

ENGINEERING AND OPERATIONS SERVICES NEW YORK STATE SUPERFUND STANDBY CONTRACT Multi-Site Preliminary Site Assessments HEALTH AND SAFETY PLAN

Hempstead Area Dry Cleaners (Site No. 130096)

Glen Head Groundwater Plume (Site No. 130xxx)

Techem, Inc. (Site No. 130524)

Kings Park Cleaners (Site No. 152168)

Turf Specialists (152160)

33 Wheeler Rd. Parking Lot (Site No. 152161)

Gabriel Manufacturing (Site No. 344041)

Camarota Cleaners (Site No. 546044)

Work Assignment No. D002676-45

May 1999



Prepared for:

**New York State
Department of
Environmental Conservation**

50 Wolf Road, Albany, New York 12233

John Cahill, *Commissioner*

Division of Environmental Remediation

Michael J. O'Toole, *Director*

By:

Lawler, Matusky & Skelly Engineers LLP

**ENGINEERING AND OPERATIONS SERVICES
NEW YORK STATE SUPERFUND STANDBY CONTRACT**

MULTI-SITE PRELIMINARY SITE ASSESSMENTS

**Hempstead Area Dry Cleaners (Site No. 1-30-096)
Glen Head Groundwater Plume (Site No. 1-30-XXX)
Techem, Inc. (Site No. 1-30-524)
King Park Cleaners (Site No. 1-52-168)
Turf Specialists (Site No. 1-52-160)
33 Wheeler Road Parking Lot (Site No. 1-52-161)
Gabriel Manufacturing Co., Inc. (Site No. 3-44-041)
Camarota Cleaners (Site No. 5-46-044)**



Work Assignment No. D002676-45

HEALTH AND SAFETY PLAN

Prepared for:

**New York State Department of Environmental Conservation
Division of Environmental Remediation**

May 1999

**LAWLER, MATUSKY & SKELLY ENGINEERS LLP
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS**

One Blue Hill Plaza
Pearl River, New York 10965

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SITE-SPECIFIC HEALTH AND SAFETY PLAN CAMAROTA CLEANERS

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

STANDARD OPERATING PROCEDURES MANUAL FOR HEALTH AND SAFETY

INTRODUCTION

Lawler, Matusky & Skelly Engineers LLP (LMS) has developed a site-specific Health and Safety Plan (HASP) for each site using LMS' standard short-form for preparing health and safety plans. Following the site-specific HASPS is a copy of LMS' Standard Operating Procedures Manual for Health and Safety.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

HEMPSTEAD AREA DRY CLEANERS

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Hempstead Area Dry Cleaners **HASP Preparer:** Edith Hollister

Address: Fulton Avenue, between Washington Street and Robson Place **City/State:** Hempstead, NY 11550

Job No.: 650-451, 650-452, 650-453

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: John Nixon
On-Site Health and Safety Officer: John Nixon

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

In groundwater: Chlorinated solvents present in the groundwater are reported to be tetrachloroethylene (PCE), and trichloroethylene (TCE).

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure. PCE is the compound of highest concern both from the point of view of its suspected carcinogenicity and its high vapor pressure. TCE has also been identified as a compound of concern because of its abundance in the groundwater samples. The international Agency for Research on Cancer (IARC) has classified TCE as a probable human carcinogen. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workbooks and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other

TABLE 1

**CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
HEMPSTEAD AREA DRY CLEANERS**

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG . TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Tetrachloroethylene	Perchloroethylene, Perchloroethylene, Perk, Tetrachloroethene	25 A3, BEI	Ca	100	Ca 150	NA	NA	NA	-	14	5.8	9.32	0.02%	4.7-50	yes	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som; skin eryt; liver damage; [carc]
Trichloroethylene	Ethylene trichloride, TCE, Trichloroethene; Trilene	50 A5, BEI	25	100	Ca 1000	8	10.5	?	788	58	4.5	9.45	0.0001 %	21.4-400	yes	Irrit eyes, skin; head, vertigo; vis dist, ftg, gidd; tremor; som, nau, vomit; derm; card arry; pares; liver inj; [carc]

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
HEMPSTEAD AREA DRY CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Ceiling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
A2	Suspected human carcinogen	chol	Cholinesterase	fasc	Fasciculation
A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
abdom	Abdominal	conf	Confusion	ftg	Fatigue
abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
HEMPSTEAD AREA DRY CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurring behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal mucus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheral neuropathy	ST	Short-term exposure limit
mod	Moderate	periorb	Periorbital (situated around the eye)	subs	Substernal (occurring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocytes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneuitis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbronc	Tracheobronchitis

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
HEMPSTEAD AREA DRY CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities, surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NW corner of Fulton Avenue and Clinton Street.

MONITORING PROCEDURES (If required by the Safety Officer)

