HEALTH AND SAFETY PLAN

EPA Region 5 Records Ctr.
234682

II

TABLE OF CONTENTS - Continued

SECTION 2
HEALTH AND SAFETY PLAN

2.1 INTRODUCTION

The following pages present the site-specific health and safety plan prepared by PRC. Included in this plan are a site description, a list of known or suspected contaminants, and monitoring, decontamination, disposal, and emergency procedures. Also included are a safety meeting sign-off sheet and a site log to be completed by field personnel on-site.

2.2 GENERAL CONSIDERATIONS

To help ensure the safety of all field personnel working at the Petersen Sand & Gravel site, PRC has prepared a health and safety plan. The plan, which follows, is in accordance with the following documents:

- Section III(c)(6) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980
- U.S. EPA Orders 1440.2 and 1440.3
- U.S. EPA Occupational Health and Safety Manual
- U.S. EPA Standard Operating and Safety Guidelines (Nov. 1984)
- OSHA, 29 CFR 1910, Applicable requirements and OSHA Construction Industry Standards 29 CFR 1926 Subparts C, D, E, and F.

All field personnel will have received a baseline medical examination within the past year and are certified to wear respiratory protection. Personnel will be fit-tested prior to on-site arrival. If a worker's vision must be corrected an approved spectacle kit will be fitted inside the respirator. PRC will be using subcontractors to complete portions of the field work. All subcontractors will provide PRC with written documentation that their field personnel have received a baseline medical examination within the past year and are certified to wear respirators.

The level of personal protection used at the site is based on the following criteria:

Level of Protection	Reading on HNU 101
D	0 ppm above background
C	1 to 5 ppm above background
B	6 to 500 ppm above background

To help establish the level of protection the following equipment will be used:

- o Monitox
- o Oxygen Meter
- o Explosimeter
- o Rad Tad
- o HNU 101
- o Drager Tubes

The monitox personal alarm unit is a portable hand-carried detector which continuously monitors air quality for hydrogen cyanide. Hydrogen cyanide is an acutely toxic substance which is instantly lethal at a relatively low concentration (0.1%). The oxygen meter specifically monitors for oxygen deficiency (<19.5%) while the explosimeter monitors air quality for potentially explosive conditions. The Rad-Tad will detect alpha, beta, and gamma radiation if radioactive materials were disposed of at the facility.

The HNU 101 is a portable, non-specific vapor/gas detector employing the principal of photionization to detect a wide variety of volatile chemical compounds, both organic and inorganic. Drager tubes will be used in conjunction with the HNU 101 to monitor specifically for acrylonitrile. Calibrated in parts per million, these direct reading tubes are based on the cleavage of the acrylonitrile in the oxidizing layer of the pre tube. The acrylonitrile liberated is measured in the indicating layer changing the color of the indicating layer to red. This acrylonitrile indication is not affected by the following compounds: 1000 ppm acetone, 20 ppm benzene, 1000 ppm ethyl acetate, 1000 ppm ethanol, 10 ppm ethyl benzene, 1000 ppm hexane, 50 ppm styrene, and 100 ppm toulene. However, part of the oxidation layer is consumed in the presence of butadiene. At 200 ppm the indication error on the 20

stroke test is a minus 30%. If the HNU reads less than the lowest level of the interfering chemical (10 ppm ethyl benzene) the acrylonitrile drager tubes can be used with extreme accuracy.

If necessary field personnel will upgrade their level of protection according to the lowest sustained (approximately 15 seconds) reading recorded on an HNU photoionizer. If acrylonitrile is detected during field monitoring, field personnel will upgrade to Level B Protection.

In the event of an upgrade in personal protection, the safety coordinator will suspend on-site activities and notify personnel. The field crew will be advised of the change in personal protection and receive the appropriate equipment to complete the day's work, or the safety coordinator will suspend work until the appropriate equipment can be brought in.

The site health and safety coordinator will have the authority to suspend on-site activities under any of the following conditions:

- o The health and safety plan is not being followed
- o The level of protection must be upgraded to B or A
- o A life-threatening situation develops

The safety coordinator will keep a daily log which details site activities, names on-site personnel and visitors, tracks the amount of time spent in on-site activities, records weather conditions, and relates any health and safety-related problems as well as the resolutions of the problems. In addition, the safety coordinator will maintain a visitors log and provide a hold-harmless form which states that the visitor has received a copy of the Health & Safety Plan and will follow said plan. A copy of this health and safety plan will be posted so that all field personnel will have easy access to it. A brightly colored flag will be displayed at all times so that wind direction and relative velocity are visible from the work area. An air horn will be used to signal emergency evacuation procedures. Escape routes will be perpendicular to the direction of prevailing winds and will be designated before on-site activities begin.

---

[a] HNU 101 photoionizer with a 11.7 ev lamp

One main entrance is used to gain access to this site which is fenced on the north and east sides and is adjacent to a river on the west side. A guard sits at the main entrance. The field team leader will control access to the field work areas by posting "No Trespassing" signs around the work areas. On occasion, Petersen Sand & Gravel workers may need to enter an area where PRC personnel are working. The site safety coordinator will advise the field team leader of the current site conditions. Together, they will decide if it is safe for site workers to enter.

The field team leader will notify the appropriate emergency rescue personnel (police, fire department, and local hospital) of the field team's activities on site and give them a copy of this health and safety plan. Site representatives and visitors will also be briefed on PRC's field activities and receive a copy of this plan. The field team leader and site safety coordinator will then discuss the plan with visitors to make certain they understand the plan.

2.3 HEALTH AND SAFETY PLAN

Project No: 02-2964-15-01 EPA Region: Region V

Site Name: Petersen Sand & Gravel
Address/Location: Buckley and River Roads, Libertyville, IL

Objectives: PRC will install 15 monitoring wells and collect 65 surface soil samples, 15 ground-water samples, 1 surface water sample, and 1 sediment sample. The samples will be collected to determine the existence and extent of contamination.

Proposed Date of Investigation: _____
Background Review is: Preliminary _____ Complete X
State has additional data _____
Overall Hazard is:
High _____ Moderate _____ Low X Unknown _____

Review And Approvals

Plan Prepared by: Anne C. Sause Date: _____
Project Manager: Kurt Thomsen Date: _____
Health & Safety Director: Dan Chow Date: _____
Field Team Leader: Thomas W. Lentzen Date: _____
On-Site Safety Officer: Anne C. Sause Date: _____
IEPA Primary Contact: Ken Miller Date: _____
U.S. EPA Primary Contact: Allison Hiltner Date: _____
Site QA Manager: Elsa Krauss Date: _____

Site/Facility Description

Facility Description: Site is a 70-acre sand and gravel quarry on the east bank of the Des Plaines River. About 20 acres of the old quarry were used for disposal of drummed solvents and paint sludges.

Principal Disposal Method (type and location): Filled drums were disposed of in open pits and buried under gravel and sand.

Unusual Features (containers, buildings, dikes, power lines, terrain, etc.): The site is a currently operating sand and gravel excavation pit. Site is adjacent to the Des Plaines River and has three or four ponds on-site.

Status, and Years of Operation (Open, Closed, Unknown): Site operation began in 1952, and at still operates as a sand and gravel mining site. Waste disposal took place from approximately 1955 to 1971. Portions of the site have been cleaned up twice in 1977 and in 1983.

Site background (worker or non-worker injury, complaints from the public, past regulatory or enforcement actions): Site background is detailed in Appendix A.

Hazardous/Toxic Materials

List known or suspected materials, contaminated media, storage container, wastes, etc.

Attach Material Safety Data Sheet(s), if available.

	Substance	Form(A)	Toxicity(B)	Characteristics(C)	Quantity Unit
1.	PCB	Liquid	High	Persistent, Carcinogenic	Unknown
2.	Oil	Liquid	Low	Unknown	Unknown
3.	Paint	Sludge	High-Medium	Persistent, Flammable, Toxic	Unknown
4.	Solvents	Liquid	High	Flammable Toxic, Volatile	Unknown
5.	Acrylon-itrile	Liquid	High	Corrosive, Toxic Carcinogenic	Unknown
6.					

(A) Form - Solid, Liquid, Vapor, Sludge

(B) Toxicity - High, Medium, Low, None

(C) Characteristics - Corrosive, Flammable, Radioactive, Toxic, Volatile, Reactive, Inert, Persistent, Carcinogenic

References: Merck Index, 10th Edition; RTECS, 1981-1982

Hazard Evaluation (A)

Toxic Contaminants: Yes X No _____ Unknown _____

See attached Hazardous Chemical Evaluation sheets

Explosivity: Yes _____ No _____ Unknown X

Radioactivity: Yes _____ No X Unknown _____

O_2 Depletion: Yes _____ No _____ Unknown X

Buried Utilities: Yes _____ No X If yes, specify _____

(A) If unknown, mark UK.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Acetone _____ **Date** _____
DOT Name Acetone _____ **WA Number** 02-2964-15-01
CAS Number 67-64-1 _____

REFERENCES: Merck Index, 10th Edition;
DOT Hazardous Materials Guidebook, 1980

CHEMICAL PROPERTIES: (Synonyms - 2-Propanone; Dimethyl ketone)

Chemical Formula	C_3H_6O	**Molecular Weight**	58.08
Physical State	Liquid	**Solubility (H_2O)**	Miscible
Boiling Point	56.5°C (133°F)	**Freezing Point**	Melting point-201.2°F
Flash Point	0°F	**Flammable Limits**	LEL-2.6% UEL-12.8%
Specific Gravity	N/A	**Vapor Pressure/Density**	25 0.788
Incompatibilities	Highly flammable; oxidizing material, acids		

BIOLOGICAL PROPERTIES:

TLV-TWA 750 ppm **PEL** 1000 ppm
IDHL: **Human** 20,000 ppm **Aquatic** _____ **Rat, Mouse** LD_{50}=10.7ml/kg (oral)
Route of Exposure: Inhalation, ingestion, dermal contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear chemically resistant clothing; avoid breathing. Wear respirator or self-contained breathing apparatus. Isolate hazard area, stay upwind and avoid low areas.

DISPOSAL/WASTE TREATMENT:

Take up with sand, or other noncombustible absorbent material, then flush area with water.

