEET



## LIQUID CARBONIC

INDUSTRIAL/MEDICAL CORPORATION

135 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS 60603-4202  
PHONE: (312) 855-2500

Propane

April, 1986

Emergency Phone Numbers: (312) 855-2500; CHEMTREC (800) 424-9300

### SECTION I--PRODUCT IDENTIFICATION

CHEMICAL NAME: Propane  
COMMON NAME AND SYNONYMS: Propane, Liquefied Petroleum Gas, Dimethylmethane  
CHEMICAL FAMILY: Alkane FORMULA: C<sub>3</sub>H<sub>8</sub>

### SECTION II--HAZARDOUS INGREDIENTS

MATERIAL	VOLUME %	CAS NO.	1985-6 ACGIH TLV UNITS
Propane	99%	74-98-6	Simple Asphyxiant

### SECTION III--PHYSICAL DATA

BOILING POINT (°F.)	-43.8	SPECIFIC GRAVITY (H <sub>2</sub> O=1) @ -49°F	0.585
VAPOR PRESSURE (psig.) @ 70°F	109.6	% VOLATILE BY VOLUME	100
VAPOR DENSITY (AIR=1) @ 32°F	1.5	EVAPORATION RATE (BUTYL ACETATE=1)	Rapid
SOLUBILITY IN WATER	Very Slightly		
APPEARANCE AND ODOR	Colorless with natural gas type odor		

### SECTION IV--FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -156°F (C.C.) FLAMMABLE LIMITS % by Vol. LEL 2.1 UEL 9.9  
EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, halon  
SPECIAL FIRE FIGHTING PROCEDURES: Stop flow of gas. Use water spray to cool fire exposed containers. When possible allow fire to burn itself out to avoid accumulation of an unburned flammable mixture. Keep personnel away since containers can rupture violently when exposed to fire. Vapors may flow along surface for considerable distance, reach an ignition source and flash back.  
UNUSUAL FIRE AND EXPLOSION HAZARDS: Propane is a dangerous fire and explosion hazard when released in air. Propane gas vapors are dense and can collect and remain in low spots, even after the source gas has been eliminated. Those putting out the fire should use self-contained breathing apparatus and protective equipment.

### SECTION V--HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: Propane is a simple asphyxiant. ACGIH TLV requires that oxygen levels be maintained at more than 18% by volume at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm of Hg.  
EFFECTS OF OVEREXPOSURE: Because it is an asphyxiant, symptoms such as dizziness, drowsiness, rapid respiration, mental dullness, incoordination, nausea, and eventual unconsciousness may result. Oxygen deficiency may occur without warning where propane may displace air. Contact with liquefied gas can produce frostbite.  
EMERGENCY AND FIRST AID PROCEDURES: If inhaled: Remove to fresh air. Obtain prompt medical assistance. If breathing has stopped give artificial respiration. If breathing is difficult administer oxygen. Keep warm and at rest. Extreme hazard of fire and explosion may result from static electrical charge or other ignition source. Do not enter areas within the flammable range because of immediate fire and explosion hazard. Use a suitable flammable gas meter calibrated for propane to measure the concentration in air. The lower flammable limit for propane is 2.1% in air by volume. Skin contact: Promptly flush affected areas with copious quantities of tepid (105°-115°F) water. All thermal injuries should receive prompt medical care.  
THERE EXISTS AN IMMEDIATE FIRE AND EXPLOSION HAZARD WHEN THE CONCENTRATION OF PROPANE IN THE ATMOSPHERE EXCEEDS THE LEL OF 2.1% BY VOLUME.  
ROUTE(S) OF ENTRY: INHALATION? Yes SKIN? yes INGESTION?  
CARCINOGENICITY NTP? No IARC MONOGRAPHS? No OSHA? No

SECTION VI--REACTIVITY DATA

STABILITY: UNSTABLE ( ) STABLE (X)

CONDITIONS TO AVOID: Do not expose to heat or flame

COMPATIBILITY (MATERIALS TO AVOID): Oxidizers such as oxygen, chlorine and fluorine

HAZARDOUS DECOMPOSITION PRODUCTS: Can produce carbon monoxide when oxidized with a deficiency of oxygen.

HAZARDOUS POLYMERIZATION: MAY OCCUR ( ) WON'T OCCUR (X)

CONDITIONS TO AVOID: N/A

SECTION VII--SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate all personnel upwind and away from affected area. Stop leak if possible. Personnel involved in attempting to stop leak should use self-contained breathing apparatus and should have protective clothing for direct contact with liquid propane. Eliminate sources of ignition. Supply maximum ventilation with explosion proof equipment.

WASTE DISPOSAL METHOD: Locate leaking containers in a remote downwind area outside and allow to vent to atmosphere. Incinerate gas by controlled burning in flare if possible. Follow Federal, State or Local regulations.

SECTION VIII--SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Use organic canister or self-contained breathing apparatus

VENTILATION: LOCAL EXHAUST (X) Where gas is present provide adequate ventilation in sumps and confined areas.

MECHANICAL (GENERAL) (X) Provide adequate ventilation to maintain workplace oxygen above 18% by volume.

PROTECTIVE GLOVES: Rubber or Plastic

EYE PROTECTION: Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT: Safety shoes, safety shower, eye wash  
Propane explosimeter to measure concentration in air, if necessary.SECTION IX--SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Protect cylinders against physical damage. Store in cool, dry, well ventilated area, away from sources of heat and ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 130°F. Isolate from oxidizers such as oxygen, chlorine, and fluorine. Use a check valve or trap in propane discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage or use area. Cylinders should be stored upright and be firmly secured to prevent falling over or being knocked over. Electrical equipment should be non-sparking or explosion proof.

OTHER PRECAUTIONS: Use only DOT or ASME coded containers. Earth ground and bond all lines and equipment associated with propane system. Use a pressure reducing regulator when connecting cylinder to lower pressure piping or systems. Propane cylinders must not be recharged except by or with consent of Liquid Carbonic. For more information refer to CGA Bulletin SB-2 "Oxygen Deficient Atmospheres" and CGA Pamphlet P-1 "Safe Handling of Compressed Gases in Containers" and NFPA Bulletin no. 58.

No guaranty is made as to the accuracy of any data or statement contained herein. While this material is furnished in good faith, NO WARRANTY EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE IS MADE. This material is offered only for your consideration, investigation and verification and Liquid Carbonic shall not in any event be liable for special, incidental or consequential damages in connection with its publication.

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

REVISED: 03/19/88

\*\*\*\*\* I. PRODUCT IDENTIFICATION \*\*\*\*\*  
MOBIL REGULAR 10W

SUPPLIER: MOBIL OIL CORP. HEALTH EMERGENCY TELEPHONE: (212) 883-4411  
CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES TRANSPORT EMERGENCY TELEPHONE: (800) 424-9300 (CHEMTREC)  
USE OR DESCRIPTION: AUTOMOTIVE ENGINE OIL

\*\*\*\*\* II. TYPICAL CHEMICAL AND PHYSICAL PROPERTIES \*\*\*\*\*

APPEARANCE: ASTM 4.0 LIQUID ODOR: MILD PH: NA  
VISCOSITY AT 100 F, SUS: 150.0 AT 40 C, CS: 30.0  
VISCOSITY AT 210 F, SUS: 42.5 AT 100 C, CS: 4.9  
FLASH POINT F(C): > 360(182) (ASTM D-92)  
MELTING POINT F(C): NA POUR POINT F(C): -10(-23)  
BOILING POINT F(C): > 600(316)  
RELATIVE DENSITY, 15/4 C: 0.885 SOLUBILITY IN WATER: NEGLIGIBLE  
VAPOR PRESSURE-MM HG 20C: < .1

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES  
FOR FURTHER INFORMATION, CONTACT YOUR LOCAL MARKETING OFFICE.

\*\*\*\*\* III. INGREDIENTS \*\*\*\*\*

WT PCT EXPOSURE LIMITS SOURCES  
(APPROX) MG/M3 PPM (AND NOTES)

HAZARDOUS INGREDIENTS:  
NONE

OTHER INGREDIENTS:  
REFINED MINERAL OILS >95  
ADDITIVES AND/OR OTHER INGREDIENTS < 5

SEE SECTION XII FOR COMPONENT REGULATORY INFORMATION.

SOURCES: A=ACGIH-TLV, A\*=SUGGESTED-TLV, M=MOBIL, O=OSHA, S=SUPPLIER  
NOTE: LIMITS SHOWN FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS.

\*\*\*\*\* IV. HEALTH HAZARD DATA \*\*\*\*\*

--- INCLUDES AGGRAVATED MEDICAL CONDITIONS, IF ESTABLISHED ---  
EFFECTS OF OVEREXPOSURE: NOT EXPECTED TO BE A PROBLEM.

\*\*\*\*\* V. EMERGENCY AND FIRST AID PROCEDURES \*\*\*\*\*  
--- FOR PRIMARY ROUTES OF ENTRY ---

EYE CONTACT: FLUSH WITH WATER.  
SKIN CONTACT: WASH CONTACT AREAS WITH SOAP AND WATER.  
INHALATION: NOT EXPECTED TO BE A PROBLEM.  
INGESTION: NOT EXPECTED TO BE A PROBLEM WHEN INGESTED. IF UNCOMFORTABLE SEEK MEDICAL ASSISTANCE.