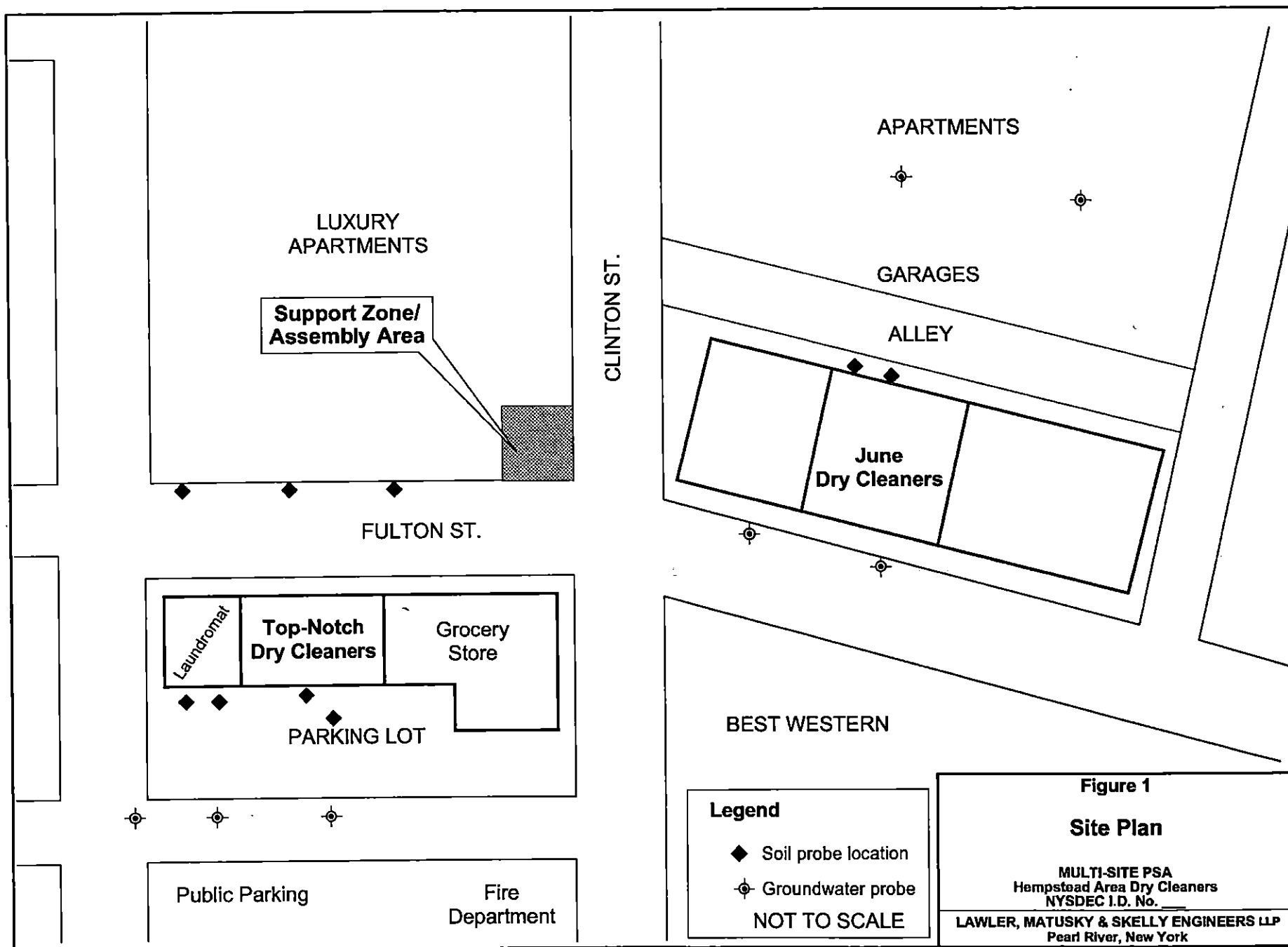
Monitoring the site for identity and concentration of contamination in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:



Not Applicable

Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Nassau County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
Hempstead General Hospital	911
800 Front St, Hempstead, NY 11550-4698	516-560-1200

See Figure 2.

Head EAST on FULTON AV [HWY 24], From Fulton + Robson go 0.2 mi TURN RIGHT onto NASSAU PL go 0.1 mi TURN LEFT onto FRONT ST [HWY 102] go 0.5 mi to Hempstead General Hospital.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Nassau County Health Department	516-571-3410
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