HEALTH HAZARDS AND FIRST AID:

If splashed in eyes, flush with water at least 15 minutes. If splashed on skin, wash with soap, rinse thoroughly. If inhaled, remove victim to fresh air, give artificial respiration. If swallowed, give water to dilute and induce vomiting.

SYMPTOMS: **Acute -** Irritates eyes, nose, throat; produces headache and dizziness.

Chronic - Affects kidneys, liver, central nervous system, central vascular system, lungs, skin and eyes.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Acrylonitrile **Date** _____
DOT Name Acrylonitrile **WA Number** 02-2964-15-01
CAS Number 107-13-1

REFERENCES: Merck Index, 10th Edition
NIOSH Pocket Guide to Chemical Hazards, 1985
DOT Hazardous Materials Guidebook, 1980

CHEMICAL PROPERTIES: (Synonyms - Vinylcyanide, Propenenitrile, Cyanoethylene)

Chemical Formula	CH_2CHCN	**Molecular Weight**	53
Physical State	Liquid	**Solubility (H_2O)**	7.1%
Boiling Point	171°F	**Freezing Point**	117°F
Flash Point	30°F	**Flammable Limits**	LEL=3% UEL=17%
Specific Gravity		**Vapor Pressure/Density**	83mm
Incompatibilities	Strong oxidizers (especially bromine), strong bases, copper and copper alloys, ammonia, amines.		

BIOLOGICAL PROPERTIES:

TLV-TWA 2 ppm, TWA (8 hr) **PEL** 2 ppm, (10 ppm ceiling 15 minutes)
IDHL: **Human** 4000 **Aquatic** _____ **Rat, Mouse** LD_{50}=0.093 g/kg
Route of Exposure: Inhalation, absorption, ingestion, contact.

Carcinogen X **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Positive pressure breathing apparatus and special protective clothing must be worn. Wash or remove clothes immediately if contact occurs. Isolate hazard. Personnel will stay upwind. Material is highly toxic and carcinogenic.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material; flush area with flooding amounts of water, do not get water in containers. No smoking, flares or flames in hazard area.

HEALTH HAZARDS AND FIRST AID:

If contact with eyes and skin occurs, wash immediately with water for 15 minutes. If inhaled and breathing becomes difficult, give oxygen; if breathing stops, perform artificial respiration. If material is swallowed, seek immediate medical attention.

SYMPTOMS: **Acute -** Asphyxia, irritated eyes, headache, sneezing, nausea and vomiting, skin vesiculation, dermatitis.

Chronic - Damage to central nervous and cardiovascular systems, liver, kidneys, brain tumor, lung and bowel cancer.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Benzene **Date** _____
DOT Name Benzene **WA Number** 02-2964-15-01
CAS Number 71-43-2

REFERENCES: NIOSH Pocket Guide to Chemical Hazards
The Merck Index

CHEMICAL PROPERTIES: (Synonyms - Benzol, Coal tar, Naphtha)

Chemical Formula	C_6H_6	**Molecular Weight**	78.11
Physical State	Clear Liquid	**Solubility (H_2O)**	0.18%
Boiling Point	176°F	**Freezing Point**	42°F
Flash Point	12°F	**Flammable Limits**	LEL=1.3% UEL=7.1%
Specific Gravity	unknown	**Vapor Pressure/Density**	75mm
Incompatibilities	Strong oxidizers, chlorine, bromine with iron		

BIOLOGICAL PROPERTIES:

TLV-TWA 10 ppm **PEL** 10 ppm
IDHL: **Human** 2000 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, absorbtion, and skin contact

Carcinogen X **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Positive pressure breathing apparatus and special protective clothing must be worn. Wash or remove clothing immediately if contact occurs. Isolate hazard, stay upwind and avoid low areas.

DISPOSAL/WASTE TREATMENT:

Take up with sand or other non-combustible absorbent material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Flush with water immediately. Skin - Soap wash immediately, flush with water.
Ingestion - Seek immediate medical attention.

SYMPTOMS: **Acute -** Irritated eyes, nose, respiratory system. Headache, nausea, staggered gate

Chronic - Damage to respiratory system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Chlorobenzene **Date** _____
DOT Name Chlorobenzene **WA Number** 02-2964-15-01
CAS Number 108-90-7

REFERENCES: DOT Hazardous Materials Guide Book, 1980
NIOSH Pocket Guide to Chemical Hazards, 1985
Merck Index, 10th edition

CHEMICAL PROPERTIES: (Synonyms - Monochlorobenzene, MCB, Phenyl chloride)

Chemical Formula	C_6H_5Cl	**Molecular Weight**	113
Physical State	Liquid	**Solubility (H_2O)**	0.1%
Boiling Point	270°F	**Freezing Point**	-47°F
Flash Point	84°F	**Flammable Limits**	LEL-1.3% UEL=7.1%
Specific Gravity	Unknown	**Vapor Pressure/Density**	8.8mm
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 350 mg/m^3 **PEL** 75 ppm
IDHL: **Human** 2400 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, Ingestion, Contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Wear self-contained breathing apparatus and full protective clothing.
Wash promptly upon skin contact, remove any wet clothes.
Stay upwind and out of low lying areas.

DISPOSAL/WASTE TREATMENT:

No flares or flames in area; take up with sand or other noncombustible absorbent material, then flush area with water

HEALTH HAZARDS AND FIRST AID:

If dermal contact occurs, flush skin and eyes with water for 15 minutes. If breathing is difficult, give oxygen; if breathing stops, artificial respiration. If ingested, seek immediate medical attention.

SYMPTOMS: **Acute -** Irritate eyes, skin, nose, drowsiness, incoherent

Chronic - Liver damage, central nervous system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name 2,4-Dimethylphenol
DOT Name Xylenol
CAS Number 1300-71-6

Date _____
WA Number 02-2964-15-01

REFERENCES: Merck Index, 10th Edition
DOT Hazardous Materials Handbook, 1980
Chemical Hazard Response Information System (CHRIS)

CHEMICAL PROPERTIES: (Synonyms - Dimethylphenol)

Chemical Formula	$C_8 H_{10} O$	**Molecular Weight**	122.16
Physical State	Solid	**Solubility (H_2O)**	Unknown
Boiling Point	412.7°F	**Freezing Point**	78.8°F
Flash Point	186°F	**Flammable Limits**	1.4% LEL
Specific Gravity	1.01	**Vapor Pressure/Density**	.2 pds/ft^3 at boiling point
Incompatibilities	None		

BIOLOGICAL PROPERTIES:

TLV-TWA 45 ppm **PEL** _____
IDHL: Human N/A **Aquatic** 7-9 ppm lethal **Rat, Mouse** LD_{50}=1070 mg/kg
Route of Exposure: Inhalation, contact, ingestion

Carcinogen ____ **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear positive pressure self-contained breathing apparatus, rubber gloves and chemically resistent clothing to minimize exposure. Avoid contact. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Should be removed. Minimize exposure to aquatic environment. Containerize material as soon as possible. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Irritating to skin and eyes; flush with water if contacted. If breathing is difficult, give oxygen, if breathing stops, provide artificial respiration. If ingested, seek immediate medical attention.

SYMPTOMS: Acute - Weakness, dizziness, headache, difficult breathing, twitching, nausea, abdominal pain.

Chronic - Affects respiratory and central nervous systems.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Di-n-butylphthalate **Date** _____
DOT Name Dibutyl Phthalate **WA Number** 02-2964-15-01
CAS Number 84-74-2

REFERENCES: N. Irving Sax, Dangerous Properties of Industrial Materials; CHRIS
NIOSH Pocket Guide to Chemical Hazards, 1980
R. Dreisbach, Handbook of Poisoning

CHEMICAL PROPERTIES: (Synonyms - Dibutyl phthalate, DBP)

Chemical Formula	$C_{16}H_{22}O_4$	**Molecular Weight**	278.38
Physical State	Liquid	**Solubility (H_2O)**	0.45%
Boiling Point	220.9°F	**Freezing Point**	-35°C
Flash Point	315°F	**Flammable Limits**	0.5% - 2.5%
Specific Gravity	1.047-1.049	**Vapor Pressure/Density**	0.001 pds/in^2
Incompatibilities	Chlorine, nitrates, strong oxidizers, alkalies and acids		

BIOLOGICAL PROPERTIES:

TLV-TWA 5mg/m^3 **PEL** _____
IDHL: **Human** 9300 mg/m^3 **Aquatic** 1230 ppm **Rat, Mouse** <LD_{50}=5-15 g/kg
Route of Exposure: Ingestion, inhalation, contact

Carcinogen ____ **Teratogen** experimental animal 5 mg/m^3 **Mutagen** ____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Wear goggles, chemically resistent gloves and chemically resistent clothing to minimize exposure. Avoid contact. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Take up material with non-flammable absorbent material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Irrigate eye immediately if contact occurs. If skin contact occurs, wash with soap and rinse with plenty of water. If breathing stops, administer artificial respiration. If swallowed, seek medical attention.

SYMPTOMS: **Acute -** Irritates nasal passages, stomach, light sensitivity GI tract

Chronic - Liver and kidney damage

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Ethyl Benzene **Date** _____
DOT Name Ethyl Benzene **WA Number** 02-2964-15-01
CAS Number 100-41-4

REFERENCES: NIOSH Pocket Guide to Hazardous Chemicals, 1985
The Merck Index, 10th ed.

CHEMICAL PROPERTIES: (Synonyms - Phenylethane ethylbenzol)

Chemical Formula	$C_2 H_5 C_6 H_5$	**Molecular Weight**	106
Physical State	Colorless liquid	**Solubility (H_2O)**	0.015%
Boiling Point	211°F	**Freezing Point**	-139°F
Flash Point	64°F	**Flammable Limits**	LEL=1.0% UEL=6.7%
Specific Gravity	Unknown	**Vapor Pressure/Density**	7.4 mm
Incompatibilities	Oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 435 mg/m^3 **PEL** 100 ppm
IDHL: **Human** 2000 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, dermal contact

Carcinogen ____ **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear chemically resistent clothing. Avoid contact. Wear respirator. Wash promptly upon contamination.

DISPOSAL/WASTE TREATMENT:

Take up with sand or other noncombustible, absorbent material. Flush area with water. Dispose by incineration or in secure landfill.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately.
Skin - Promptly flush with water.
Ingestion - Immediate medical attention.