Dec 1988  
RECEIVED

\*\*\*\*\* VI. FIRE AND EXPLOSION HAZARD DATA \*\*\*\*\*

FLASH POINT F(C): > 360(182) (ASTM D-92)
FLAMMABLE LIMITS. LEL: .6 UEL: 7.0
EXTINGUISHING MEDIA: CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.
SPECIAL FIRE FIGHTING PROCEDURES: WATER OR FOAM MAY CAUSE FROTHING.
USE WATER TO KEEP FIRE EXPOSED CONTAINERS COOL. WATER SPRAY MAY BE USED TO FLUSH SPILLS AWAY FROM EXPOSURE. FOR FIRES IN ENCLOSED AREAS, FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS. PREVENT RUNOFF FROM FIRE CONTROL OR DILUTION FROM ENTERING STREAMS OR DRINKING WATER SUPPLY.
UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE
NFPA HAZARD ID: HEALTH: 0, FLAMMABILITY: 1, REACTIVITY: 0

\*\*\*\*\* VII. REACTIVITY DATA \*\*\*\*\*

STABILITY (THERMAL, LIGHT, ETC.): STABLE
CONDITIONS TO AVOID: EXTREME HEAT
INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZERS
HAZARDOUS DECOMPOSITION PRODUCTS: CARBON MONOXIDE.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

\*\*\*\*\* VIII. SPILL OR LEAK PROCEDURE \*\*\*\*\*

ENVIRONMENTAL IMPACT: REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL FREE NUMBER 800-424-8802.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SCRAPE UP AND REMOVE. DISPOSE OF AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.
WASTE MANAGEMENT: PRODUCT IS SUITABLE FOR BURNING IN AN ENCLOSED, CONTROLLED BURNER FOR FUEL VALUE OR DISPOSAL BY SUPERVISED INCINERATION. SUCH BURNING MAY BE LIMITED PURSUANT TO THE RESOURCE CONSERVATION AND RECOVERY ACT. IN ADDITION, THE PRODUCT IS SUITABLE FOR PROCESSING BY AN APPROVED RECYCLING FACILITY OR CAN BE DISPOSED OF AT ANY GOVERNMENT APPROVED WASTE DISPOSAL FACILITY. USE OF THESE METHODS IS SUBJECT TO USER COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS AND CONSIDERATION OF PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.

\*\*\*\*\* IX. SPECIAL PROTECTION INFORMATION \*\*\*\*\*

EYE PROTECTION: NO SPECIAL EQUIPMENT REQUIRED.
SKIN PROTECTION: NO SPECIAL EQUIPMENT REQUIRED. HOWEVER, GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.
RESPIRATORY PROTECTION: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.
VENTILATION: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

\*\*\*\*\* X. SPECIAL PRECAUTIONS \*\*\*\*\*

NO SPECIAL PRECAUTIONS REQUIRED.

## \*\*\*\*\* XI. TOXICOLOGICAL DATA \*\*\*\*\*

## ---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): LD50: > 15 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

DERMAL TOXICITY (RABBITS): LD50: > 5 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

INHALATION TOXICITY (RATS): NOT APPLICABLE ---HARMFUL CONCENTRATIONS OF MISTS AND/OR VAPORS ARE UNLIKELY TO BE ENCOUNTERED THROUGH ANY CUSTOMARY OR REASONABLY FORESEEABLE HANDLING, USE, OR MISUSE OF THIS PRODUCT.

EYE IRRITATION (RABBITS): EXPECTED TO BE NON-IRRITATING. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SKIN IRRITATION (RABBITS): EXPECTED TO BE NON-IRRITATING. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

## ---SUBCHRONIC TOXICOLOGY (SUMMARY)---

SEVERELY SOLVENT REFINED AND SEVERELY HYDROTREATED MINERAL BASE OILS HAVE BEEN TESTED AT MOBIL ENVIRONMENTAL AND HEALTH SCIENCES LABORATORY BY DERMAL APPLICATION TO RATS 5 DAYS/WEEK FOR 90 DAYS AT DOSES SIGNIFICANTLY HIGHER THAN THOSE EXPECTED DURING NORMAL INDUSTRIAL EXPOSURE. EXTENSIVE EVALUATIONS INCLUDING MICROSCOPIC EXAMINATION OF INTERNAL ORGANS AND CLINICAL CHEMISTRY OF BODY FLUIDS, SHOWED NO ADVERSE EFFECTS.

## ---CHRONIC TOXICOLOGY (SUMMARY)---

THE BASE OILS IN THIS PRODUCT ARE SEVERELY SOLVENT REFINED AND/OR SEVERELY HYDROTREATED. TWO YEAR MOUSE SKIN PAINTING STUDIES OF SIMILAR OILS SHOWED NO EVIDENCE OF CARCINOGENIC EFFECTS.

## ---OTHER TOXICOLOGY DATA---

STUDIES HAVE SHOWN THAT MICE DEVELOPED SKIN CANCER AFTER REPEATED APPLICATION OF USED GASOLINE ENGINE OIL TO THE SKIN FOR THE LIFETIME OF THE ANIMALS. NO EFFORT WAS MADE TO WASH THE OIL OFF BETWEEN APPLICATIONS. USED OIL FROM DIESEL ENGINES DID NOT PRODUCE THIS EFFECT. BECAUSE OF THE EFFECTS OBSERVED IN THE LABORATORY TESTS, SERVICE STATION WORKERS, ENGINE MECHANICS, AND ALL PERSONS WHO REGULARLY HANDLE USED MOTOR OIL SHOULD TAKE PRECAUTIONS TO MINIMIZE CONTACT WITH THE OIL. GOOD PERSONAL HYGIENE PRACTICES, INCLUDING WASHING ANY SKIN CONTACT AREAS AND REMOVING OIL SOAKED CLOTHING, SHOULD BE FOLLOWED.

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\*\*\*\*\* XII. REGULATORY INFORMATION \*\*\*\*\*  
GOVERNMENTAL INVENTORY STATUS: ALL COMPONENTS REGISTERED IN ACCORDANCE WITH TSCA.

D.O.T. SHIPPING NAME: NOT APPLICABLE

D.O.T. HAZARD CLASS: NOT APPLICABLE

US OSHA HAZARD COMMUNICATION STANDARD: PRODUCT ASSESSED IN ACCORDANCE WITH OSHA 29 CFR 1910.1200 AND DETERMINED NOT TO BE HAZARDOUS.

RCRA INFORMATION: THE UNUSED PRODUCT, IN OUR OPINION, IS NOT SPECIFICALLY LISTED BY THE EPA AS A HAZARDOUS WASTE (40 CFR, PART 261D); DOES NOT EXHIBIT THE HAZARDOUS CHARACTERISTICS OF IGNITABILITY, CORROSIVITY, OR REACTIVITY, AND IS NOT FORMULATED WITH THE METALS CITED IN THE EP TOXICITY TEST. HOWEVER, USED PRODUCT MAY BE REGULATED.

U.S. SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III: THIS PRODUCT CONTAINS NO "EXTREMELY HAZARDOUS SUBSTANCES".

THE FOLLOWING PRODUCT INGREDIENTS ARE CITED ON THE LISTS BELOW:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
ZINC (ELEMENTAL ANALYSIS) (0.045 PCT)	7440-66-6	15

--- KEY TO LIST CITATIONS ---

- 1 = OSHA Z, 2 = ACGIH, 3 = IARC, 4 = NTP, 5 = NCI,
- 6 = EPA CARC, 7 = NFPA 49, 8 = NFPA 325M, 9 = DOT HMT, 10 = CA RTK,
- 11 = IL RTK, 12 = MA RTK, 13 = MN RTK, 14 = NJ RTK, 15 = MI 293,
- 16 = FL RTK, 17 = PA RTK, 18 = CA P65.