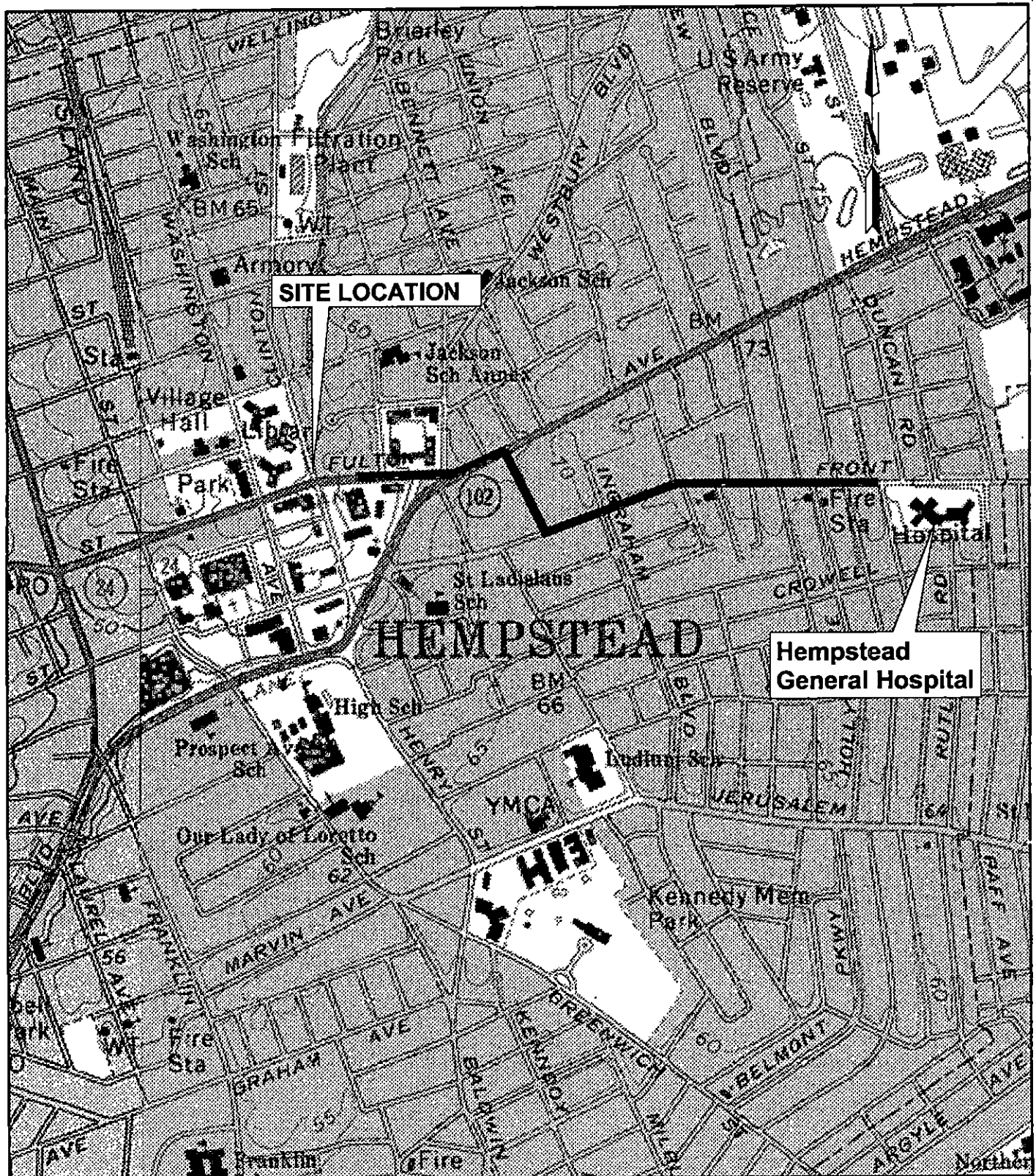


Figure 2

Route to Hospital

MULTI-SITE PSA
Hempstead Area Dry Cleaners
NYSDEC I.D. No. 130xxx

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Map source: USGS 7.5 minute quadrangle,
Freeport, NY, 1969, photorevised 1979.
Printed from Wildflower Productions "TOPO!"

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
HEMPSTEAD AREA DRY CLEANERS

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Water Sampling	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

TABLE 3
ACTION LEVELS
Hempstead Area Dry Cleaners

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Hempstead Area Dry Cleaners site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

GLEN HEAD GROUNDWATER PLUME

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Glen Head Groundwater Plume **HASP Preparer:** Edith Hollister
Address: Glen Head Road **City/State:** Glen Head, NY 11040
Job No.: 650-454, 650-455, 650-456

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Brett MacDonald
On-Site Health and Safety Officer: Brett MacDonald

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

In the groundwater: VOCs identified as being contained in groundwater are tetrachloroethylene (PCE), trichloroethylene (TCE), 1,2-dichloroethylene (1,2-DCE), 1,1-dichloroethylene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and dichloroethane(DCA).

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure. PCE is the compound of highest concern both from the point of view of its suspected carcinogenicity and its high vapor pressure. TCE has also been identified as a compound of concern because of its abundance in the groundwater samples. The international Agency for Research on Cancer (IARC) has classified TCE as a probable human carcinogen. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure.. Air monitoring and personnel protection devises will serve to prevent exposure from chemicals. See Table 1.

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TABLE 1

CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE

GLEN HEAD GROUNDWATER PLUME

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
1,1-Dichloroethane	Ethylidene chloride; 1,1-Ethylidene dichloride; Asymmetrical dichloroethane	100 A4	100	100	3000	5.4	11.4	2	824	182	3.42	11.06	0.6%	120	yes	Irrit skin; CNS depres; liver, kidney lung damage
1,1-Dichloroethylene	Vinylidene chloride; Vinylidene dichloride; 1,1-DCE; 1,1-Dichloroethene	5 (A3)	Ca	-	Ca	6.5	15.5	-2	1058	500	3.4	10.00	0.04%	-	yes	Irrit eyes, skin, throat; dizz, head, nau; dysp; liver, kidney dysfunc; pneuitis; [carc]
1,2-Dichloroethylene	Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene	200	200	200	1000	5.6	12.8	36-39	860	180-265	3.4	9.65	0.4%	0.085-500	yes	Irrit eyes, resp sys; CNS depres
Tetrachloroethylene	Perchlorethylene, Perchloroethylene, Perk, Tetrachloroethene	25 A3, BEI	Ca	100	Ca 150	NA	NA	NA	-	14	5.8	9.32	0.02%	4.7-50	yes	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som; skin eryt; liver damage; [carc]
1,1,1-Trichloroethane	Methyl chloroform; 1,1,1-TCA	350 A4, BEI	C 350	350	700	7.5	12.5	?	-	100	4.55	11.00	0.4%	20-400	yes	Irrit eyes, skin; head; lass; CNS depres; poor equi; derm; card arrhy; liver damage
Trichloroethylene	Ethylene trichloride, TCE, Trichloroethene; Trilene	50 A5, BEI	25	100	Ca 1000	8	10.5	?	788	58	4.5	9.45	0.0001 %	21.4-400	yes	Irrit eyes, skin; head, vertigo; vis dist, ftg, gidd; tremor; som, nau, vomit; derm; card arrhy; pares; liver inj; [carc]

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A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
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A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
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abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
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album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis?	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

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GLEN HEAD GROUNDWATER PLUME

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurring behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal mucus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheral neuropathy	ST	Short-term exposure limit
mod	Moderate	peri orb	Periorbital (situated around the eye)	subs	Substernal (occurring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocytes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneutis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbronc	Tracheobronchitis

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
GLEN HEAD GROUNDWATER PLUME

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities, surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NW corner of Glen Head Road and Dumond Place.