SYMPTOMS: **Acute -** Irritation of eyes and mucous membranes

Chronic - Affects respiratory systems

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Isophorone _____ **Date** _____
DOT Name N/A _____ **WA Number** 02-2964-15-01
CAS Number 78-59-1 _____

REFERENCES: NIOSH Pocket Guide to Chemical Hazards, 1985
Robert H. Dreisbach, Handbook of Poisoning

CHEMICAL PROPERTIES: (**Synonyms** - 3,5,5-Trimethyl-2-cyclohexene-1-one)

Chemical Formula	$C_9H_{14}O$	**Molecular Weight**	138
Physical State	Liquid	**Solubility (H_2O)**	1.2%
Boiling Point	419°F	**Freezing Point**	17°F
Flash Point	184°F	**Flammable Limits**	LEL=0.8% UEL=3.8%
Specific Gravity	Unknown	**Vapor Pressure/Density**	0.2mm
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 23mg/m³ (10 hr) _____ **PEL** 25 ppm
IDHL: **Human** 800 ppm **Aquatic** _____ **Rat, Mouse** LD_{50}=2330
Route of Exposure: Inhalation, ingestion, dermal contact

Carcinogen ____ **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (**Personal Protection Measures**)

Wear chemically resistent clothing to minimize repeated and prolonged exposure. Wear respirator. If splashed, promptly remove wet nonimpervious clothing.

DISPOSAL/WASTE TREATMENT:

Take up with non-flammable absorbent material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Wash eyes and skin immediately if in contact; use soap on skin. Provide artificial respiration if breathing stops. Seek immediate medical attention if ingested.

SYMPTOMS: **Acute -** Irritated eye, nose and throat, headache, dizziness, narcotic effect.

Chronic - Liver and kidney damage

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Methylene chloride **Date** _____
DOT Name Methylene chloride **WA Number** 02-2964-15-01
CAS Number 75-09-2

REFERENCES: NIOSH Pocket Guide to Chemical Hazards, 1985
DOT Hazardous Materials Guidebook, 1980
Merck Index, 10th Edition

CHEMICAL PROPERTIES: (Synonyms Dichloromethane, Methylene dichloride)

Chemical Formula	CH_2Cl_2	**Molecular Weight**	85
Physical State	Colorless liquid	**Solubility (H_2O)**	1.3%
Boiling Point	104°F	**Freezing Point**	-142°F
Flash Point	None	**Flammable Limits**	LEL=12% UEL=19°F
Specific Gravity	Unknown	**Vapor Pressure/Density**	350 mm
Incompatibilities	Strong oxidizers and caustics; chemically active metals such as aluminum or magnesium powders; sodium, potassium		

BIOLOGICAL PROPERTIES:

TLV-TWA 75 ppm TWA - 10 hour **PEL** 500 ppm, 1000 ppm ceiling, 2000 ppm - 5 min/2hr-peak
IDHL: Human 5000 ppm **Aquatic** _____ **Rat, Mouse** LD_{50}=1.6 ml/kg 5mm/2hr-peak
Route of Exposure: Inhalation, ingestion, contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Clothing and goggles to reduce exposure; positive pressure breathing apparatus and protective clothing should be worn. Isolate hazard area. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material; take up with sand or other noncombustible absorbent material; then flush area with water

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately; Skin - soap wash promptly.
Breathing - Move victim to fresh air; give artificial respiration if necessary.
Ingestion - Seek immediate medical attention.

SYMPTOMS: **Acute -** Fatigue, weakness, sleepy, light-headedness, irritated eyes and skin, nausea, vertigo, limbs numb, tingle.

Chronic - Central nervous system and cardiovascular system damage, angina

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Naphthalene **Date** _____
DOT Name Naphthalene **WA Number** 02-2964-15-01
CAS Number 91-20-3

REFERENCES: Merck Index, 10th edition
DOT Hazardous Materials Guidebook, 1980
NIOSH Pocket Guide to Chemical Hazards, 1985

CHEMICAL PROPERTIES: (**Synonyms** - White tar, Napthalin, Napthene)

Chemical Formula	$C_{10}H_8$	**Molecular Weight**	128
Physical State	Solid	**Solubility (H_2O)**	0.003%
Boiling Point	424°F	**Freezing Point**	165 to 176°F
Flash Point	174°F	**Flammable Limits**	LEL=0.9% UEL = 5.9%
Specific Gravity	Unknown	**Vapor Pressure/Density**	0.05 mm
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 10 ppm **PEL** 10 ppm
IDHL: **Human** 500 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, absorption, ingestion, contact

Carcinogen ____ **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (**Personal Protection Measures**)

Wear self-contained breathing apparatus and full protective clothing to reduce risk of exposure. Wash promptly if contact occurs and remove non-impervious clothing. Isolate hazard area, keep upwind and avoid low areas.

DISPOSAL/WASTE TREATMENT:

Shovel into dry containers and cover; move containers to secure area; then flush area with water.

HEALTH HAZARDS AND FIRST AID:

In case of contact with eyes or skin, wash immediately for 15 minutes with water, use soap on skin. Preform artificial respiration if breathing stops; if ingested, seek immediate medical attention.

SYMPTOMS: **Acute -** Eye irritant; confusion, headache, excitement, nausea, vomiting, abdominal pain, fever, profuse sweating

Chronic - Damage to liver, kidneys, blood, central nervous system, hemolytic anemia, hepatic necrosis, renal shutdown, coma

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Pentachlorophenol **Date** _____
DOT Name Pentachlorophenol **WA Number** 02-2964-15-01
CAS Number 87-86-5

REFERENCES: DOT, 1980
Merck Index, 10th edition
NIOSH Pocket Guide to Chemical Hazards

CHEMICAL PROPERTIES: (Synonyms - PCP, Penta)

Chemical Formula	C_{16} H Cl_5 O	**Molecular Weight**	266.35
Physical State	Solid (brown)	**Solubility (H_2O)**	0.002%
Boiling Point	592°F	**Freezing Point**	360° to 374°
Flash Point	None	**Flammable Limits**	N/A
Specific Gravity	Unknown	**Vapor Pressure/Density**	0.0002 mm
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.5 mg/m^3 **PEL** 1,000 ppm
IDHL: **Human** 150 mg/m^3 **Aquatic** _____ **Rat, Mouse** LD_{50}=146 mg/kg
Route of Exposure: Inhalation, absorption, ingestion, contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear protective clothing and goggles to eliminate any possible exposure. Immediately wash any contaminants and/or remove any contaminated non-impervious materials. Use SCBA. Stay upwind and out of low areas.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material. Take up with sand or other noncombustible absorbent material, then flush area with water.

HEALTH HAZARDS AND FIRST AID:

Poisonous dust, if splashed in eyes, flush with water immediately for at least 15 minutes. Wash skin with soap and flush with water for 15 minutes. If inhaled, move victim to fresh air, perform artificial respiration if breathing stops. If ingested, seek immediate medical attention.

SYMPTOMS: **Acute -** Irritates eyes, nose and throat, causes coughing and sneezing, weakness, headache, dizziness,nausea and vomiting, chest pains.

Chronic - Can cause damage to respiratory system, eyes, liver and kidneys, central nervous system and cardiovascular system.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Phenol **Date** _____
DOT Name Phenol **WA Number** 02-2964-15-01
CAS Number 108-95-2

REFERENCES: NIOSH Pocket Guide to Chemical Hazards
DOT, 1980
Merck Index, 10th edition

CHEMICAL PROPERTIES: (**Synonyms** - Carbolic acid, Monohydroxyl benzene)

Chemical Formula	C_6H_6O	**Molecular Weight**	94
Physical State	Solid or thick liquid	**Solubility (H_2O)**	8.4%
Boiling Point	359°F	**Freezing Point**	106°F
Flash Point	174°F	**Flammable Limits**	LEL=1.7% UEL=8.6%
Specific Gravity	Unknown	**Vapor Pressure/Density**	0.36mm
Incompatibilities	Strong oxidizers, calcium hypochlorite		

BIOLOGICAL PROPERTIES:

TLV-TWA 20 mg/m³ TWA-10 hour **PEL** 5ppm
IDHL: **Human** 100 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, absorption, ingestion, contact

Carcinogen ____ **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (**Personal Protection Measures**)

Wear protective clothing and goggles to prevent any possible contact; use positive pressure breathing apparatus. Immediately remove any contaminated clothing. DO NOT HANDLE WITH BARE HANDS. Isolate hazard area. Remain upwind.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material; take up with sand or other noncombustible absorbent material, then wash area with water.

HEALTH HAZARDS AND FIRST AID:

This material is caustic and poisonous. If eye contact occurs, immediately flush with water. Wash exposed skin with soap and water immediately. Provide artificial respiration if victim stops breathing. If swallowed, provide immediate medical attention.

SYMPTOMS: **Acute** - Irritated eyes,nose, throat, weakness, muscular aches, pain, tremors, convulsions, twitching, ochronosis, skin burns, nausea and vomiting.

Chronic - Liver and kidney damage, circulatory collapse, paralysis, death from respiratory failure, sometimes cardiac arrest.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Toluene **Date** _____
DOT Name Toluene **WA Number** 02-2964-15-01
CAS Number 108-88-3

REFERENCES: The Merck Index
The NIOSH Pocket Guide to Chemical Hazards

CHEMICAL PROPERTIES: (Synonyms - Toluol, Phenyl methane, Methyl benzene)

Chemical Formula	$C_6 H_5 C H_3$	**Molecular Weight**	92
Physical State	Colorless liquid	**Solubility (H_2O)**	0.05%
Boiling Point	231°F	**Freezing Point**	-139°F
Flash Point	40°F	**Flammable Limits**	1.3 - 7.1%
Specific Gravity	Unknown	**Vapor Pressure/Density**	22mm
Incompatibilities	Strong oxides		

BIOLOGICAL PROPERTIES:

TLV-TWA 100 ppm (10 hours) **PEL** 200 ppm
IDHL: **Human** 2000 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, absorbtion, ingestion, skin contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Wear chemically resistent clothing and gloves. Wear respirator or self-contained breathing apparatus. Remove wet clothing immediately. Isolate hazard and remain upwind.