--- NTP, IARC, AND OSHA INCLUDE CARCINOGENIC LISTINGS ---

NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

\*\*\*\*\*  
INFORMATION GIVEN HEREIN IS OFFERED IN GOOD FAITH AS ACCURATE, BUT WITHOUT GUARANTEE. CONDITIONS OF USE AND SUITABILITY OF THE PRODUCT FOR PARTICULAR USES ARE BEYOND OUR CONTROL; ALL RISKS OF USE OF THE PRODUCT ARE THEREFORE ASSUMED BY THE USER AND WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. NOTHING IS INTENDED AS A RECOMMENDATION FOR USES WHICH INFRINGE VALID PATENTS OR AS EXTENDING LICENSE UNDER VALID PATENTS. APPROPRIATE WARNINGS AND SAFE HANDLING PROCEDURES SHOULD BE PROVIDED TO HANDLERS AND USERS.  
\*\*\*\*\*

\*\*\*\*\*  
PREPARED BY: MOBIL OIL CORPORATION  
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPARTMENT, PRINCETON, NJ  
FOR FURTHER INFORMATION, CONTACT:  
MOBIL OIL CORPORATION, PRODUCT FORMULATION AND QUALITY CONTROL  
3225 GALLOWES ROAD, FAIRFAX, VA 22037 (703) 849-3265  
\*\*\*\*\*

\*\*\*\*\* APPENDIX \*\*\*\*\*  
FOR MOBIL USE ONLY: (FILL NO: MTN533A2151) MHC: 0\* 0\* NA 0\* 0\* PPEC:  
US83-031 APPROVE REVISED: 04/12/83

# MATERIAL SAFETY DATA SHEET



## LIQUID CARBONIC

INDUSTRIAL/MEDICAL CORPORATION

135 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS 60603 4282  
PHONE (312) 855-2500

Acetylene

April 1986

Emergency Phone Numbers: (312) 855-2500; CHEMTREC (800) 424-9300

### SECTION I--PRODUCT IDENTIFICATION

CHEMICAL NAME: Acetylene  
 COMMON NAME AND SYNONYMS: Acetylene, Ethyne, Ethine  
 CHEMICAL FAMILY: Alkynes FORMULA: C<sub>2</sub>H<sub>2</sub>

### SECTION II--HAZARDOUS INGREDIENTS

MATERIAL	VOLUME %	CAS NO.	1985-6 ACGIH TLV UNITS
Acetylene	100%	74-86-2	Simple asphyxiant-No TLV

### SECTION III--PHYSICAL DATA

BOILING POINT (°F.)	-112°F	SPECIFIC GRAVITY (H <sub>2</sub> O=1)	0.613 @ B. P.
VAPOR PRESSURE (mmHg.) @ -112°F	760	% VOLATILE BY VOLUME	100%
VAPOR DENSITY (AIR=1)	32°F 0.907	EVAPORATION RATE (BUTYL ACETATE=1)	Rapid
SOLUBILITY IN WATER	Slight		
APPEARANCE AND ODOR	Colorless with garlic like odor		

### SECTION IV--FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -18°C (C.C.)  
 FLAMMABLE LIMITS % BY VOLUME IN AIR LEL 2.5 UEL 81  
 EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, Halon, water

SPECIAL FIRE FIGHTING PROCEDURES: Stop gas flow and fight fire conventionally. Fire fighters should be cognizant of extreme fire and explosion hazards and fight fire from safe distance. Keep containers cool with water spray. Use self contained breathing apparatus. Fires which have been extinguished without stopping flow of gas can easily re-ignite or explode.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Acetylene decomposes above 15 psig pressure if undissolved in acetone. Cylinder safety fuse melts at 212°F and will release gas. Acetylene can decompose violently when heated or shocked. Ref: OGA bulletin SB-4 "Handling Acetylene Cylinders in Fire Situations."

### SECTION V--HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: No TLV Established - Workplace air must have over 18% O<sub>2</sub> by volume at atmospheric pressure.  
 EFFECTS OF OVEREXPOSURE: Headaches, dizziness, shortness of breath, unconsciousness, death. Symptoms of anoxia only occur when gas is in flammable range and has not ignited.  
 EMERGENCY AND FIRST AID PROCEDURES: Remove to fresh air. Do not enter areas within the flammability range (over 2.5%) because of immediate fire and explosion hazard. Use an explosimeter for acetylene to measure concentration in air. Stop gas supply if possible and keep containers cool with water spray. Gas has an anesthetic action. Pure Acetylene can be inhaled in high concentrations without chronic harmful affects. Acetylene is a simple asphyxiant which can displace oxygen in the air to asphyxiating levels. If inhaled give oxygen, or if unconscious give artificial respiration. Obtain prompt medical assistance. Keep warm and at rest.  
 ROUTE(S) OF ENTRY: INHALATION? Yes SKIN? INGESTION?  
 CARCINOGENICITY: NTP? No IARC MONOGRAPHS? No OSHA? No

## SECTION VI--REACTIVITY DATA

STABILITY: UNSTABLE (X) STABLE ( )  
 CONDITIONS TO AVOID: Undissolved gas dissociates above 15 psig. Can decompose violently when heated or shocked without oxygen or air.  
 INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizers, halogens, copper, silver, mercury  
 HAZARDOUS DECOMPOSITION PRODUCTS: Carbon and hydrogen  
 HAZARDOUS POLYMERIZATION: MAY OCCUR ( ) WON'T OCCUR (X)  
 CONDITIONS TO AVOID: N/A

## SECTION VII--SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate all personnel from affected area. Use appropriate protective equipment. Eliminate ignition sources. Shut off flow of gas if possible. Provide maximum explosion proof ventilation.

WASTE DISPOSAL METHOD: Move cylinders to a remote outdoor area. Burn off gas or allow to slowly diffuse into atmosphere. Follow Federal, state, or local disposal regulations.

## SECTION VIII--SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Self-contained breathing apparatus

VENTILATION: LOCAL EXHAUST (X) Provide local ventilation to keep acetylene concentration in air below 2500 ppm.

MECHANICAL (GENERAL) (X) Forced ventilation to prevent acetylene concentration from reaching up to flammable range.

PROTECTIVE GLOVES: Leather

EYE PROTECTION: Safety goggles

OTHER PROTECTIVE EQUIPMENT: Safety shoes, acetylene monitor and alarm

## SECTION IX--SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Protect cylinders from physical damage. Store in cool, dry, and well ventilated area. Electrical equipment should be explosion proof and non-sparking. All lines and equipment should be electrically grounded. Post "No Smoking or Open Flame" signs in storage and use areas. Store away from oxidizer and corrosive gases. Store cylinders in upright position, secured to prevent falling over. There should be no sources of ignition in storage or use area. Use a check valve or trap in cylinder discharge to prevent hazardous back-flow.

OTHER PRECAUTIONS: To avoid hazardous acetylene dissociation, do not allow the free gas to exceed 15 psig pressure @ 70°F. Follow withdrawal rate maximum so that solvent is not withdrawn with gas. Use only DOT or ASME coded containers. Container must not be recharged except by or with consent of Liquid Carbonic. Reference CGA Bulletins SB-2 "Oxygen Deficient Atmospheres," SB-4 "Handling Acetylene Cylinders in Fire Situations"; CGA Pamphlets G-1 "Acetylene" and P-1 "Safe Handling of Compressed Gases in Containers."

No guaranty is made as to the accuracy of any data or statement contained herein. While this material is furnished in good faith, NO WARRANTY EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE IS MADE. This material is offered only for your consideration, investigation and verification and Liquid Carbonic shall not in any event be liable for special, incidental or consequential damages in connection with its publication.

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 MATERIAL SAFETY DATA SHEET

GENERAL FORMATION	ACCEPTED BY OSHA AS ESSENTIALLY SIMILAR TO OSHA FORM 20		THE INFORMATION ACCUMULATED HEREIN IS BELIEVED TO BE ACCURATE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH ASHLAND OR NOT. RECIPIENTS ARE ADVISED TO CONFIRM IN ADVANCE OF NEED THAT THE INFORMATION IS CURRENT, APPLICABLE, AND SUITABLE TO THEIR CIRCUMSTANCES.				
	PRODUCT NAME	GASOLINE - PREMIUM UNLEADED	DATA SHEET NO.	05	DATE PREPARED	4-12-83	CODE NUMBER
PRODUCT IDENTIFICATION	PRODUCT CLASS	GENERAL OR GENERIC IDENTIFICATION			10391		
	PASSES D.O.T. TEST FOR HAZARDOUS CLASSIFICATION	HAZARD CLASSIFICATION					
HAZARDOUS COMPONENTS	INGREDIENT				%	TLV	
	PETROLEUM DISTILLATE (BOILING POINT RANGE 80-440° F)				>90	300* PPM	
* ACGIH RECOMMEND 8 HOUR TIME WEIGHTED AVERAGE EXPOSURE LIMIT FOR GASOLINE.							
NOTE: SEE SECTION IX FOR A SPECIFIC TOXICITY STATEMENT CONCERNING GASOLINE.							
PHYSICAL DATA	INITIAL BOILING POINT	IF LIQUID AT 88°F			80 °F	°F	
		<input checked="" type="checkbox"/> PRODUCT	<input type="checkbox"/> COMPONENT (	%)	@ 760	mmHg	
	SPECIFIC GRAVITY	<input type="checkbox"/> GREATER THAN WATER <input type="checkbox"/> EQUAL TO WATER <input type="checkbox"/> LESS THAN WATER			@ 0.6-0.7	°F	
	VAPOR PRESSURE	IF LIQUID AT 88°F OR WHICH SUBLIME			500-700 mmHg	°F	
		<input type="checkbox"/> PRODUCT	<input type="checkbox"/> COMPONENT (	%)	@ 68		
	PERCENT VOLATILES	INGREDIENT WITH INITIAL BOILING POINT BELOW 423°F			100%		
VAPOR DENSITY	FOR VOLATILE PORTION OF PRODUCT			(air = 1)			
	<input type="checkbox"/> LIGHTER THAN AIR	<input checked="" type="checkbox"/> HEAVIER THAN AIR					
EVAPORATION RATE	<input type="checkbox"/> FASTER THAN ETHER			<input checked="" type="checkbox"/> SLOWER THAN ETHER	( = 1)		
FIRE AND EXPLOSION DATA	FLASH POINT	<input type="checkbox"/> LESS THAN 73°F <input type="checkbox"/> 73-100°F <input type="checkbox"/> 100-200°F <input type="checkbox"/> MORE THAN 200°F			-45	°F	
	LOWER EXPLOSION LIMIT	<input checked="" type="checkbox"/> PRODUCT	<input type="checkbox"/> LOWEST VALUE OF COMPONENT		1.4		
	HAZARDOUS DECOMPOSITION PRODUCTS	KNOWN HAZARDOUS PRODUCTS RESULTING FROM HEATING, BURNING, ETC. OR UNREACTED RAW MATERIAL.					
MAY FORM TOXIC MATERIALS: CARBON DIOXIDE AND CARBON MONOXIDE, VARIOUS HYDROCARBONS.							