MONITORING PROCEDURES (If required by the Safety Officer)

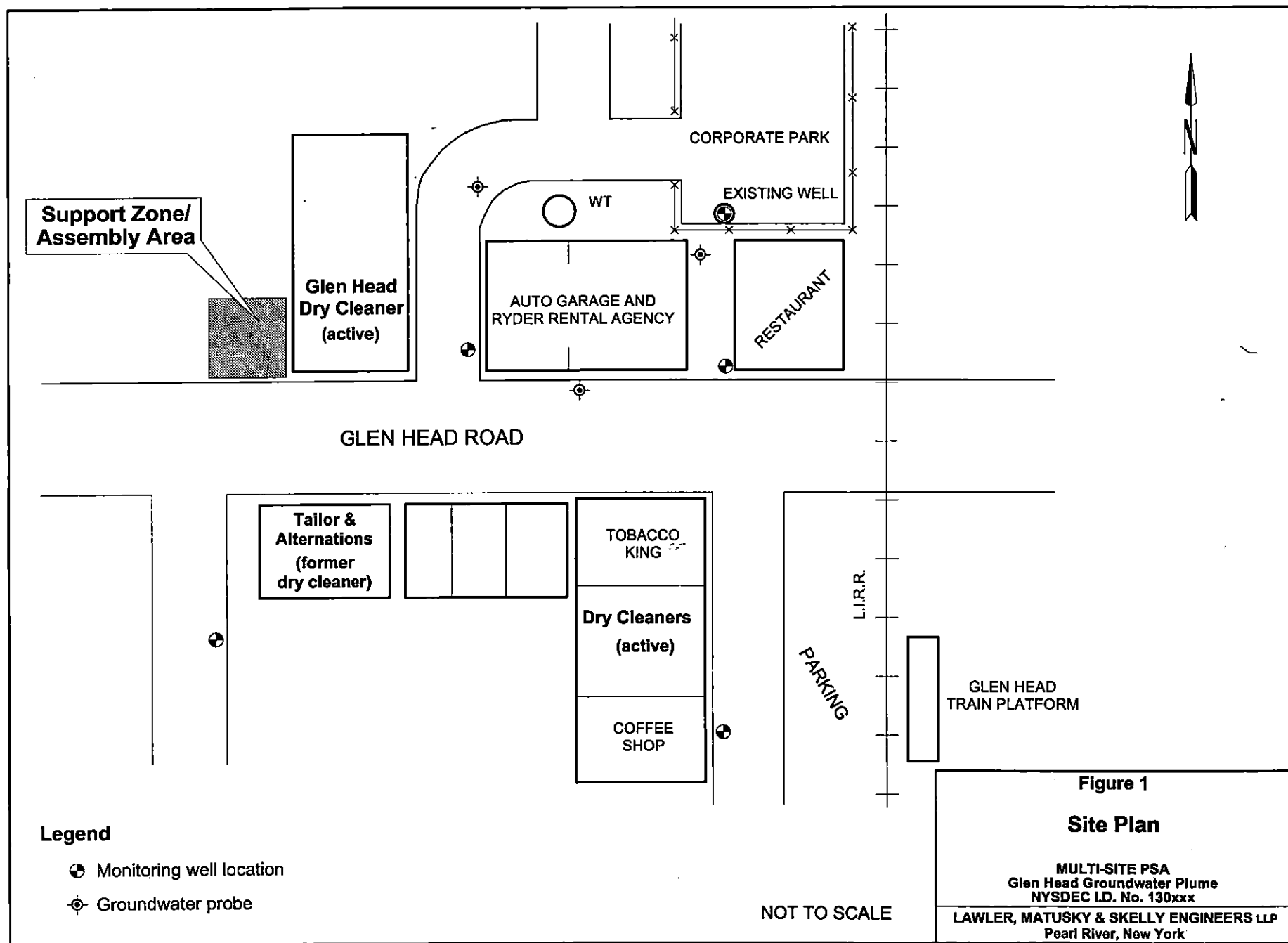
Monitoring the site for identity and concentration of contamination in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:



Not Applicable

Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Nassau County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)

Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
North Shore University Hospital 101 Saint Andrews Ln, Glen Cove, NY 11542-2254	911 516-674-7300

See Figure 2.

Head EAST on GLENWOOD RD, From Glen Head Rd go Less than .1 mi TURN LEFT onto GLEN COVE AV go 2.2 mi CONTINUE onto BREWSTER ST go 0.4 mi CONTINUE onto SCHOOL ST go 0.1 mi CONTINUE onto FOREST AV go 0.5 mi TURN RIGHT onto WALNUT RD go 0.1 mi TURN RIGHT onto SAINT ANDREWS LN go Less than .1 mi to North Shore University Hospital.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Nassau County Health Department	516-571-3410
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)

Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

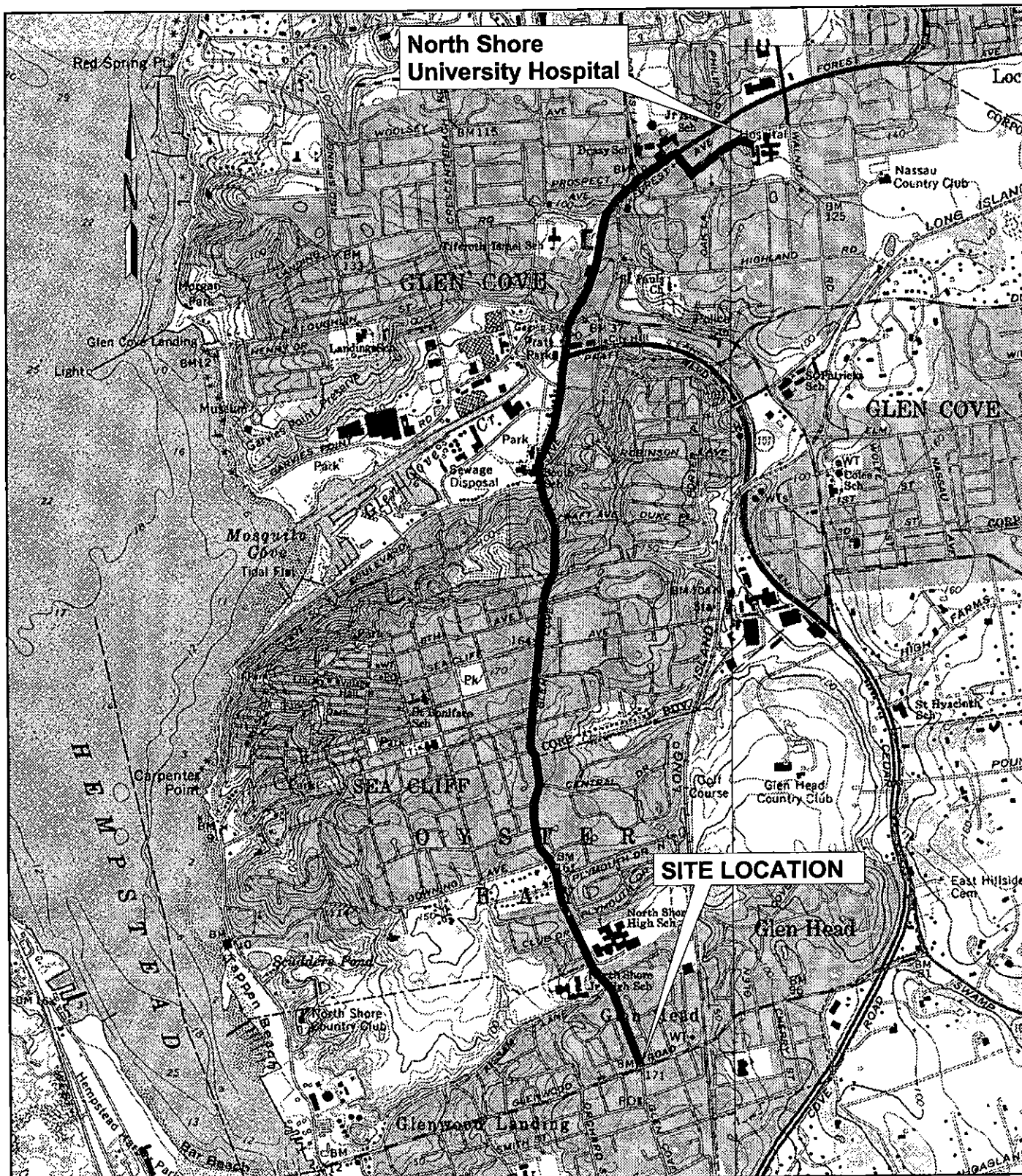


Figure 2

Route to Hospital

MULTI-SITE PSA
Glen Head Groundwater Plume
NYSDEC I.D. No. 130xxx

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Map source:
USGS 7.5-minute Quadrangle Map,
Hicksville, NY, 1967, photorevised 1979
Sea Cliff, NY, 1968, photorevised 1979.
Printed from Wildflower Productions "Topo".

0 2000 ft
SCALE

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
GLEN HEAD GROUNDWATER PLUME

TASK	LEVEL OF PROTECTION	DESCRIPTION
1. Well Installation	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.
2. Well Sampling	D	Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron and Nitrile Gloves in case of splash.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

TABLE 3
ACTION LEVELS
Glen Head Groundwater Plume

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Glen Head site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

TECHEM, INC.

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Techem, Inc.

HASP Preparer: Edith Hollister

Address: 1840 Falmouth Ave

City/State: New Hyde Park, NY 11040

Job No.: 650-457, 650-458, 650-459

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: John Nixon
On-Site Health and Safety Officer: John Nixon

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

This site was a facility which manufactured acid-based chromium, cadmium, cyanide, nickel, and zinc electroplating solutions. EPA has removed soil contaminated with lead and cadmium. Chromic acid, hydrochloric acid, sulfuric acid, cadmium oxide, caustic soda, sodium cyanide, sodium stannate, copper cyanide, ethylenediamine, and ammonium hydroxide were used in the manufacturing process. Due to leaking drums and flooding problems, these materials entered the subsurface through a floor sump. Cadmium and lead levels in soil adjacent to the property exceeded TCLP thresholds.

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of dust would provide the mechanism for exposure. Cadmium is the compound of highest concern from the point of view of its suspected human carcinogenicity. Chromate has also been identified as a compound of concern because ACGIH has classified chromate as a confirmed human carcinogen. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

TABLE 1

CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE **TECHEM, INC.**

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG . TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Cadmium	-	0.01mg/m3 tot,0.002 mg/m3 resp, A2, BEI	Ca	0.005 mg/m3	Ca 9 mg/m3	NA	NA	NA	NA	0	-	NA	insol	inadequate	yes	Pulm edema, dysp, cough; chest tight, subs pain; head; chills, musc aches; nau, vomit, diarr; anos; emphy; prot; mild anemia; [carc]
Chromic acid and chromates	Chromic acid: none; Synonyms of chromates (i.e., chromium (VI) compounds) vary depending upon the specific compound	0.05 mg/m3 A1, BEI	Ca 0.001 mg/m3	C 0.1 mg/m3	Ca 15 mg/m3	NA	NA	NA	NA	very low	-	NA	63%		yes	Irrit resp sys; nasal septum pert; liver, kidney damage; leucyt, leupen, monocyt, eosin; eye inj, conj; skin ulcer, sens derm; [carc]
Chromium metal	Chrome, Chromium	0.5 mg/m3 A4	0.5 mg/m3	1 mg/m3	250 mg/m3	NA	NA	NA	NA	0	-	NA	insol	-	yes	Irrit eyes, skin; lung fib (histologic)
Ethylenediamine	1,2-Diaminoethane; 1,2- Ethanediamine; Ethylenediamine (anhydrous)	skin 10 A4	10	10	1000	2.5	12	93	725	11	2.1	8.60	misc		yes	Irrit nose, resp sys; sens derm; asthma; liver, kidney damag
Hydrogen cyanide	Formonitrite, Hydrocyanic acid, Prussic acid	C4.7 skin	ST 4.7	10 skin	50	5.6	40.0	0	1000	630	0.9	13.60	misc		yes	Asphy; weak, head, conf; nau, vomit; incr rate and depth of respiration or respiration slow and gasping; thyroid, blood changes

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**CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
TECHEM, INC.**