DISPOSAL/WASTE TREATMENT:

Take up with sand or other non-flammable, absorbent material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately.
Skin - Wash with soap immediately.
Ingestion - Seek immediate medical attention.

SYMPTOMS: **Acute -** Fatigue, weakness, confusion, dizziness, headache, dilated pupils

Chronic - *Photophobia dermatitis*

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Trichloroethylene **Date** _____
DOT Name Trichloroethylene **WA Number** 02-2964-15-01
CAS Number 79-01-6

REFERENCES: Hazardous Materials, DOT, 1980
Merck Index, 10th Edition
NIOSH Pocket Guide to Chemical Hazards

CHEMICAL PROPERTIES: (**Synonyms** - Ethylenetrichloride, Triclene)

Chemical Formula	$C_2 H Cl_3$	**Molecular Weight**	131
Physical State	Liquid	**Solubility (H_2O)**	0.1%
Boiling Point	188°F	**Freezing Point**	-123°F
Flash Point	None	**Flammable Limits**	LEL=11% UEL=41%
Specific Gravity	Unknown	**Vapor Pressure/Density**	58 mm
Incompatibilities	Strong caustics; when acidic reacts with aluminum, chemically active metals: barium, lithium, sodium, magnesium, titanium.		

BIOLOGICAL PROPERTIES:

TLV-TWA 25 ppm TWA - 10 hour **PEL** 100 ppm, (200 ppm ceil, 300 ppm peak)
IDHL: **Human** 1000 ppm **Aquatic** _____ **Rat, Mouse** LD_{50}=4.92 ml/kg
Route of Exposure: Inhalation, ingestion, skin or eye contact

Carcinogen X **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (**Personal Protection Measures**)

Wear chemically resistent clothing to avoid repeated or prolonged exposure. Wear positive pressure breathing apparatus. Isolate hazard. Remain upwind.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material. Take up with sand or other noncombustible absorbent material, then flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Eye should be flushed with large amounts of water immediately.
Skin - Soap wash immediately.
Breathing - Move victim to fresh air; give artificial respiration if needed.
Ingestion - seek immediate medical attention.

SYMPTOMS: **Acute** - Vertigo, visual disturbance, tremors, nausea and vomiting, eye and skin irritation.

Chronic - Cardiac arrythmia, liver and kidney damage possible, central nervous system damage, paresthesia.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Xylene **Date** _____
DOT Name Xylene **WA Number** 02-2964-15-01
CAS Number 1330-20-7

REFERENCES: NIOSH Pocket Guide to Chemical Hazards
The Merck Index

CHEMICAL PROPERTIES: (Synonyms - Dimethylbenzene, Xylol)

Chemical Formula	C_8H_{10}	**Molecular Weight**	106.16
Physical State	Liquid	**Solubility (H_2O)**	Insoluble
Boiling Point	281°F	**Freezing Point**	-12°F
Flash Point	81°F	**Flammable Limits**	LEL=1.1% UEL= 7%
Specific Gravity	Unknown	**Vapor Pressure/Density**	7-9mm
Incompatibilities	Strong oxides		

BIOLOGICAL PROPERTIES:

TLV-TWA 100 ppm TWA (10 hours) **PEL** 100 ppm
IDHL: **Human** 10,000 ppm **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, absorbtion, skin contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Clothing - avoid repeated and prolonged exposure
Goggles - avoid contact
Wash - promptly upon contamination
Remove any wet articles (inflammable)

DISPOSAL/WASTE TREATMENT:

Take up with sand or other non-combustible, absorbent material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately.
Skin - Wash with soap.
Ingestion - Seek immediate medical attention.

SYMPTOMS: **Acute -** Dizziness, excitement, drowsiness, staggering gate, irritating eyes, nose, and throat, nausea and vomiting.

Chronic - Dermatitis. Affects respiratory system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Asbestos **Date** _____
DOT Name N/A **WA Number** 02-2964-15-01
CAS Number 1332-21-4

REFERENCES: NIOSH Pocket Guide to Chemical Hazards

CHEMICAL PROPERTIES: **(Synonyms -** Chrysotile, Amosite, Crocidolite)

Chemical Formula	$Mg_6(Si_4O_{10})(OH)_8$	**Molecular Weight**	Varies
Physical State	Fine flaxy fibers	**Solubility (H_2O)**	N/A
Boiling Point	N/A	**Freezing Point**	N/A
Flash Point	N/A	**Flammable Limits**	Varies
Specific Gravity	Unknown	**Vapor Pressure/Density**	Unknown
Incompatibilities	None		

BIOLOGICAL PROPERTIES:

TLV-TWA 2 fibers (5um)/cc **PEL** _____
IDHL: **Human** Carcinogen **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation

Carcinogen X **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Clothing - avoid any possible contact; wear chemically resistant clothing and gloves. Avoid breathing. Wear full-face respirator or self-contained breathing apparatus.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material. Cover with plastic or other nonporous material to prevent asbestos from blowing. Dispose in secure landfill.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately with plenty of water.
Inhalation - Move victim to fresh air; seek medical attention immediately.

SYMPTOMS: **Acute -** Dyspnea, interstitial fibrosis, restricted pulmonary functions

Chronic - Asbestos

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Arsenic **Date** _____
DOT Name N/A **WA Number** 02-2964-15-01
CAS Number 7740-38-2

REFERENCES: NIOSH Pocket Handbook to Hazardous Chemicals, 1985
The Merck Index, 10th Edition
DOT Hazardous Materials Guidebook, 1980,

CHEMICAL PROPERTIES: (Synonyms - Varies according to compound)

Chemical Formula	As	**Molecular Weight**	74.92
Physical State	Metallic Solid	**Solubility (H_2O)**	Varies
Boiling Point	Sublimes @ 615°F	**Freezing Point**	615°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	.0822	**Vapor Pressure/Density**	Varies
Incompatibilities	N/A		

BIOLOGICAL PROPERTIES:

TLV-TWA .2 mg/m^3 **PEL** 10 ug/m^3 (2 ug/m^3/15 min ceil)
IDHL: **Human** Carc. **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, Skin absorbtion, skin/eye contact, ingestion

Carcinogen X **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear goggles and chemically resistent clothing - if direct contact is possible.
Wear self-contained breathing apparatus and full protective clothing when handling.
Isolate hazard area. Avoid contact. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Do not touch spilled material. Take up with sand or other noncombustible absorbent material if liquid is spilled. Shovel into containers and cover if dry material is spilled. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately, flush for 15 minutes.
Skin - Soap wash skin immediately.
Ingestion - Immediate medical attention.
Inhalation - Move victim to fresh air. Seek medical attention.

SYMPTOMS: **Acute -** Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation

Chronic - Hyperpigmentation of skin, degeneration of liver and kidneys.

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Barium **Date** _____
DOT Name Barium **WA Number** 02-2964-15-01
CAS Number 7440-39-3

REFERENCES: NIOSH Pocket Guide to Chemical Hazards, 1985

CHEMICAL PROPERTIES: (Synonyms - Vary depending upon compound)

Chemical Formula	Ba	**Molecular Weight**	137
Physical State	Solids	**Solubility (H_2O)**	Varies
Boiling Point	Varies	**Freezing Point**	Varies
Flash Point	Varies	**Flammable Limits**	Varies
Specific Gravity	Varies	**Vapor Pressure/Density**	Varies
Incompatibilities	Varies depending on compound		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.5 mg/m^3 **PEL** _____
IDHL: **Human** 250 mg/m^3 **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, dermal contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Recommendations vary depending on specific compound. Generally, avoid contact. Wear chemically resistent clothing and gloves.

DISPOSAL/WASTE TREATMENT:

Varies. Generally, contain spilled material. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Wash eye and skin with water immediately if contact occurs. Provide artificial respiration if breathing stops. Seek immediate medical attention if swallowed.

SYMPTOMS: **Acute -** Upper respiratory irritation, muscle spasms, slow pulse, irritated eyes, skin burns, extrasystole

Chronic - Respiratory and cardiac failure

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Cadmium **Date** _____
DOT Name Cadmium **WA Number** 02-2964-15-01
CAS Number 7440-43-9

REFERENCES: NIOSH Pocket Guide to Hazardous Chemicals, 1985
The Merck Index, 10th Edition

CHEMICAL PROPERTIES: (Synonyms - Varies with compounds)

Chemical Formula	Cd	**Molecular Weight**	112.41
Physical State	Solid	**Solubility (H_2O)**	Insoluble
Boiling Point	765°F	**Freezing Point**	321°F
Flash Point	None	**Flammable Limits**	Varies
Specific Gravity	Unknown	**Vapor Pressure/Density**	Varies
Incompatibilities	Strong oxidizers elemental sulphurs		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.05 mg/m³ **PEL** 0.2 mg/m³ (0.6 mg/m³ ceiling)
IDHL: **Human** 40 mg/m³ **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion

Carcinogen X **Teratogen** ____ **Mutagen** ____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear chemically resistant clothing; avoid breathing. Wear full face respirator or self-contained breathing apparatus. Isolate hazard, stay upwind.

DISPOSAL/WASTE TREATMENT:

Cover material to avoid airborne particles. Drum loose material and dispose in secure landfill.

HEALTH HAZARDS AND FIRST AID:

Eyes - Wash immediately with plenty of water.
Skin - Soap wash immediately, rinse thoroughly.
Ingestion - Seek immediate medical attention.
Inhalation - Move victim to fresh air, seek medical attention.

SYMPTOMS: **Acute -** Dyspnea, cough, tight chest, headache, chills, nausea, diarrhea

Chronic - Affects central nervous system and respiratory system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Chromium **Date** _____
DOT Name Chromium **WA Number** 02-2964-15-01
CAS Number 7440-47-3

REFERENCES: The Merck Index, 10th Edition
NIOSH Pocket Guide to Hazardous Chemicals, 1985

CHEMICAL PROPERTIES: (Synonyms - Varies with compound)

Chemical Formula	Cr	**Molecular Weight**	51.996
Physical State	Solid	**Solubility (H_2O)**	Varies
Boiling Point	2642°F	**Freezing Point**	1900°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	N/A	**Vapor Pressure/Density**	Varies
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.5 mg/m^3 (0.05 mg/m^3 for Cr (VI)) **PEL** 1 mg/m^3
IDHL: **Human** 500 mg/m^3 **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion

Carcinogen X **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Clothing - avoid repeated or prolonged exposure, wear chemically resistent clothing. Wear full-face respirator or self contained breathing apparatus. Avoid contact. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Cover material to avoid airborne particles. Drum loose material and dispose in secure landfill

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately with plenty of water.
Skin - Soap wash immediately, rinse with plenty of water.
Ingestion - Immediate medical attention.
Inhalation - Move victim to fresh air, seek medical attention.