(SEE DEFINITION ON REVERSE SIDE)

(CONTINUED BACK OF THIS PAGE)



FIRE AND EXPLOSION DATA

(CONTINUED)

SPECIAL FIRE FIGHTING PROCEDURES

INDICATE EQUIPMENT TO PROTECT FIREMEN FROM TOXIC PRODUCTS/COMBUSTION OR IF WATER IS NOT TO BE USED

WATER MAY BE INEFFECTIVE.

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CODE NUMBER

UNUSUAL FIRE AND EXPLOSION HAZARDS

PRODUCT IGNITES EXPLOSIVELY. \*SEE SECTION IX.

EXTINGUISHING MEDIA

DRY CHEMICAL     WATER FOG     CARBON DIOXIDE  
 REGULAR FOAM     ALCOHOL FOAM     OTHER: \_\_\_\_\_

THRESHOLD LIMIT VALUE

OSHA ESTABLISHED VALUE

NOT ESTABLISHED FOR PRODUCT. SEE SECTION II.

EFFECTS OF OVER-EXPOSURE FOR

PRODUCT  
 COMPONENT

KNOWN EFFECTS LISTED, UNLESS NOT APPLICABLE DUE TO PHYSICAL FORM OF PRODUCT

EYES-CAN CAUSE SEVERE IRRITATION, REDNESS, TEARING BLURRED VISION.  
SKIN-PROLONGED OR REPEATED CONTACT CAN CAUSE MODERATE IRRITATION, DEFATTING, DERMATITIS.  
BREATHING-EXCESSIVE INHALATION OF VAPORS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, HEADACHE, POSSIBLE UNCONSCIOUSNESS, AND EVEN ASPHYXIATION.  
SWALLOWING-CAN CAUSE GASTROINTESTINAL IRRITATION, NAUSEA, VOMITING, DIARRHEA. ASPIRATION OF MATERIAL INTO THE LUNGS CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

HEALTH HAZARD DATA



SPECIAL FIRST AID ACTION

IF ON SKIN

THOROUGHLY WASH EXPOSED AREA WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING. LAUNDRY CONTAMINATED CLOTHING BEFORE RE-USE.

IF IN EYES

FLUSH WITH LARGE AMOUNTS OF WATER, LIFTING UPPER AND LOWER LIDS OCCASIONALLY, GET MEDICAL ATTENTION.

IF SWALLOWED

DO NOT INDUCE VOMITING, KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION. ASPIRATION OF MATERIAL INTO THE LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

IF BREATHED

IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION.

ACTIVITY DATA	HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID HAZARDOUS POLYMERIZATION RESULTING IN A LARGE RELEASE OF ENERGY <input type="checkbox"/> CAN OCCUR <input checked="" type="checkbox"/> CANNOT OCCUR
	STABILITY	CONDITIONS TO AVOID IF UNSTABLE UNDER NORMAL CONDITIONS <input checked="" type="checkbox"/> STABLE <input type="checkbox"/> UNSTABLE
	INCOMPATIBILITY (MATERIALS TO AVOID)	COMMON MATERIALS OR CONTAMINANTS WHICH WOULD RESULT IN A HAZARDOUS REACTION WITH THE PRODUCT ARE SHOWN AVOID CONTACT WITH STRONG OXIDIZING AGENTS (E.G. NITRIC ACID, PERMANGANATES, ETC.).
SPILL OR LEAK PROCEDURES	STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	SMALL SPILL ELIMINATE ALL SOURCES OF IGNITION. VENTILATE AREA, ABSORB LIQUID ON PAPER, VERMICULITE FLOOR ABSORBENT OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD. ALLOW TO EVAPORATE.
		LARGE SPILL ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE, DIKE AREA OF SPILL TO PREVENT SPREADING, PUMP LIQUID TO SALVAGE TANK. REMAINING LIQUID MAY BE TAKEN UP ON SAND, CLAY EARTH, FLOOR ABSORBENT, OR OTHER MATERIAL AND SHOVEL INTO CONTAINERS.
REASONABLE PRECAUTIONS TO BE TAKEN AND METHODS OF CLEANUP TO BE USED IN THE EVENT OF SPILLAGE OF THE PRODUCT	WASTE DISPOSAL METHOD	SMALL SPILL ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. DESTROY REMAINING MATERIAL BY BURNING IN AN IRON PAN.
		LARGE SPILL DESTROY BY LIQUID INCINERATION.
PROTECTIVE EQUIPMENT TO BE USED	RESPIRATORY PROTECTION	IF TLV OF THE PRODUCT OR ANY COMPONENT IS EXCEEDED, A NIOSH MESA JOINTLY APPROVED SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IS ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MESA RESPIRATORS UNDER SPECIFIED CONDITIONS. (SEE YOUR SAFETY EQUIPMENT SUPPLIER).
	PROTECTIVE GLOVES	WEAR RESISTANT GLOVES SUCH AS: NEOPRENE, BUNA-N.
	EYE PROTECTION	CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES. (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER).
	VENTILATION	PROVIDE SUFFICIENT MECHANICAL (GENERAL), AND/OR LOCAL EXHAUST VENTILATION TO MAINTAIN EXPOSURE BELOW TLV'S.
	OTHER PROTECTIVE EQUIPMENT	TO PREVENT REPEATED OR PROLONGED SKIN CONTACT, WEAR IMPERVIOUS CLOTHING AND BOOTS.

THE ATLANTIC RICHFIELD COMPANY FILED A TSCA 8(e) NOTICE WITH THE ENVIRONMENTAL PROTECTION AGENCY ON DECEMBER 9, 1981 CONCERNING AN AMERICAN PETROLEUM INSTITUTE SPONSORED CHRONIC INHALATION STUDY. THE STUDY HAS SHOWN CHRONIC EXPOSURE TO UNLEADED GASOLINE VAPORS HAS CAUSED ADVERSE HEALTH EFFECTS IN CERTAIN LABORATORY TEST ANIMALS. MALE RATS EXPOSED FOR APPROXIMATELY TWO YEARS TO VARIOUS LEVELS OF UNLEADED GASOLINE VAPORS SHOWED INCREASED LEVELS OF DEGENERATIVE KIDNEY DISEASE AND KIDNEY CANCER. IT SHOULD BE NOTED THAT THE KIDNEY CANCERS OCCURRED LATE IN THE ANIMALS' LIVES AND WERE NOT THE CAUSE OF DEATH IN ANY CASE. THE KIDNEYS OF FEMALE RATS AND MALE AND FEMALE MICE ALSO IN THE STUDY DID NOT SHOW SIMILAR TOXIC RESPONSES. HOWEVER, FEMALE MICE EXPOSED TO THE HIGHEST DOSES LEVELS OF UNLEADED GASOLINE DID SHOW SLIGHTLY HIGHER LEVELS OF LIVER CANCER.

\*(CONTD. FROM SECTION IV)

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR MAY BE MOVED BY VENTILATION AND IGNITED BY PILOT LIGHTS, OTHER FLAMES, SPARKS, HEATERS, SMOKING, ELECTRIC MOTORS, OR OTHER SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING POINT.

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) CAN IGNITE EXPLOSIVELY.

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED. SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPOR, LIQUID, AND/OR SOLID), ALL HAZARD PRECAUTIONS GIVEN IN THIS DATA SHEET MUST BE OBSERVED.

HAZARDOUS INGREDIENT IS ONE WHICH MEETS ONE OR MORE OF THE FOLLOWING CRITERIA:

1. It is listed in the annual Registry of Toxic Effects of Chemical Substances, or is known to be toxic within the parameters of that Registry, and is present at a level of 1% or greater. DOT Poisons are listed if present at any level.
2. It has an OSHA established 8-hour time-weighted average or acceptable ceiling concentration (c), or an American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Value, and by the nature of the product or its known use, is likely to become airborne.
3. It contributes to one or more of the following hazards of the product:
  - a. Flashpoint below 200°F (cc), or subject to spontaneous heating or decomposition.
  - b. Causes skin burns. (DOT)
  - c. Strong oxidizing agent. (DOT)
  - d. Subject to hazardous polymerization.

Each hazardous ingredient is listed by chemical, generic, or proprietary name, its level in the product is expressed as 1% or less, 1-10%, 10-30%, 30-60%, or greater than 60%, or by other means if such information is proprietary. Adopted ACGIH values are only listed, with appropriate notation, where OSHA values are not available.