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG . TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Lead	Lead metal, Plumbum	0.05 mg/m3 A3, BEI	0.1 mg/m3	0.050 mg/m3	100 mg/m3	NA	NA	NA	NA	NA	0	-	NA	insol	yes	Weak, lass; insom; facial pallor; pal eye anor, low-wgt; malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; kidney disease; irrit eyes; hypotension
Nickel metal and other compounds (as Ni)	Nickel, Nickel metal; Elemental metal, Nickel catalyst	1.5 mg/m3, A5	0.015 mg/m3 Ca	1 mg/m3	Ca 10 mg/m3	NA	NA	NA	NA	0	-	NA	insol	-	yes	Sens derm; allergic asthma; pneumonitis; [carc]
Sodium hydroxide	Caustic soda; Lye; Soda lye; Sodium hydrate	C 2 mg/m3	C 2 mg/m3	2 mg/m3	10 mg/m3	NA	NA	NA	-	0	-	NA	111 %		yes	Irrit eyes, skin, muc memb; pneutis; eye, skin burns; temporary loss of hair
Zinc oxide dust		10 mg/m3	-	15 mg/m3 total 5 mg												

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
TECHEM, INC.

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Celling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
A2	Suspected human carcinogen	chol	Cholinesterase	fasc	Fasciculation
A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
abdom	Abdominal	conf	Confusion	ftg	Fatigue
abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

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TECHEM, INC.

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
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leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
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liq	Liquid	OSHA PEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
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monocy	Monocytosis (increased blood monocytes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
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muc memb	Mucous membrane	pneuitis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
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unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workboots and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities, surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NW corner of Falmouth and Denton Avenues.

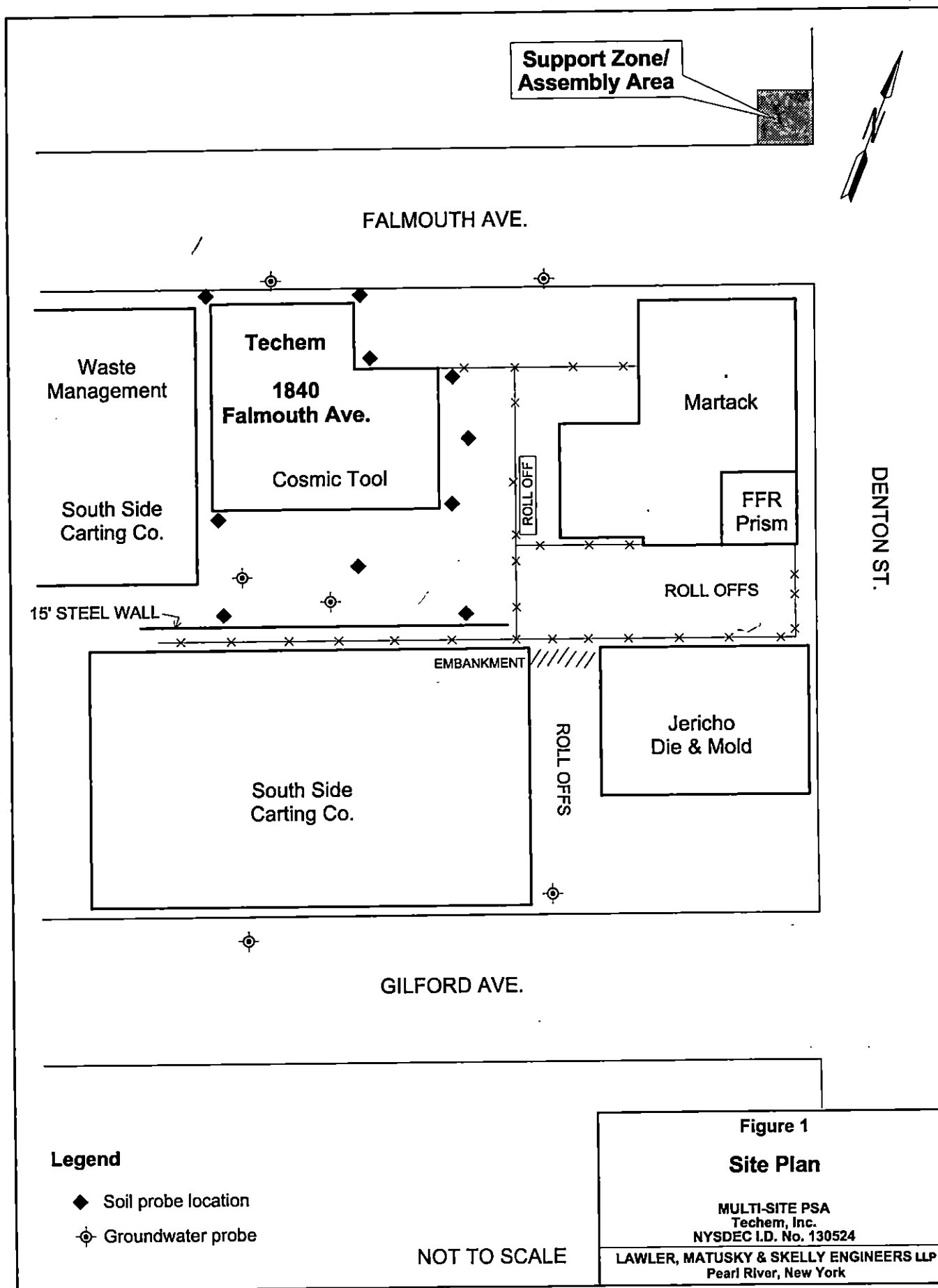
MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

A DataRAM or RAM-1, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.



Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable

Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Nassau County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
Long Island Jewish Medical Ctr 27005 76th Ave # C204, New Hyde Park, NY 11040-1496	911 718-470-7000

See Figure 2.