SYMPTOMS: **Acute -** Histological fibrosis of the lungs

Chronic - Affects respiratory system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Cobalt
DOT Name Cobalt
CAS Number 7440-48-4

Date _____
WA Number 02-2964-15-01

REFERENCES: The Merck Index, 10th Edition
NIOSH Pocket Guide to Hazardous Chemicals, 1985

CHEMICAL PROPERTIES: (Synonyms - Vary)

Chemical Formula	Co	**Molecular Weight**	59 - 182 (Varies)
Physical State	Solid	**Solubility (H_2O)**	Insoluble
Boiling Point	5612°F	**Freezing Point**	2715°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	N/A	**Vapor Pressure/Density**	Varies
Incompatibilities	Strong oxidizers		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.1 mg/m^3* **PEL** 0.1 mg/m^3
IDHL: **Human** 20 mg/m^3 **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, skin contact

Carcinogen X **Teratogen** _____ **Mutagen** _____
(Radioactive)

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Caution - may be radioactive! Wear chemically resistent clothing. Avoid touching. Wear full-face respirator or self-contained breathing apparatus. Isolate hazard.

DISPOSAL/WASTE TREATMENT:

Cover material to prevent airborne particles. Drum loose material and dispose in a secure landfill. Caution - may be radioactive!

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately with plenty of water.
Skin - Wash with soap promptly.
Ingestion - Seek medical attention immediately.
Inhalation - seek medical attention immediately; move victim to fresh air.

SYMPTOMS: **Acute** - Cough, dyspnea, decrease in pulmonary function; salts - nausea, vomiting.

Chronic - Affects respiratory system. Radioactive cobalt is carcinogenic.

* Intended change to 0.05 mg/m^3

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Copper
DOT Name Copper
CAS Number 7440-50-8

Date _____
WA Number 02-2964-15-01

REFERENCES: NIOSH Pocket Guide to Hazardous Chemicals, 1985
The Merck Index, 10th Edition

CHEMICAL PROPERTIES: (Synonyms - Vary)

Chemical Formula	Cu	**Molecular Weight**	63.546
Physical State	Solid	**Solubility (H_2O)**	Varies
Boiling Point	2595°F	**Freezing Point**	1083°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	Unknown	**Vapor Pressure/Density**	Unknown
Incompatibilities	Acetylene gas, magnesium metal		

BIOLOGICAL PROPERTIES:

TLV-TWA 1 mg/m^3 **PEL** 1 mg/m^3
IDHL: **Human** N/A **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, skin contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Clothing - avoid repeated or prolonged contact; wear chemically resistent clothing, and full-face respirator or self-contained breathing apparatus. Isolate hazard. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Cover material to prevent airborne particles. Dispose in secure landfill. Flush area with water.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately with plenty of water.
Skin - Wash with soap.
Ingestion - Seek immediate medical attention.
Inhalation - Move victim to fresh air; seek medical attention.

SYMPTOMS: **Acute -** Irritated mucous membranes, pharynx, nasal perforation

Chronic - Affects respiratory system and blood system

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Lead **Date** _____
DOT Name Lead **WA Number** 02-2964-15-01
CAS Number 7439-92-1

REFERENCES: The Merck Index, 10th Edition
NIOSH Pocket Guide to Hazardous Chemicals, 1985

CHEMICAL PROPERTIES: (Synonyms - Vary)

Chemical Formula	Pb	**Molecular Weight**	207.2
Physical State	Solid	**Solubility (H_2O)**	Varies
Boiling Point	1740°F	**Freezing Point**	327.4°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	Varies	**Vapor Pressure/Density**	Varies
Incompatibilities	Strong oxidizers, hydrogen per oxide, sodium potassium		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.15 mg/m^3 TWA - 10 hours **PEL** 0.05 mg/m^3
IDHL: **Human** Variable **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion, skin contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Clothing - avoid repeated or prolonged exposure; wear chemically resistent clothing and full-face respirator or self-contained breathing apparatus. Avoid breathing dust. Isolate hazard. Stay upwind.

DISPOSAL/WASTE TREATMENT:

Cover material to prevent airborne particulates. Dispose in a secure landfill.

HEALTH HAZARDS AND FIRST AID:

Eye - Wash immediately with plenty of water.
Skin - Wash with soap and flush with water.
Ingestion - Prompt medical attention should be sought.
Inhalation - Move victim to fresh air, seek medical attention.

SYMPTOMS: **Acute -** Lassitude, insomnia, weight loss, abdominal pains

Chronic - Weight loss, weakness, anemia

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Mercury **Date** _____
DOT Name Mercury **WA Number** 02-2964-15-01
CAS Number 7439-97-6

REFERENCES: Merck Index, 10th Edition
NIOSH Pocket Guide to Chemical Hazards, 1985

CHEMICAL PROPERTIES: (Synonyms - Quicksilver)

Chemical Formula	Hg	**Molecular Weight**	201
Physical State	Liquid	**Solubility (H_2O)**	0.002%
Boiling Point	674°F	**Freezing Point**	-38°F
Flash Point	N/A	**Flammable Limits**	N/A
Specific Gravity	Unknown	**Vapor Pressure/Density**	0.0012 mm
Incompatibilities	Acetylenes, ammonia gases		

BIOLOGICAL PROPERTIES:

TLV-TWA 0.05 mg/m^3 10 hour TWA **PEL** 0.1 mg/m^3 ceiling
IDHL: **Human** 28 mg/m^3 **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, absorption, contact

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: (Personal Protection Measures)

Wear protective clothing to minimize exposure. Promptly remove contaminated non-impervious clothing. Wear respirator. Avoid contact. Isolate hazard.

DISPOSAL/WASTE TREATMENT:

Drum and place in secure landfill.

HEALTH HAZARDS AND FIRST AID:

If contact with eyes, wash immediately. If in contact with skin, wash promptly with soap. If breathing stops, perform artificial respiration. If swallowed, seek immediate medical attention.

SYMPTOMS: **Acute -** Coughing, bronchial pneumonia, tremors, insomnia, irritability, indecision, headache, fatigue, irritated eyes and skin.

Chronic - Kidney damage, central nervous system damage, inflammation of gums and mouth, excessive salivation, depression, nervousness, spasms of extremities

PRC ENGINEERING
Hazardous Chemical Evaluation

Chemical Name Zinc **Date** _____
DOT Name Zinc **WA Number** 02-2964-15-01
CAS Number 7440-66-6

REFERENCES: N. Irving Sax, Dangerous Properties of Industrial Materials
Carson, Ellis, McCann, Toxicology and Biological Monitoring of Metals in Humans

CHEMICAL PROPERTIES: (Synonyms - Blue powder, C.I. Pigment Black 16)

Chemical Formula	Zn	**Molecular Weight**	65.37
Physical State	Solid	**Solubility (H_2O)**	Varies
Boiling Point	908°C	**Freezing Point**	419.8°C
Flash Point	None	**Flammable Limits**	None
Specific Gravity	Unknown	**Vapor Pressure/Density**	7.14
Incompatibilities	NH_4NO_3, chlorinated rubber, catalytic metals, halocarbons, nitrobenzene, transitionmetal halides, non-metals		

BIOLOGICAL PROPERTIES:

TLV-TWA 5 mg/m³* **PEL** _____
IDHL: **Human** _____ **Aquatic** _____ **Rat, Mouse** _____
Route of Exposure: Inhalation, ingestion

Carcinogen _____ **Teratogen** _____ **Mutagen** _____

HANDLING RECOMMENDATIONS: **(Personal Protection Measures)**

Avoid direct contact and breathing dust. Wear chemically resistent clothing and full-face respirator.

DISPOSAL/WASTE TREATMENT:

Keep dust minimal to prevent explosion hazard. Drum loose material and dispose in secure landfill.

HEALTH HAZARDS AND FIRST AID:

Skin and eye irritant - if contact, flush with water. If inhaled, move victim to fresh air. Seek medical attention.

SYMPTOMS: **Acute -** Irritates eyes, nose and throat; can also irritate gastrointestinal tract, can cause fever, stomach cramps, nausea and vomiting

Chronic - Affects mucuous membranes

* Zinc oxide fume; since oxide dust is merely "nuisance particulate"

Monitoring Procedures

Perimeter Identified? No Map/Sketch Attached? Yes

Site Secured? No Zone(s) of Contamination Identified? Yes

Exclusion zones, contamination reduction areas, and support areas will be determined pending the ambient air survey. Wind directions will be determined from either a colored flag or from wind direction/wind speed instrumentation. Soil gas samples will be considered contaminated if a response is registered on the HNU 301.

Personal Protection:

Level B _____ Type SCBA Positive-Pressure

Level C Ambient air and soil gas survey Type Cartridge GMC-H

Level D Geophysical, elevational survey, surface soil and surface water sampling, drilling, well installation, development, and sampling.

Modifications/Notes: Geophysical and other surveying will be performed in level D, but will be upgraded to level C if organic vapor levels rise above the action levels listed on page 103. See appendix B, Section 2 Personal Protection Equipment for additional modifications.

Surveillance equipment and materials needed to monitor the site for identity and concentration of contaminant(s): HNU 101 photoionizer with an 11.7 ev lamp will be used to monitor for concentrations of organic vapors in the ambient air. Personnel protection at the site will be based on the highest levels measured. The monitoring will be performed at the worker's breathing zone. Additional monitoring will be performed with an 0_2/explosimeter, rad tad, monitox and drager tubes. A brightly colored flag will be flown at all times to allow site crew to see direction of wind.

Medical Surveillance procedures for evidence of personnel exposure: Each person will have completed a baseline medical examination within the past year. If exposure is suspected, each person will receive additional medical surveillance. Medical monitoring will be coordinated with on-site safety officer, health & safety officer, health & safety director, and clinic.