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MATERIAL SAFETY DATA SHEET

GENERAL INFORMATION	ACCEPTED BY OSHA AS ESSENTIALLY SIMILAR TO OSHA FORM 20		THE INFORMATION ACCUMULATED HEREIN IS BELIEVED TO BE ACCURATE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH ASHLAND OR NOT. RECIPIENTS ARE ADVISED TO CONFIRM IN ADVANCE OF NEED THAT THE INFORMATION IS CURRENT, APPLICABLE, AND SUITABLE TO THEIR CIRCUMSTANCES.					
	PRODUCT NAME	GASOLINE - UNLEADED	DATA SHEET NO.	05	DATE PREPARED	4-12-83	CODE NUMBER	RME
PRODUCT IDENTIFICATION	PRODUCT CLASS	GENERAL OR GENERIC IDENTIFICATION LIGHT PETROLEUM DISTILLATE - MOTOR FUEL					10378	
	PASSES D.O.T. TEST FOR HAZARDOUS CLASSIFICATION	HAZARD CLASSIFICATION FLAMMABLE LIQUID U.N. 1203						
HAZARDOUS COMPONENTS  (SEE DEFINITION ON REVERSE SIDE)	INGREDIENT						%	TLV
	PETROLEUM DISTILLATE (BOILING POINT RANGE 80-440° F)  * ACGIH RECOMMEND 8 HOUR TIME WEIGHTED AVERAGE EXPOSURE LIMIT FOR GASOLINE.  NOTE: SEE SECTION IX FOR A SPECIFIC TOXICITY STATEMENT CONCERNING GASOLINE						> 90	300* PPM
PHYSICAL DATA	INITIAL BOILING POINT	IF LIQUID AT 68°F <input checked="" type="checkbox"/> PRODUCT <input type="checkbox"/> COMPONENT ( %)					@	80 °F 760 mmHg
	SPECIFIC GRAVITY	<input type="checkbox"/> GREATER THAN WATER <input type="checkbox"/> EQUAL TO WATER <input type="checkbox"/> LESS THAN WATER					@	0.6-0.7 °F
	VAPOR PRESSURE	IF LIQUID AT 68°F OR WHICH SUBLIME <input type="checkbox"/> PRODUCT <input type="checkbox"/> COMPONENT ( %)					@	500-700 mmHg 68 °F
	PERCENT VOLATILES	INGREDIENT WITH INITIAL BOILING POINT BELOW 423°F						100%
	VAPOR DENSITY	FOR VOLATILE PORTION OF PRODUCT <input type="checkbox"/> LIGHTER THAN AIR <input checked="" type="checkbox"/> HEAVIER THAN AIR						(air = 1)
	EVAPORATION RATE	<input type="checkbox"/> FASTER THAN ETHER <input checked="" type="checkbox"/> SLOWER THAN ETHER					(	=1)
FIRE AND EXPLOSION DATA	FLASH POINT	<input type="checkbox"/> LESS THAN 73°F <input type="checkbox"/> 73-100°F <input type="checkbox"/> 100-200°F <input type="checkbox"/> MORE THAN 200°F						-45 °F
	LOWER EXPLOSION LIMIT	<input checked="" type="checkbox"/> PRODUCT <input type="checkbox"/> LOWEST VALUE OF COMPONENT						1.4
	HAZARDOUS DECOMPOSITION PRODUCTS	KNOWN HAZARDOUS PRODUCTS RESULTING FROM HEATING, BURNING, ETC. OR UNREACTED RAW MATERIAL. MAY FORM TOXIC MATERIALS: CARBON DIOXIDE AND CARBON MONOXIDE, VARIOUS HYDROCARBONS.						

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FIRE AND EXPLOSION DATA  
(CONTINUED)

SPECIAL FIRE FIGHTING PROCEDURES

INDICATE EQUIPMENT TO PROTECT FIREMEN FROM TOXIC PRODUCTS/EXPOSURE OR IF WATER IS NOT TO BE USED  
WATER MAY BE INEFFECTIVE.

SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

6038

UNUSUAL FIRE AND EXPLOSION HAZARDS

PRODUCT IGNITES EXPLOSIVELY. \*SEE SECTION IX.

EXTINGUISHING MEDIA

DRY CHEMICAL     WATER FOG     CARBON DIOXIDE  
 REGULAR FOAM     ALCOHOL FOAM     OTHER: \_\_\_\_\_



THRESHOLD LIMIT VALUE

OSHA ESTABLISHED VALUE  
NOT ESTABLISHED FOR PRODUCT. SEE SECTION II.

EFFECTS OF OVER-EXPOSURE FOR

PRODUCT  
 COMPONENT

KNOWN EFFECTS LISTED, UNLESS NOT APPLICABLE DUE TO PHYSICAL FORM OF PRODUCT  
EYES-CAN CAUSE SEVERE IRRITATION, REDNESS, TEARING BLURRED VISION.  
SKIN-PROLONGED OR REPEATED CONTACT CAN CAUSE MODERATE IRRITATION, DEFATTING, DERMATITIS.  
BREATHING-EXCESSIVE INHALATION OF VAPORS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, HEADACHE, POSSIBLE UNCONSCIOUSNESS, AND EVEN ASPHYXIATION.  
SWALLOWING-CAN CAUSE GASTROINTESTINAL IRRITATION, NAUSEA, VOMITING, DIARRHEA. ASPIRATION OF MATERIAL INTO THE LUNGS CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

HEALTH HAZARD DATA



SPECIAL FIRST AID ACTION

IF ON SKIN  
THOROUGHLY WASH EXPOSED AREA WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING. LAUNDRY CONTAMINATED CLOTHING BEFORE RE-USE.

IF IN EYES  
FLUSH WITH LARGE AMOUNTS OF WATER, LIFTING UPPER AND LOWER LIDS OCCASIONALLY, GET MEDICAL ATTENTION.

IF SWALLOWED  
DO NOT INDUCE VOMITING, KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION. ASPIRATION OF MATERIAL INTO THE LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

IF BREATHED  
IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION.

000065

	HAZARDOUS POLY-MERIZATION	OF ENERGY <input type="checkbox"/> CAN OCCUR <input checked="" type="checkbox"/> CANNOT OCCUR	
ACTIVITY DATA	STABILITY	CONDITIONS TO AVOID IF UNSTABLE UNDER NORMAL CONDITIONS <input checked="" type="checkbox"/> STABLE <input type="checkbox"/> UNSTABLE	6038
	INCOMPATIBILITY (MATERIALS) TO AVOID	COMMON MATERIALS OR CONTAMINANTS WHICH WOULD RESULT IN A HAZARDOUS REACTION WITH THE PRODUCT ARE SHOWN AVOID CONTACT WITH STRONG OXIDIZING AGENTS (E.G. NITRIC ACID, PERMANGANATES, ETC.).	
SPILL OR LEAK PROCEDURES	STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	SMALL SPILL ELIMINATE ALL SOURCES OF IGNITION. VENTILATE AREA, ABSORB LIQUID ON PAPER, VERMICULITE FLOOR ABSORBENT OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD. ALLOW TO EVAPORATE. <hr/> LARGE SPILL ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE, DIKE AREA OF SPILL TO PREVENT SPREADING, PUMP LIQUID TO SALVAGE TANK. REMAINING LIQUID MAY BE TAKEN UP ON SAND, CLAY EARTH, FLOOR ABSORBENT, OR OTHER MATERIAL AND SHOVEL INTO CONTAINERS.	
REASONABLE CAUTIONS TO BE TAKEN AND METHODS OF CLEANUP TO BE USED IN THE EVENT OF SPILLAGE OF THE PRODUCT	WASTE DISPOSAL METHOD	SMALL SPILL ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. DESTROY REMAINING MATERIAL BY BURNING IN AN IRON PAN. <hr/> LARGE SPILL DESTROY BY LIQUID INCINERATION.	
PROTECTIVE EQUIPMENT TO BE USED	RESPIRATORY PROTECTION	IF TLV OF THE PRODUCT OR ANY COMPONENT IS EXCEEDED, A NIOSH MESA JOINTLY APPROVED SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IS ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MESA RESPIRATORS UNDER SPECIFIED CONDITIONS. (SEE YOUR SAFETY EQUIPMENT SUPPLIER).	
PROTECTIVE GLOVES	WEAR RESISTANT GLOVES SUCH AS: NEOPRENE, BUNA-N.		
EYE PROTECTION	CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES. (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER).		
VENTILATION	PROVIDE SUFFICIENT MECHANICAL (GENERAL), AND/OR LOCAL EXHAUST VENTILATION TO MAINTAIN EXPOSURE BELOW TLV'S.		
OTHER PROTECTIVE EQUIPMENT	TO PREVENT REPEATED OR PROLONGED SKIN CONTACT, WEAR IMPERVIOUS CLOTHING AND BOOTS.		