Head NORTH on NEW HYDE PARK RD, From Falmouth Ave go 1.0 mi TURN LEFT onto UNION TPK go 0.7 mi TURN RIGHT onto LAKEVILLE RD go 0.3 mi TURN LEFT onto DRIVEWAY go 0.1 mi to Long Island Jewish Medical Ctr.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Nassau County Health Department	516-571-3410
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Water may be used to keep down dust levels.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

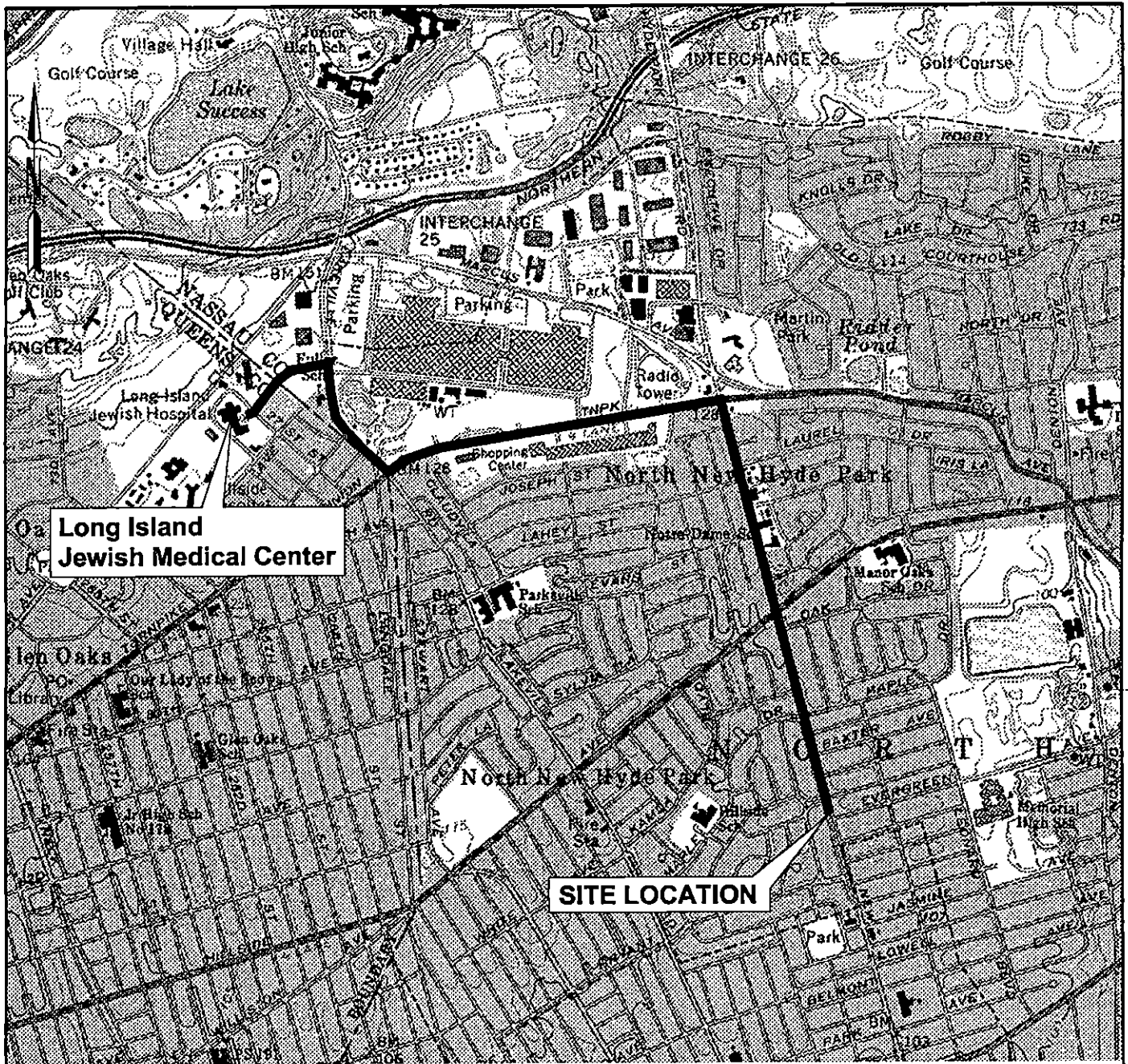
(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.



Map source: USGS 7.5 minute quadrangle,
Lynbrook, NY, 1969, photorevised 1972.
Printed from Wildflower Productions "TOPO!"

0 2000 ft
SCALE

Figure 2

Route to Hospital

MULTI-SITE PSA
Techem, Inc.
NYSDEC I.D. No. 130524

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
TECHEM, INC.

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Water Sampling	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.

NOTE: In areas with known high metals contamination use full face respirator equipped with HEPA filter if dust levels are excessive ($> 150 \mu\text{g}/\text{m}^3$ in the breathing zone), and can't be controlled with engineering controls.

TABLE 3
ACTION LEVELS
Techem, Inc.

Instrument	Hazard Monitored	Level	Action Required
DataRAM or RAM-1	Dust	>150 µg/m ³	Use engineering controls to reduce levels, then if necessary, upgrade to Level C.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Techem site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

KINGS PARK DRY CLEANERS

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Kings Park Cleaners

HASP Preparer: Edith Hollister

Address: 44 Indian Head Road

City/State: Kings Park, NY 11754

Job No.: 650-701, 650-702, 650-703

APPROVALS

Project Manager: Michael Musso

Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Neal Grasso

On-Site Health and Safety Officer: Neal Grasso

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

In the sediment in two outside subsurface leaching pools: tetrachloroethylene (PCE), cis-1,2-dichloroethylene (cis-1,2-DCE), and 1,2-dichlorobenzene (1,2-DCB).