Personnel authorized to enter site, or otherwise handle hazardous materials:

	Personnel	Responsibility
1.	Kurt Thomsen	Project Manager
2.	Tom Lentzen	Site Manager - Drilling Overseer
3.	Anne C. Sause	Site Safety Coordinator - Sampler
4.	Elsa Krauss	Field QA Manager
5.	Ken Miller	IEPA - Oversight
6.	Allison Hiltner	U.S. EPA - Oversight

A site log will be completed for field crew only for each work week.

Training/Medical Monitoring Requirements Each member of the field crew will have received at least 36 hours of instruction of safety procedures, emergency evacuation procedures, equipment to be worn, and anticipated hazards. Medical monitoring will be coordinated with on-site safety officer, health & safety director, and clinic.

Site Entry Procedures Personnel will enter in pairs upwind from the potential hazards. Visual contact will be maintained with site safety officer.

Work Limitations (time of day, weather, etc.): Work will be limited to normal business and daylight hours. Crew will be aware of heat stress and cold stress symptoms.

Decontamination

Decontamination Procedures (personnel, materials, instruments, equipment, etc.): The procedures for decontamination of personnel and equipment during drilling, surveying, and sampling are described in Appendix B.

Disposal Procedures (Contaminated equipment, supplies, disposable washwater): All drilling fluids and cuttings, and decontamination solutions and rinse water will be drummed for later disposal, off- or on-site, depending on remedial alternative selected by IEPA. Disposable equipment and clothing will be drummed separately.

Emergency Procedures

First Aid:

Dermal Exposure Exposed area will be washed thoroughly with soap and rinsed with copious amounts of clean water. Medical attention will be sought if exposure is severe or skin is noticeably changed (such as skin becomes red or, a rash, blisters, or other irritations developes).

Inhalation Exposed personnel will be moved to fresh air. Medical attention will be sought if exposure is severe and exposed personnel do not recover after being moved to fresh air.

Ingestion Victim will be transported to nearest hospital for first aid.

A first aid kit, blanket, eye wash unit, and stretcher will be kept on-site for emergencies. Eyewash unit will be kept at a ten-second distance or no more than 100 feet from work area.

Action Levels: (Except for Acrylonitrile)

Toxic Vapors

0 ppm = Normal background

1 to 5 ppm = Level C protection

5 to 500 ppm = Level B protection; call health and safety director

>500 ppm = Level A protection; call health and safety director

Ionizing Radiation

0.01 to 0.02 mR/hr = Normal background

0.02 to 2.0 mR/hr = Continue investigation with caution.

2.0 to 10.0 mR/hr. = Map 2mR/hr contour

>10mR/hr = Evacuate site

Oxygen Depletion:

21% = Normal background

21 to 19% = Continue investigation with caution

>19% = Abandon site; call health and safety director; Level B protection

Draeger tubes will be used with an HNU to monitor for Acrylonitrile. For any level of Acrylonitrile detected above background, personnel will upgrade to Level B protection.

Emergency Resources

Location of Telephone: On-site

Potential or Actual Fire or Explosion: (Telephone Number)

Call Fire Dept: Libertyville 362-2121

Call Police/Sheriff: Libertyville 362-2131

Personal Injury:

Call Hospital Condell Memorial Hospital 362-2900

Poison Control Center Rush-Presbyterian-St. Lukes 1-800-942-5969

Ambulance TEK Ambulance 362-1310

Call PRC -

Project Manager Kurt Thomsen (312) 938-0300

Daniel Chow, Health and Safety Coordinator (312) 938-0300

Thomas D. Brisbin (312) 938-0300

Carla Hickey (Emergency phone numbers and insurance information) (312) 938-0300

IEPA Contact Ken Miller (217) 782-6760

U.S. EPA Contact Allison Hiltner (312) 886-7089

IEPA Emergency Response Unit (217) 782-3637

Emergency Services And Disaster Agency (217) 782-7860

Health Plus Contact

Site Water Supply To be provided by PRC

Other

Hospital Route Directions To Condell Memorial Hospital, 900 S. Garfield Ave., Libertyville: Exit site on Buckley Road / Rte 137 west to Milwaukee Ave. / Rte 21. Turn left / south and follow to Garfield Ave. Turn right / west into hospital.

Hospital Route Map is attached. (Figure 2-1)

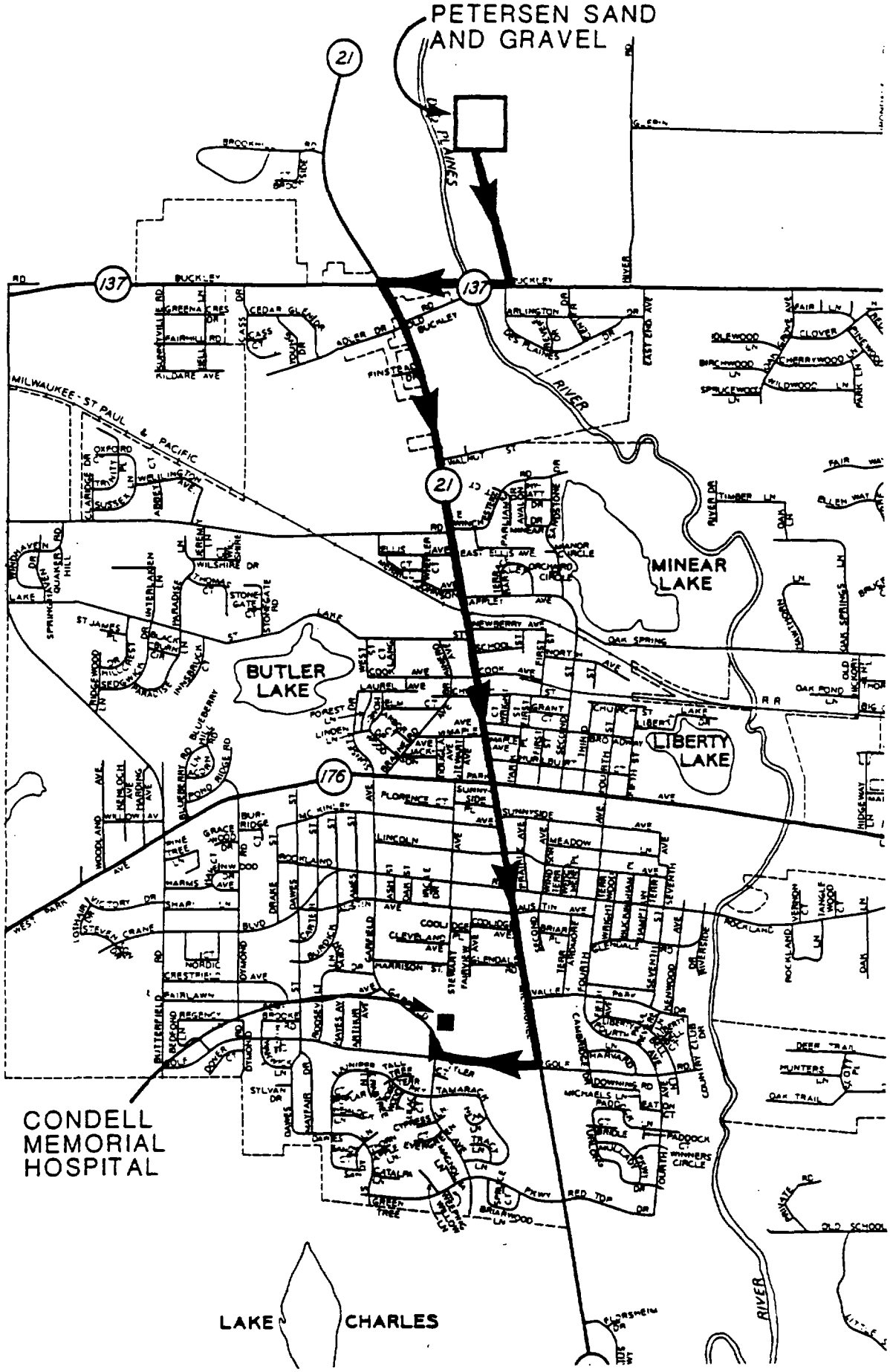


FIGURE 2-1 HOSPITAL ROUTE MAP

SAFETY MEETING SIGN-OFF SHEET

Meeting Held by: _____ Date: _____

Items discussed:

Hazard Evaluation:

Toxic Vapors	Yes _____	No _____	If no, why? _____
Explosivity	Yes _____	No _____	If no, why? _____
Radioactivity	Yes _____	No _____	If no, why? _____
O_2 Depletion	Yes _____	No _____	If no, why? _____

Personal Protection and Equipment to be Used and/or Worn

Yes _____ No _____ If no, why? _____

Decontamination Procedures: Yes _____ No _____

Emergency Information:

First Aid	Yes _____	No _____
Hospital Route	Yes _____	No _____
Poison Control Center	Yes _____	No _____

Team Member, signature	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

SITE LOG

To be completed by PRC health and safety coordinator for field crew only. One form to be completed for each work week.

Team Member	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
TLD Badge No.	(/ /)	(/ /)	(/ /)	(/ /)	(/ /)	(/ /)

Enter time spent on-site (ONS), in off-site reconnaissance (OSR), decontamination procedures (DEC), office interview (OFC), or other field work.

APPENDIX A

SITE BACKGROUND

SITE BACKGROUND

PRC has developed a work plan for the remedial investigation and feasibility study (RI/FS) for the Petersen Sand and Gravel site in Libertyville, Lake County, Illinois. The site, on the National Priority List, is one part of a multi-site contract awarded to PRC by the Illinois Environmental Protection Agency (IEPA).

The Petersen Sand and Gravel site consists of approximately 20 acres of land and is located on the east bank of the Des Plaines River in an area of moderately sloping terrain north of Libertyville, Illinois. It is situated in the SW 1/4 section 4, township 44 north, range 11 east, Lake County (Figure A-1). The adjacent areas are forest and cropland with some residential land to the south, west, and northeast. A site map is presented as Figure A-2.

Between 1955 and 1958, refuse was dumped into a 3- to 4-acre worked-out portion of the gravel pit east of the Des Plaines River. The refuse supposedly consisted primarily of construction debris, trees, tires and other non-hazardous materials. It is unclear when the site began accepting hazardous material; however, it was probably during the mid to late 1960s.