THE ATLANTIC RICHFIELD COMPANY FILED A TSCA 8(e) NOTICE WITH THE ENVIRONMENTAL PROTECTION AGENCY ON DECEMBER 9, 1981 CONCERNING AN AMERICAN PETROLEUM INSTITUTE SPONSORED CHRONIC INHALATION STUDY. THE STUDY HAS SHOWN CHRONIC EXPOSURE TO UNLEADED GASOLINE VAPORS HAS CAUSED ADVERSE HEALTH EFFECTS IN CERTAIN LABORATORY TEST ANIMALS. MALE RATS EXPOSED FOR APPROXIMATELY TWO YEARS TO VARIOUS LEVELS OF UNLEADED GASOLINE VAPORS SHOWED INCREASED LEVELS OF DEGENERATIVE KIDNEY DISEASE AND KIDNEY CANCER. IT SHOULD BE NOTED THAT THE KIDNEY CANCERS OCCURRED LATE IN THE ANIMALS' LIVES AND WERE NOT THE CAUSE OF DEATH IN ANY CASE. THE KIDNEYS OF FEMALE RATS AND MALE AND FEMALE MICE ALSO IN THE STUDY DID NOT SHOW SIMILAR TOXIC RESPONSES. HOWEVER, FEMALE MICE EXPOSED TO THE HIGHEST DOSES LEVELS OF UNLEADED GASOLINE DID SHOW SLIGHTLY HIGHER LEVELS OF LIVER CANCER.

\*(CONTD. FROM SECTION IV)

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR MAY BE MOVED BY VENTILATION AND IGNITED BY PILOT LIGHTS, OTHER FLAMES, SPARKS, HEATERS, SMOKING, ELECTRIC MOTORS, OR OTHER SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING POINT.

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) CAN IGNITE EXPLOSIVELY.

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED. SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPOR, LIQUID, AND/OR SOLID), ALL HAZARD PRECAUTIONS GIVEN IN THIS DATA SHEET MUST BE OBSERVED.

HAZARDOUS INGREDIENT IS ONE WHICH MEETS ONE OR MORE OF THE FOLLOWING CRITERIA:

1. It is listed in the annual Registry of Toxic Effects of Chemical Substances, or is known to be toxic within the parameters of that Registry, and is present at a level of 1% or greater. DOT Poisons are listed if present at any level.
2. It has an OSHA established 8-hour time-weighted average or acceptable ceiling concentration (c), or an American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Value, and by the nature of the product or its known use, is likely to become airborne.
3. It contributes to one or more of the following hazards of the product:
  - a. Flashpoint below 200°F (cc), or subject to spontaneous heating or decomposition.
  - b. Causes skin burns. (DOT)
  - c. Strong oxidizing agent. (DOT)
  - d. Subject to hazardous polymerization.

Each hazardous ingredient is listed by chemical, generic, or proprietary name, its level in the product is expressed as 1% or less, 1-10%, 10-30%, 30-60%, or greater than 60%, or by other means if such information is proprietary. Adopted ACGIH values are only listed, with appropriate notation, where OSHA values are not available.

1 MATERIAL SAFETY DATA SHEET

GENERAL INFORMATION	ACCEPTED BY OSHA AS ESSENTIALLY SIMILAR TO OSHA FORM 20		THE INFORMATION ACCUMULATED HEREIN IS BELIEVED TO BE ACCURATE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH ASHLAND OR NOT. RECIPIENTS ARE ADVISED TO CONFIRM IN ADVANCE OF NEED THAT THE INFORMATION IS CURRENT, APPLICABLE, AND SUITABLE TO THEIR CIRCUMSTANCES.		
	PRODUCT NAME	DATA SHEET NO.	DATE PREPARED	CODE NUMBER	
	GASOLINE - UNLEADED	05	4-12-83	RME	

PRODUCT IDENTIFICATION	PRODUCT CLASS	GENERAL OR GENERIC IDENTIFICATION	
	PASSES O.O.T. TEST FOR HAZARDOUS CLASSIFICATION	HAZARD CLASSIFICATION	
		LIGHT PETROLEUM DISTILLATE - MOTOR FUEL	10378
		FLAMMABLE LIQUID	U.N. 1203

HAZARDOUS COMPONENTS	INGREDIENT	%	TLV
	(SEE DEFINITION ON REVERSE SIDE)	PETROLEUM DISTILLATE (BOILING POINT RANGE 80-440° F)	> 90
* ACGIH RECOMMEND 8 HOUR TIME WEIGHTED AVERAGE EXPOSURE LIMIT FOR GASOLINE.			
NOTE: SEE SECTION IX FOR A SPECIFIC TOXICITY STATEMENT CONCERNING GASOLINE			

PHYSICAL DATA	INITIAL BOILING POINT	IF LIQUID AT 66°F	
		<input checked="" type="checkbox"/> PRODUCT <input type="checkbox"/> COMPONENT ( %)	@ 80 °F 760 mmHg
	SPECIFIC GRAVITY	<input type="checkbox"/> GREATER THAN WATER <input type="checkbox"/> EQUAL TO WATER <input type="checkbox"/> LESS THAN WATER	@ 0.6-0.7 °F
	VAPOR PRESSURE	IF LIQUID AT 66°F OR WHICH SUBLIME <input type="checkbox"/> PRODUCT <input type="checkbox"/> COMPONENT ( %)	500-700 mmHg @ 68 °F
	PERCENT VOLATILES	INGREDIENT WITH INITIAL BOILING POINT BELOW 423°F	100%
	VAPOR DENSITY	FOR VOLATILE PORTION OF PRODUCT <input type="checkbox"/> LIGHTER THAN AIR <input checked="" type="checkbox"/> HEAVIER THAN AIR	(air = 1)
EVAPORATION RATE	<input type="checkbox"/> FASTER THAN ETHER <input checked="" type="checkbox"/> SLOWER THAN ETHER	( = 1)	

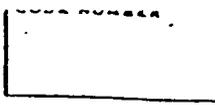
FIRE AND EXPLOSION DATA	FLASH POINT	<input type="checkbox"/> LESS THAN 73°F <input type="checkbox"/> 73-100°F <input type="checkbox"/> 100-200°F <input type="checkbox"/> MORE THAN 200°F	-45 °F
	LOWER EXPLOSION LIMIT	<input checked="" type="checkbox"/> PRODUCT <input type="checkbox"/> LOWEST VALUE OF COMPONENT	1.4
	HAZARDOUS DECOMPOSITION PRODUCTS	KNOWN HAZARDOUS PRODUCTS RESULTING FROM HEATING, BURNING, ETC. OR UNREACTED RAW MATERIAL. MAY FORM TOXIC MATERIALS: CARBON DIOXIDE AND CARBON MONOXIDE, VARIOUS HYDROCARBONS.	

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INDICATE EQUIPMENT TO PROTECT PERSON FROM LOCAL PRODUCTS/CONTAMINATION OR IF WATER IS NOT TO BE USED

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FIRE AND EXPLOSION DATA

SPECIAL FIRE FIGHTING PROCEDURES

WATER MAY BE INEFFECTIVE.  
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

(CONTINUED)

UNUSUAL FIRE AND EXPLOSION HAZARDS

PRODUCT IGNITES EXPLOSIVELY. \*SEE SECTION IX.

EXTINGUISHING MEDIA

DRY CHEMICAL     WATER FOG     CARBON DIOXIDE  
 REGULAR FOAM     ALCOHOL FOAM     OTHER: \_\_\_\_\_



THRESHOLD LIMIT VALUE

OSHA ESTABLISHED VALUE  
NOT ESTABLISHED FOR PRODUCT. SEE SECTION II.

EFFECTS OF OVER-EXPOSURE FOR

PRODUCT  
 COMPONENT

KNOWN EFFECTS LISTED, UNLESS NOT APPLICABLE DUE TO PHYSICAL FORM OF PRODUCT  
EYES-CAN CAUSE SEVERE IRRITATION, REDNESS, TEARING BLURRED VISION.  
SKIN-PROLONGED OR REPEATED CONTACT CAN CAUSE MODERATE IRRITATION, DEFATTING, DERMATITIS.  
BREATHING-EXCESSIVE INHALATION OF VAPORS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, HEADACHE, POSSIBLE UNCONSCIOUSNESS, AND EVEN ASPHYXIATION.  
SWALLOWING-CAN CAUSE GASTROINTESTINAL IRRITATION, NAUSEA, VOMITING, DIARRHEA. ASPIRATION OF MATERIAL INTO THE LUNGS CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

HEALTH HAZARD DATA



SPECIAL FIRST AID ACTION

IF ON SKIN  
THOROUGHLY WASH EXPOSED AREA WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING. LAUNDER CONTAMINATED CLOTHING BEFORE RE-USE.

IF IN EYES  
FLUSH WITH LARGE AMOUNTS OF WATER, LIFTING UPPER AND LOWER LIDS OCCASIONALLY, GET MEDICAL ATTENTION.

IF SWALLOWED  
DO NOT INDUCE VOMITING, KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION. ASPIRATION OF MATERIAL INTO THE LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

IF BREATHED  
IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET, AND GET MEDICAL ATTENTION.