The owner, Mr. Raymond Petersen, filed for a landfill permit in 1971, but due to the high soil permeability at the site, a denial was issued. That same year, the IEPA filed a complaint against Mr. Petersen and his company, Sand and Gravel, Inc., in response to public complaints regarding illegal dumping activities at the site. The pit was subsequently closed by directive from the IEPA. However, according to local residents, dumping may have continued until 1972 or 1973. The Illinois Pollution Control Board, in 1971, directed the owner to install and sample monitoring wells and remove the refuse from the pit.

Mr. Petersen did not start cleanup until 1977, when IEPA obtained a Lake County Circuit Court order requiring removal of waste. Under partial supervision of IEPA, the owner removed 400 to 500 55-gallon barrels of paint and solvent waste from the site.

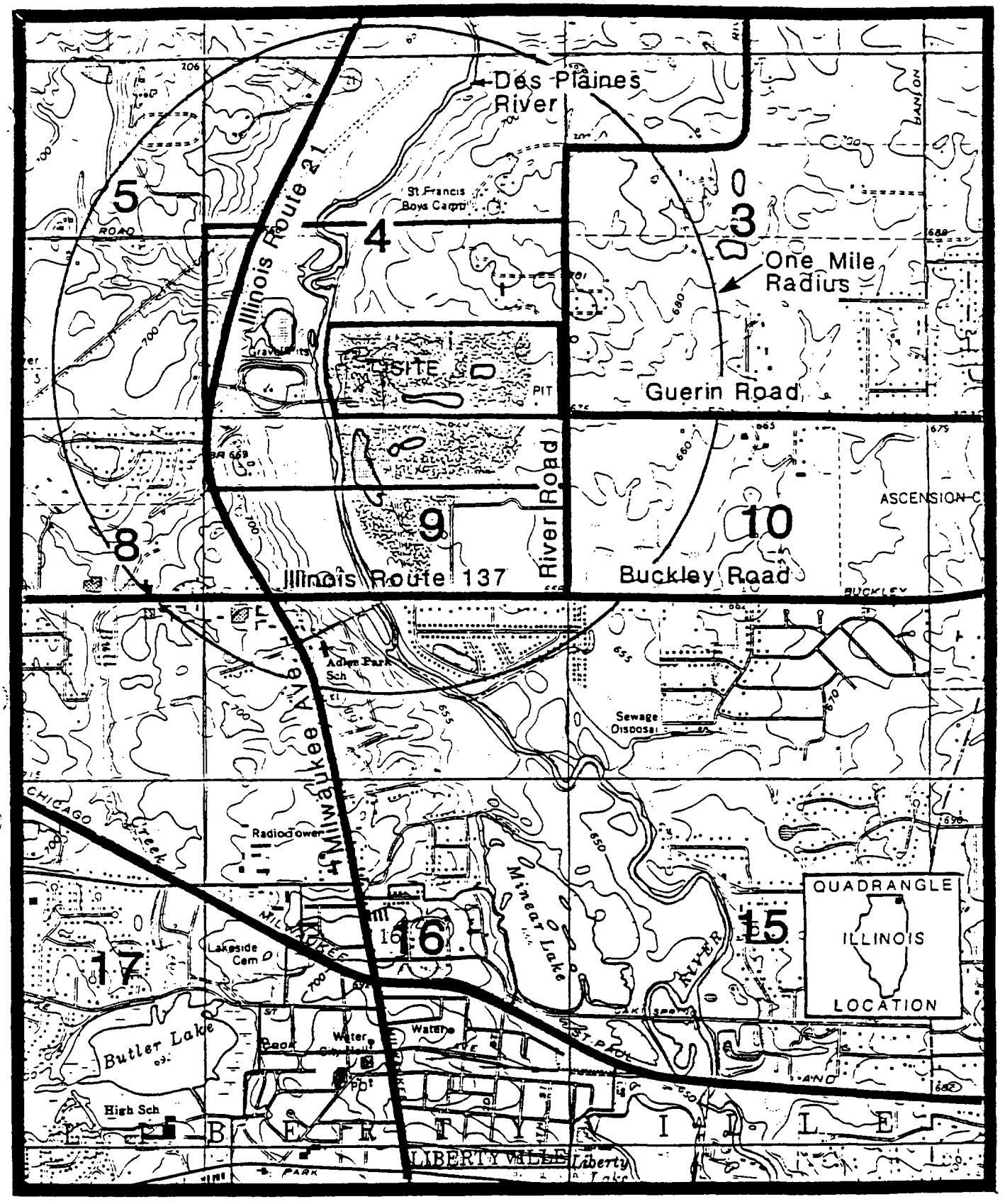
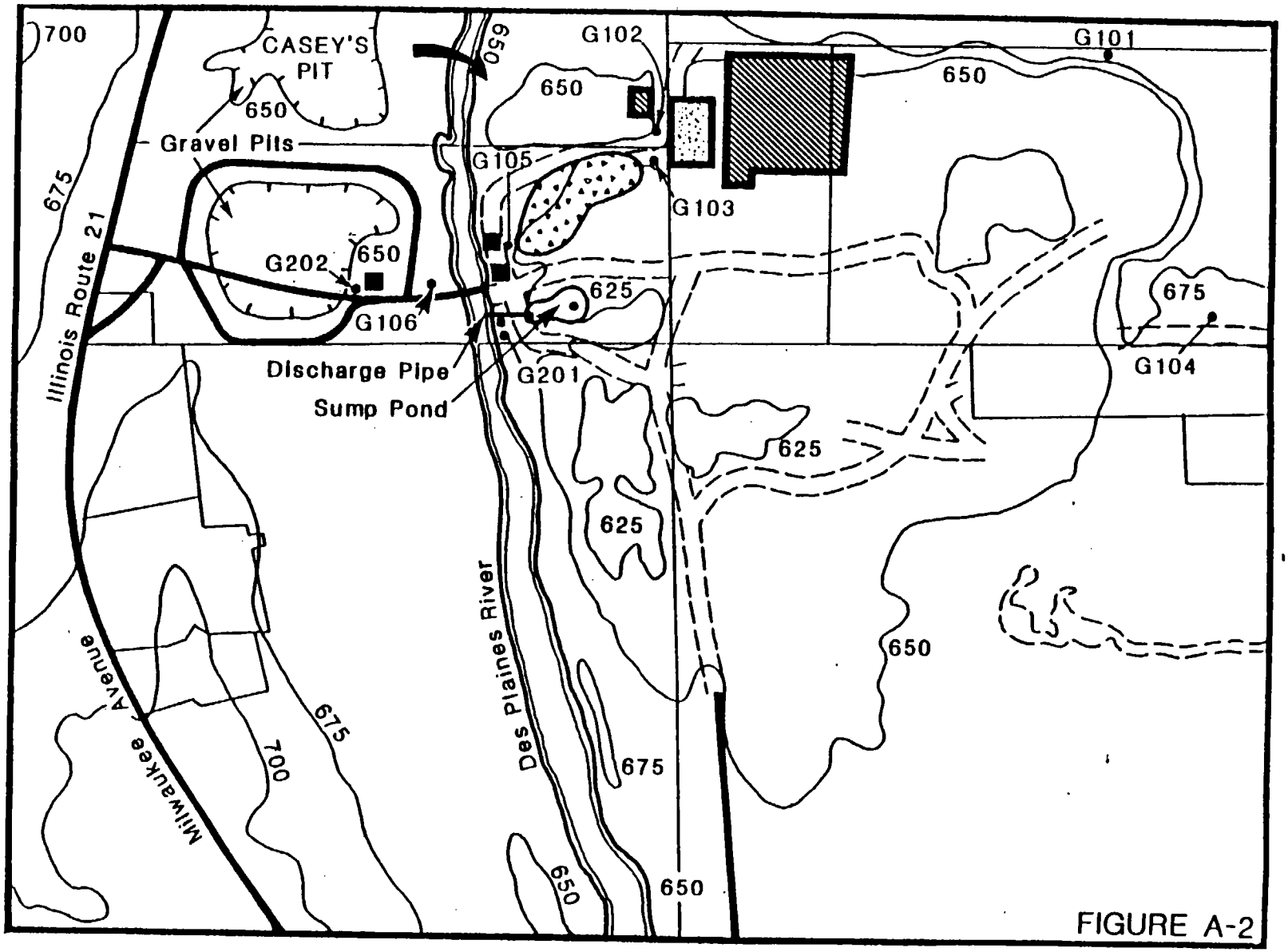


FIGURE A-1 **Site Location**

Source: Libertyville Quadrangle, Illinois-Lake Co.
7.5-min. Series Topographic, U.S.G.S. 1960
Photo revised 1972 and 1980.
Contour interval: 50 ft.


ERSEN'S SAND & GRAVE ITE MAP
700
CASEY'S PIT
650
Gravel Pits
650
G102
650
G101
650
G105
G103
675
Illinois Route 21
G202
650
625
675
G106
Discharge Pipe
Sump Pond
G201
G104
625
625
650
Des Plaines River
Milwaukee Avenue
675
700
675
650
650
FIGURE A-2
Topographic Contours
G101 Well
Approx. Property Lines
Roads
Site Roads
Landfill with Construction Material
1977 Cleanup
1983 Geophysical Survey & Cleanup
N

The Lake County Forest Preserve District purchased the site in 1979 and planned to convert a portion of the site into a recreational lake. When lake excavations began in 1983, additional drums were uncovered. Subsequent studies resulted in the removal of approximately 450 barrels of solvent waste, 1000 paint cans, and contaminated soil. That same year, consultants to the U.S. EPA evaluated the site according to the Hazard Ranking Scoring System (HRS) and the site was place on the National Priority List (NPL). In 1984, the site was reevaluated by U.S. EPA but remained on the NPL.

APPENDIX B
PERSONAL PROTECTION EQUIPMENT AND DECONTAMINATION PROCEDURES

1.0 INTRODUCTION

The proper selection of personal protection equipment is necessary to ensure the safety of field personnel. Proper decontamination is also necessary to ensure the safety of field personnel. The types of equipment to be used and the decontamination procedures to be followed during this project are discussed in detail below.

2.0 PERSONAL PROTECTIVE EQUIPMENT

The elevational survey crew, geophysical crew, surface soil and surface water sampling crews will wear level D personal protection. The protective clothing to be worn includes the following:

- o Chemically resistant steel-toed safety boots or steel-toed neoprene boots.
- o Chemically resistant disposable rubber booties
- o Chemically resistant inner gloves (optional for elevational and geophysical crews).
- o Chemically resistant butyl rubber or neoprene work gloves (optional for elevational and geophysical survey crews).
- o Tyvek coveralls (optional for elevational and geophysical survey crews).

The ambient air and soil gas survey crews will wear level C personal protection. The protective clothing to be worn includes the following:

- o Chemically resistant, steel-toed boots or steel-toed neoprene boots
- o Chemically resistant disposable booties
- o Polyethylene laminated tyveks or sarnex coveralls
- o Disposable latex gloves (inner)
- o Chemically resistant butyl rubber or neoprene gloves (outer)
- o Full-face, air purifying respirator with GMC-H cartridges

Monitoring equipment used with level C protection for the ambient air survey will include the following:

- o HNU 101
- o Acrylonitrile draeger tubes
- o Oxygen meter
- o Explosimeter
- o Monitox
- o Rad Tad

The ambient air in the crew's breathing zone will be continually monitored with an oxygen meter and an HNU 101 photoionizer. The oxygen meter will be used to ensure adequate oxygen in the ambient air. The HNU 101 will be used to detect toxic vapors or gases. If the HNU 101 registers a sustained reading (longer than 15 seconds) of 5 to 500 ppm above background levels, the survey crews will upgrade to Level B protection. If acrylonitrile is detected and confirmed (minimum of 3 draeger tubes for confirmation) the survey crews will upgrade to Level B protection. Level B protection is discussed below.

If contamination is detected at the borehole locations during the ambient air/soil gas surveys or if HNU readings are 1 to 5 ppm above background during the drilling and well installation phase, Level C with the potential to upgrade to Level B personal protection will be initiated. The action levels listed on page 103 will dictate which personal protection level will be used. The protective clothing to be worn for level B includes the following:

- o Chemically resistant, steel-toed safety boots or steel-toed neoprene boots
- o Chemically resistant disposable booties
- o Saranex coveralls
- o Disposable latex gloves (inner)
- o Chemically resistant butyl rubber or neoprene gloves (outer)
- o Full-face, self-contained breathing apparatus
- o Hard hat

During the drilling phase, borehole monitoring tests using the equipment listed above will be performed after each 5 foot advancement of the auger flights and prior to the soil sampling using the split barrel sampler.

If acrylonitrile is detected and confirmed at the borehole locations during the surveys and/or during the drilling and well installation phase, Level B will automatically be initiated.

While in Level B protection the workers breathing zone will be continually monitored with an HNU 101. If a sustained reading (longer than 15 seconds) of greater than 500 ppm is registered on the HNU 101, the field crew will abandon the site and call PRC's health and safety director.

If HNU readings are above background during the drilling and well installation phase and/or during the well development and sampling phase, Level C or Level B personal protection will be required. The action levels listed on page 103 will dictate which personal protection level will be used. If acrylonitrile was detected during the drilling and well installation phase or is detected and confirmed during the well development and sampling phase Level B personal protection will be worn.

If contamination is not detected during the initial surveys or during the working phases, modified Level D will be required. The protective clothing to be worn includes the following:

- Chemically resistant, steel-toed safety boots or steel-toed neoprene boots.
- Chemically resistant disposable booties
- Tyvek coveralls
- Disposable latex gloves (inner)
- Chemically protective outer gloves
- Hard hat (for drilling operations)
- Eye protection (for drilling operations)

3.0 DECONTAMINATION PROCEDURES

3.1 General Considerations

Reducing the spread of contamination is the responsibility of each individual engaged in on-site activities. To minimize contamination of off-site areas and support vehicles, a hotline and zone of contamination reduction (ZCR) will be maintained. The ZCR will have a personnel decontamination station which will

consist of a plastic drop cloth for equipment, two steel drums, a chair or bench, and two wash tubs. The drums will be for the separate disposal of (1) potentially contaminated disposable equipment and clothing, and (2) wash and rinse waters. The plastic drop cloth will be used for segregated equipment drop. The chair is for personnel to rest on; one wash tub will contain a decontamination solution and the other will contain rinse water.

Specific decontamination procedures to be used by the drilling, surveying, and sampling crews are explained below

3.2 Drilling and Surveying

All drilling equipment will be steam-cleaned before being used on-site and between each hole. Surveying equipment which touches the ground will be washed with a solution of Alconox and clean water, rinsed with clean tap water, and rinsed three times with distilled water.

The drilling and surveying personnel will don clean gloves, boots, and Tyvek coveralls each day. If the gloves, boots, and Tyvek coveralls are torn, they will be replaced immediately. The drilling or surveying crew will decontaminate according to the procedures listed below for the sampling crew.

3.3 Sampling

Sampling equipment will be decontaminated before it is used at the site and between each sampling location. The following decontamination procedures will be followed:

1) Between sample locations, loose dirt or sediment will be scraped off.
2) Equipment will be scrubbed with a decontamination solution made of clean water and Alconox.
3) Equipment will be rinsed with tap water.
4) Equipment will be rinsed with pesticide grade hexane.
5) Equipment will be triple rinsed with distilled water.

The equipment will be allowed to air dry and then wrapped in aluminum foil. Sampling equipment will be made of stainless steel.

The sampling crew will wear Level D protection while sampling, but may possibly wear Level C or B protection in certain instances. Personnel coming off-site in Level C or B protection must be decontaminated and will pass through a zone of decontamination reduction. The procedures to be followed for decontaminating personnel wearing Level C or B protection are as follows:

1) A segregated equipment drop will be established.
2) Boot covers, gloves, and Tyvek or Saranex coveralls will be washed and rinsed.
3) Tape will be removed.
4) Boot covers will be removed.
5) Outer gloves will be removed.
6) Level C canister or mask will be changed; or Level B air tank will be changed.
7) Splash suit (Tyvek or Saranex coveralls) will be removed.
8) Level C respirator or Level B SCBA will be removed.
9) Inner gloves will be washed and rinsed.
10) Inner glove will be removed.
11) Field wash (face and hands) will be performed.

One person from the field crew (the decontamination coordinator) will operate the zone of decontamination reduction and assist personnel in removing and washing gloves, boot covers, and tyvek coveralls. The decontamination coordinator will be dressed in modified Level D which includes wearing a hard hat with a face shield to prevent splashes from the decontamination solution, but does not require wearing a respirator.

The decontamination solution used for washing gloves, boot covers, and Tyvek coveralls will consist of clean water and Alconox. The rinse water will be clean tap water. All wash and rinse waters will be collected and drummed. Disposable clothing will also be collected and drummed in a separate container. Nondisposable monitoring equipment (such as the HNU 101, oxygen meter, and so on) will be wiped clean and stored in sealed plastic bags. Respirators will be sanitized according to manufacturer's recommendations and stored in sealed plastic bags.

APPENDIX C

HEAT STROKE AND HEAT EXHAUSTION: GUIDELINES AND SYMPTOMS

Personnel Monitoring Symptoms

- Heat Stroke
- Heat Exhaustion
- Heat Rash
- Heat Cramps

Prevention and First Aid

- Liquids
- Cooling Devices
- Shelter
- Work Limitations

HEAT STROKE AND EXHAUSTION: GUIDELINES AND SYMPTOMS

PERSONNEL MONITORING

Monitoring of personnel wearing impervious clothing and respirators should begin when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as the rate of worker recovery slows. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period. The following technique will be used to monitor workers' ability to recover from excess heat.

The heart rate (HR) will be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 33 percent while the rest period remains the same. If the HR is 100 beats per minute at the beginning of the next rest period, the following work cycle will be shortened by 33 percent.

In addition to monitoring HR, physical reactions will also be noted. For example, profuse sweating or a total lack of sweating will be noted. Possible physical reactions to excess heat include fatigue, flushed skin, decreased concentration and movement, light headedness, nausea, and loss of manual dexterity. Red Cross reference book will be kept on site for reference.

SYMPTOMS

The symptoms of heat stroke and heat exhaustion, and two milder forms of heat stress, heat rash and heat cramps, are explained below.

Heat Stroke

Heat stroke is the most severe form of heat stress and can potentially lead to death. It is caused by the body's inability to meet the increasing demands to cool itself. A worker experiencing heat stroke must be cooled immediately to prevent

severe injury or death. Symptoms are: red, hot, dry skin; lack of perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma.

Heat Exhaustion

Heat exhaustion is less severe than heat stroke and is also caused by increased stress on various organs to meet the increasing demands to cool itself. A worker experiencing heat exhaustion must be cooled immediately to prevent severe injury or death. Symptoms are the same as for heat stroke.

Heat Rash

Heat rash is caused by continuous exposure to heat and humid air, and is aggravated by tight or chafing clothes. A heat rash will decrease a worker's ability to tolerate heat.

Heat Cramps

Heat cramps are caused by profuse sweating with an inadequate fluid intake and chemical replacement (especially salts). Symptoms are muscle spasms and pain in the extremities and abdomen.

PREVENTION AND FIRST AID

Prevention of heat stress is an important consideration in planning and conducting site operations. The following guidelines will be adopted to reduce the possibility of workers developing heat stress.

Liquids

Adequate liquids will be provided to replace fluids (water and electrolytes) lost due to sweating. Drinking water; dilute, unsweetened fruit juices; and dilute commercial preparations (such as Gatorade or Quench) will be available.

Cooling Devices

Workers will be instructed to wear cotton underclothing which will act as a wick in absorbing moisture and will protect the skin from direct contact with heat-absorbing protective clothing. If necessary, workers will wear ice vests. A mobile shower or hose-down facility will be available to reduce body temperature and cool protective clothing.

Shelter

Adequate shelter will be provided to protect workers during rest periods.

Work Limitations

During extreme heat, non-emergency response activities will be conducted in the early morning or evening. Also, work crews will be rotated. Clothing will be permitted to dry during rest periods.

Reference: U.S. EPA., Interim Standard Operating Safety Guides, revised September 1982.