HAZARDOUS POLYMERIZATION

OF ENERGY

CAN OCCUR

CANNOT OCCUR

ACTIVITY DATA

STABILITY

CONDITIONS TO AVOID IF UNSTABLE UNDER NORMAL CONDITIONS

STABLE

UNSTABLE

INCOMPATIBILITY (MATERIALS) TO AVOID

COMMON MATERIALS OR CONTAMINANTS WHICH WOULD RESULT IN A HAZARDOUS REACTION WITH THE PRODUCT ARE SHOWN

AVOID CONTACT WITH STRONG OXIDIZING AGENTS (E.G. NITRIC ACID, PERMANGANATES, ETC.).

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

SMALL SPILL

ELIMINATE ALL SOURCES OF IGNITION. VENTILATE AREA, ABSORB LIQUID ON PAPER, VERMICULITE FLOOR ABSORBENT OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD. ALLOW TO EVAPORATE.

LARGE SPILL

ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE, DIKE AREA OF SPILL TO PREVENT SPREADING, PUMP LIQUID TO SALVAGE TANK. REMAINING LIQUID MAY BE TAKEN UP ON SAND, CLAY EARTH, FLOOR ABSORBENT, OR OTHER MATERIAL AND SHOVEL INTO CONTAINERS.

REASONABLE CAUTIONS TO BE TAKEN AND METHODS OF ANALYSIS TO BE USED IN THE EVENT OF A RELEASE OF THE PRODUCT

WASTE DISPOSAL METHOD

SMALL SPILL

ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. DESTROY REMAINING MATERIAL BY BURNING IN AN IRON PAN.

LARGE SPILL

DESTROY BY LIQUID INCINERATION.

PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION

IF TLV OF THE PRODUCT OR ANY COMPONENT IS EXCEEDED, A NIOSH MESA JOINTLY APPROVED SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IS ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MESA RESPIRATORS UNDER SPECIFIED CONDITIONS. (SEE YOUR SAFETY EQUIPMENT SUPPLIER).

PROTECTIVE GLOVES

WEAR RESISTANT GLOVES SUCH AS: NEOPRENE, BUNA-N.

EYE PROTECTION

CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES. (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER).

VENTILATION

PROVIDE SUFFICIENT MECHANICAL (GENERAL), AND/OR LOCAL EXHAUST VENTILATION TO MAINTAIN EXPOSURE BELOW TLV'S.

OTHER PROTECTIVE EQUIPMENT

TO PREVENT REPEATED OR PROLONGED SKIN CONTACT, WEAR IMPERVIOUS CLOTHING AND BOOTS.

THE ATLANTIC RICHFIELD COMPANY FILED A TSCA 8(e) NOTICE WITH THE ENVIRONMENTAL PROTECTION AGENCY ON DECEMBER 9, 1981 CONCERNING AN AMERICAN PETROLEUM INSTITUTE SPONSORED CHRONIC INHALATION STUDY. THE STUDY HAS SHOWN CHRONIC EXPOSURE TO UNLEADED GASOLINE VAPORS HAS CAUSED ADVERSE HEALTH EFFECTS IN CERTAIN LABORATORY TEST ANIMALS. MALE RATS EXPOSED FOR APPROXIMATELY TWO YEARS TO VARIOUS LEVELS OF UNLEADED GASOLINE VAPORS SHOWED INCREASED LEVELS OF DEGENERATIVE KIDNEY DISEASE AND KIDNEY CANCER. IT SHOULD BE NOTED THAT THE KIDNEY CANCERS OCCURRED LATE IN THE ANIMALS' LIVES AND WERE NOT THE CAUSE OF DEATH IN ANY CASE. THE KIDNEYS OF FEMALE RATS AND MALE AND FEMALE MICE ALSO IN THE STUDY DID NOT SHOW SIMILAR TOXIC RESPONSES. HOWEVER, FEMALE MICE EXPOSED TO THE HIGHEST DOSES LEVELS OF UNLEADED GASOLINE DID SHOW SLIGHTLY HIGHER LEVELS OF LIVER CANCER.

\*(CONTD. FROM SECTION IV)

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR MAY BE MOVED BY VENTILATION AND IGNITED BY PILOT LIGHTS, OTHER FLAMES, SPARKS, HEATERS, SMOKING, ELECTRIC MOTORS, OR OTHER SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING POINT.

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) CAN IGNITE EXPLOSIVELY.

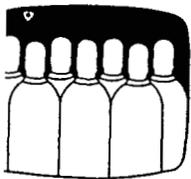
CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED. SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPOR, LIQUID, AND/OR SOLID), ALL HAZARD PRECAUTIONS GIVEN IN THIS DATA SHEET MUST BE OBSERVED.

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HAZARDOUS INGREDIENT IS ONE WHICH MEETS ONE OR MORE OF THE FOLLOWING CRITERIA:

1. It is listed in the annual Registry of Toxic Effects of Chemical Substances, or is known to be toxic within the parameters of that Registry, and is present at a level of 1% or greater. DOT Poisons are listed if present at any level.
2. It has an OSHA established 8-hour time-weighted average or acceptable ceiling concentration (c), or an American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Value, and by the nature of the product or its known use, is likely to become airborne.
3. It contributes to one or more of the following hazards of the product:
  - a. Flashpoint below 200°F (cc), or subject to spontaneous heating or decomposition.
  - b. Causes skin burns. (DOT)
  - c. Strong oxidizing agent. (DOT)
  - d. Subject to hazardous polymerization.

Each hazardous ingredient is listed by chemical, generic, or proprietary name, its level in the product is expressed as 1% or less, 1-10%, 10-30%, 30-60%, or greater than 60%, or by other means if such information is proprietary. Adopted ACGIH values are only listed, with appropriate notation, where OSHA values are not available.



# MATHESON GAS PRODUCTS MATERIAL SAFETY DATA SHEET

6038

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MAT04600

PAGE 01 OF 09

MATERIAL SAFETY DATA SHEET

MATHESON GAS PRODUCTS  
30 SEAVIEW DRIVE  
SECAUCUS, NEW JERSEY 07096  
(201) 867-4100

EMERGENCY CONTACT:  
CHEMTREC 1-800-424-9300

#10102

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7782-50-5

SUBSTANCE: CHLORINE

TRADE NAMES/SYNONYMS:

CHLORINE MOLECULAR; CHLORINE MOL.; DIATOMIC CHLORINE; DICHLORINE;  
MOLECULAR CHLORINE; STCC 4904120; UN 1017; CL2; MAT04600

CHEMICAL FAMILY:  
HALOGEN

INORGANIC GAS

MOLECULAR FORMULA: CL2

MOLECULAR WEIGHT: 70.906

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=0  
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: CHLORINE PERCENT: 100.0  
CAS# 7782-50-5

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

CHLORINE:

0.5 PPM (1.5 MG/M3) OSHA TWA; 1 PPM (3 MG/M3) OSHA STEL  
0.5 PPM (1.5 MG/M3) ACGIH TWA; 1 PPM (3 MG/M3) ACGIH STEL  
0.5 PPM NIOSH RECOMMENDED 15 MINUTE CEILING

100 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY  
10 POUNDS SARA SECTION 304 REPORTABLE QUANTITY  
10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY  
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING.

PHYSICAL DATA

DESCRIPTION: PALE GREENISH-YELLOW GAS WITH A CHARACTERISTIC, SUFFOCATING ODOR.

BOILING POINT: -31 F (-35 C) MELTING POINT: -150 F (-101 C)

SPECIFIC GRAVITY: 3.214 G/L @ 0 C VAPOR PRESSURE: 5168 MMHG @ 21 C

SOLUBILITY IN WATER: 1.46% @ 0 C ODOR THRESHOLD: 0.01 PPM

060072

INHALATION-MOUSE LC50; 660 PPM/4 HOURS INHALATION-RABBIT LCLO; 330 PPM/7 HOURS INHALATION-GUINEA PIG LCLO; 800 PPM/30 MINUTES INHALATION-DOG LCLO; 660 PPM/4 HOURS INHALATION-CAT LCLO, 500 PPM/5 MINUTES INHALATION-MAMMAL LCLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).

CARCINOGEN STATUS: NONE.

LOCAL EFFECTS: CORROSIVE- SKIN, EYE; IRRITANT- MUCOUS MEMBRANES.

ACUTE TOXICITY LEVEL: TOXIC BY INHALATION.

TARGET EFFECTS: POISONING MAY AFFECT THE LUNGS.

AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING HEART DISEASE OR TUBERCULOSIS.

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#### HEALTH EFFECTS AND FIRST AID

INHALATION:

CHLORINE:

CORROSIVE/TOXIC.

30 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- MUCOUS MEMBRANE IRRITATION MAY OCCUR AT 0.2 TO 16 PPM AND COUGH AT 30 PPM. INHALATION OF 500 PPM FOR 5 MINUTES HAS BEEN LETHAL IN HUMANS AND 1000 PPM MAY BE FATAL AFTER A FEW DEEP BREATHS. OCCUPATIONAL EXPOSURES HAVE RESULTED IN BURNING OF THE NOSE AND MOUTH WITH RHINORRHEA, RESPIRATORY DISTRESS WITH COUGHING, CHOKING, WHEEZING, RALES, RETCHING, HEMOPTYSIS, SUBSTERNAL PAIN, DYSPNEA, AND CYANOSIS. TRACHEOBRONCHITIS, PROGRESSING TO IMMEDIATE OR POSSIBLY DELAYED PULMONARY EDEMA AND OCCASIONAL PNEUMONITIS HAVE ALSO BEEN REPORTED. COUGH GENERALLY INCREASES IN FREQUENCY AND SEVERITY AFTER TWO TO THREE DAYS AND BECAME PRODUCTIVE OF THICK MUCOPURULENT SPUTUM, WHICH DISAPPEARS BY THE END OF 14 DAYS. LUNG DAMAGE IS USUALLY NOT PERMANENT; RESPIRATORY DISTRESS USUALLY SUBSIDES WITHIN 72 HOURS. AT HIGH CONCENTRATIONS, CHLORINE MAY ACT AS AN ASPHYXIAANT BY CAUSING CRAMPS OF THE LARYNX MUSCLES AND SWELLING OF THE THE MUCOUS MEMBRANES. OTHER SYMPTOMS MAY INCLUDE SALIVATION, ANXIETY, SNEEZING, PALLOR OR REDNESS OF THE FACE, WEAKNESS, HOARSENESS, HEADACHE, DIZZINESS, AND GENERAL EXCITEMENT AND RESTLESSNESS. MASSIVE INHALATION MAY ALSO CAUSE DEATH BY CARDIAC ARREST.

CHRONIC EXPOSURE- PERSONS REPEATEDLY EXPOSED TO LOW CONCENTRATIONS MAY DEVELOP CHLORACNE, OLFACTORY DEFICIENCY AND TOLERANCE BUILD-UP. PROLONGED AND REPEATED EXPOSURE TO 0.8-1.0 PPM MAY CAUSE PERMANENT, ALTHOUGH MODERATE REDUCTION IN PULMONARY FUNCTION. CHRONIC EXPOSURE AT 5 PPM MAY RESULT IN INFLAMMATION OF THE MUCOUS MEMBRANES OF THE NOSE, DISEASE OF THE BRONCHI, AND INCREASED SUSCEPTIBILITY TO RESPIRATORY INFECTION INCLUDING TUBERCULOSIS. DENTAL EROSION MAY OCCUR. ANIMALS SURVIVING SUBLETHAL EXPOSURES FOR 15 TO 193 DAYS AFTER GASSING SHOWED MARKED EMPHYSEMA.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

CHLORINE:

CORROSIVE.

ACUTE EXPOSURE- HIGH VAPOR CONCENTRATIONS MAY IRRITATE THE SKIN AND CAUSE BURNING AND PRICKING SENSATIONS, INFLAMMATION, AND VESICLE FORMATION. CONTACT WITH LIQUID MAY CAUSE BURNS, BLISTERING, TISSUE DESTRUCTION, AND

ALKYL ISOTHIUREA SALTS: FORMATION OF EXPLOSIVE NITROGEN TRICHLORIDE.  
AMMONIA: EXPLODES WHEN HEATED.  
ANTIMONY: IGNITION REACTION.  
ARSENIC: SPONTANEOUS IGNITION.  
N-ARYLSULFINAMIDES: POSSIBLE VIOLENT REACTION.  
BENZENE: EXPLOSIVE REACTION CATALYZED BY LIGHT.  
BORON: IGNITES ON CONTACT.  
BROMINE PENTAFLUORIDE: EXPLOSIVE REACTION.  
CALCIUM CHLORITE: FORMS EXPLOSIVE CHLORINE DIOXIDE.  
CALCIUM NITRIDE: INCANDESCENT REACTION.  
CARBON (ACTIVATED): IGNITES ON CONTACT.  
CARBON DISULFIDE: EXPLOSIVE REACTION IN THE PRESENCE OF IRON CATALYST.  
CESIUM NITRIDE: ATTACKED BY CHLORINE.  
3-CHLOROPROPYNE: POSSIBLE EXPLOSION.  
CHROMYL CHLORIDE + CARBON: POSSIBLE EXPLOSION.  
COMBUSTIBLE MATERIALS: CONTACT WITH THE LIQUID IS LIKELY TO RESULT IN AN EXPLOSION. CONTACT WITH THE GAS MAY RESULT IN IGNITION OR AN EXPLOSION.  
DIBORANE: EXPLODES ON CONTACT AT AMBIENT TEMPERATURES.  
DICHLOROMETHYLARSINE: POSSIBLE EXPLOSION.  
DIETHYL ETHER: EXPLODES.  
DIETHYLZINC: IGNITION.  
DIMETHYLFORMAMIDE: EXPLOSION HAZARD.  
DIMETHYL PHOSPHORAMIDATE: MAY FORM EXPLOSIVE NITROGEN TRICHLORIDE.  
DIOXYGEN DIFLUORIDE: IGNITION OR EXPLOSIVE REACTION.  
DISILYL OXIDE: EXPLOSIVE REACTION.  
4,4'-DITHIODIMORPHOLINE: MAY FORM EXPLOSIVE COMPOUND.  
ETHYLENE: EXPLOSIVE REACTION IN THE PRESENCE OF LIGHT OR CATALYSTS.  
ETHYLENE IMINE: FORMATION OF EXPLOSIVE 1-CHLOROETHYLENE IMINE.  
ETHYLPHOSPHINE: EXPLOSION ON CONTACT.  
FLAMMABLE COMPOUNDS: CONTACT WITH THE LIQUID IS LIKELY TO RESULT IN AN EXPLOSION. CONTACT WITH THE GAS MAY RESULT IN IGNITION OR AN EXPLOSION.  
FLUORINE: IGNITION FOLLOWED BY EXPLOSION ON SPARKING.  
HEXACHLORODISILANE: IGNITION ABOVE 300 C WITH POSSIBLE EXPLOSION.  
HYDRAZINE: IGNITION REACTION.  
HYDROCARBONS: CONTACT WITH THE LIQUID IS LIKELY TO RESULT IN AN EXPLOSION. CONTACT WITH THE GAS MAY RESULT IN IGNITION OR AN EXPLOSION. ADDITION OF A LEWIS ACID TO CHLORINE-HYDROCARBON MIXTURES WILL RESULT IN THE RELEASE OF LARGE VOLUMES OF HYDROGEN CHLORIDE.  
HYDROGEN: EXPLOSIVE MIXTURES.  
HYDROGEN PEROXIDE + POTASSIUM HYDROXIDE: LUMINESCENT REACTION.  
HYDROXYLAMINE: SPONTANEOUS IGNITION.  
IODINE: VIOLENT REACTION.  
IRON CARBIDE: INCANDESCENT REACTION.  
LITHIUM SILICIDE: INCANDESCENT REACTION WHEN HEATED.  
METALS AND ALLOYS: IGNITION ON CONTACT; SOME METALS MAY BE CORRODED IN THE PRESENCE OF MOISTURE.  
METAL ACETYLIDES: IGNITION REACTION.  
METAL HYDRIDES: IGNITION.  
METAL OXIDES: VIGOROUS REACTION AND POSSIBLE IGNITION.  
METAL PHOSPHIDES: IGNITION.  
NITROGEN COMPOUNDS: MAY FORM EXPLOSIVE NITROGEN TRICHLORIDE.  
NITROGEN TRIIODIDE: EXPLOSIVE REACTION ON CONTACT.  
NON-METAL HYDRIDES: IGNITE ON CONTACT.  
OXYGEN: EXPLOSION ON HEATING.  
OXYGEN DIFLUORIDE: EXPLODES ON WARMING.  
PHENYLMAGNESIUM BROMIDE: POSSIBLE EXPLOSION.  
PHOSPHOROUS: EXPLOSIVE REACTION ON CONTACT WITH THE LIQUID; IGNITION ON CONTACT WITH THE GAS.

## \*\*DISPOSAL\*\*

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001. 100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

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CONDITIONS TO AVOID

AVOID CONTACT WITH COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC); CONTACT MAY RESULT IN IGNITION OR EXPLOSION. MATERIAL MAY BE POISONOUS; AVOID INHALATION OF VAPORS OR CONTACT WITH SKIN DO NOT ALLOW MATERIAL TO CONTAMINATE WATER SOURCES.

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SPILL AND LEAK PROCEDURES

## SOIL SPILL:

DIG A PIT, POND, LAGOON OR HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL. DIKE SURFACE FLOW USING SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB BULK LIQUID WITH FLY ASH OR CEMENT POWDER. ADD CAUSTIC SODA.

## AIR SPILL:

APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

## WATER SPILL:

NEUTRALIZE WITH CAUSTIC SODA.

IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

## OCCUPATIONAL SPILL:

STOP LEAK IF YOU CAN DO IT WITHOUT RISK. KEEP COMBUSTIBLES AWAY FROM SPILLED MATERIAL. KEEP UNNECESSARY PEOPLE AWAY; ISOLATE AREA AND DENY ENTRY UNTIL GAS HAS DISPERSED. VENTILATE CLOSED SPACES BEFORE ENTERING.

## REPORTABLE QUANTITY (RQ): 10 POUNDS

THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

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PROTECTIVE EQUIPMENT

## VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

## RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS

**EYE PROTECTION:**

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

**EMERGENCY WASH FACILITIES:**

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

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**-ADDITIONAL INFORMATION-**

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