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure. PCE is the compound of highest concern both from the point of view of its suspected carcinogenicity and its high vapor pressure. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workbooks and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

TABLE 1

CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE KINGS PARK CLEANERS

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
1,2-Dichlorobenzene	o-DCB; o-Dichlorobenzene; ortho-Dichlorobenzene; o- Dichlorobenzol	25 A4	C 50	50 C	200	2.2	9.2	151	1198	1	5.1	9.06	0.01%	2-50	yes	Irrit eyes, nose; liver, kidney damage; skin blister
1,2-Dichloroethylene	Acetylene dichloride, cis- Acetylene dichloride, trans- Acetylene dichloride, sym- Dichloroethylene	200	200	200	1000	5.6	12.8	36-39	860	180- 265	3.4	9.65	0.4%	0.085-500	yes	Irrit eyes, resp sys; CNS depres
Tetrachloroethylene	Perchlorethylene, Perchloroethylene, Perk, Tetrachloroethene	25 A3, BEI	Ca	100	Ca 150	NA	NA	NA	-	14	5.8	9.32	0.02%	4.7-50	yes	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som; skin eryt; liver damage; [carc]

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
KINGS PARK CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Ceiling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
A2	Suspected human carcinogen	chol	Cholinesterase	fasc	Fasciculation
A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
abdom	Abdominal	conf	Confusion	ftg	Fatigue
abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
KINGS PARK CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurig behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal musus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheal neuropathy	ST	Short-term exposure limit
mod	Moderate	periorb	Periorbital (siutated around the eye)	subs	Substernal (occurring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocutes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneuitis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbronc	Tracheogronchitis

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
KINGS PARK CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

During typical activities surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be in the parking lot of King Park Plaza.

MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

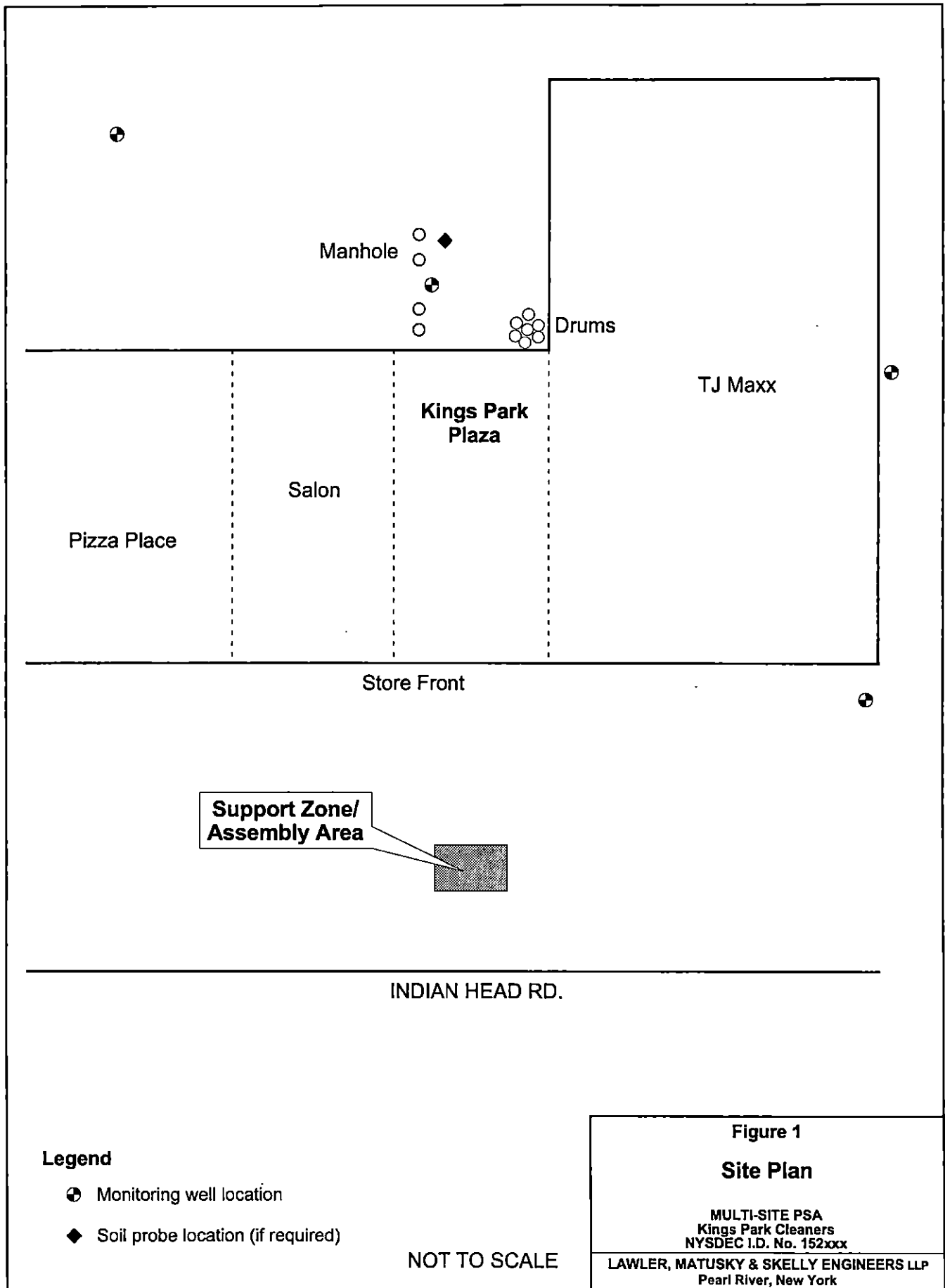
Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable



Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Suffolk County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
St John's Episcopal Hospital 50 Route 25A, Smithtown, NY 11787-1348	911 516-862-3000

See Figure 2.

Head NORTH on INDIAN HEAD RD, From Indian Head Rd, go 1.1 mi TURN RIGHT onto MAIN ST [HWY 25A] go 1.8 mi TURN RIGHT onto SMITHTOWN TO SAINT JOHN LAND RD [HWY 25A] go 1.3 mi TURN LEFT onto UNNAMED ROAD to WILLOW RIDGE DR go 0.1 mi TURN LEFT onto WILLOW RIDGE DR go 0.2 mi to St John's Episcopal Hospital.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Suffolk County Health Department	516-854-2537
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

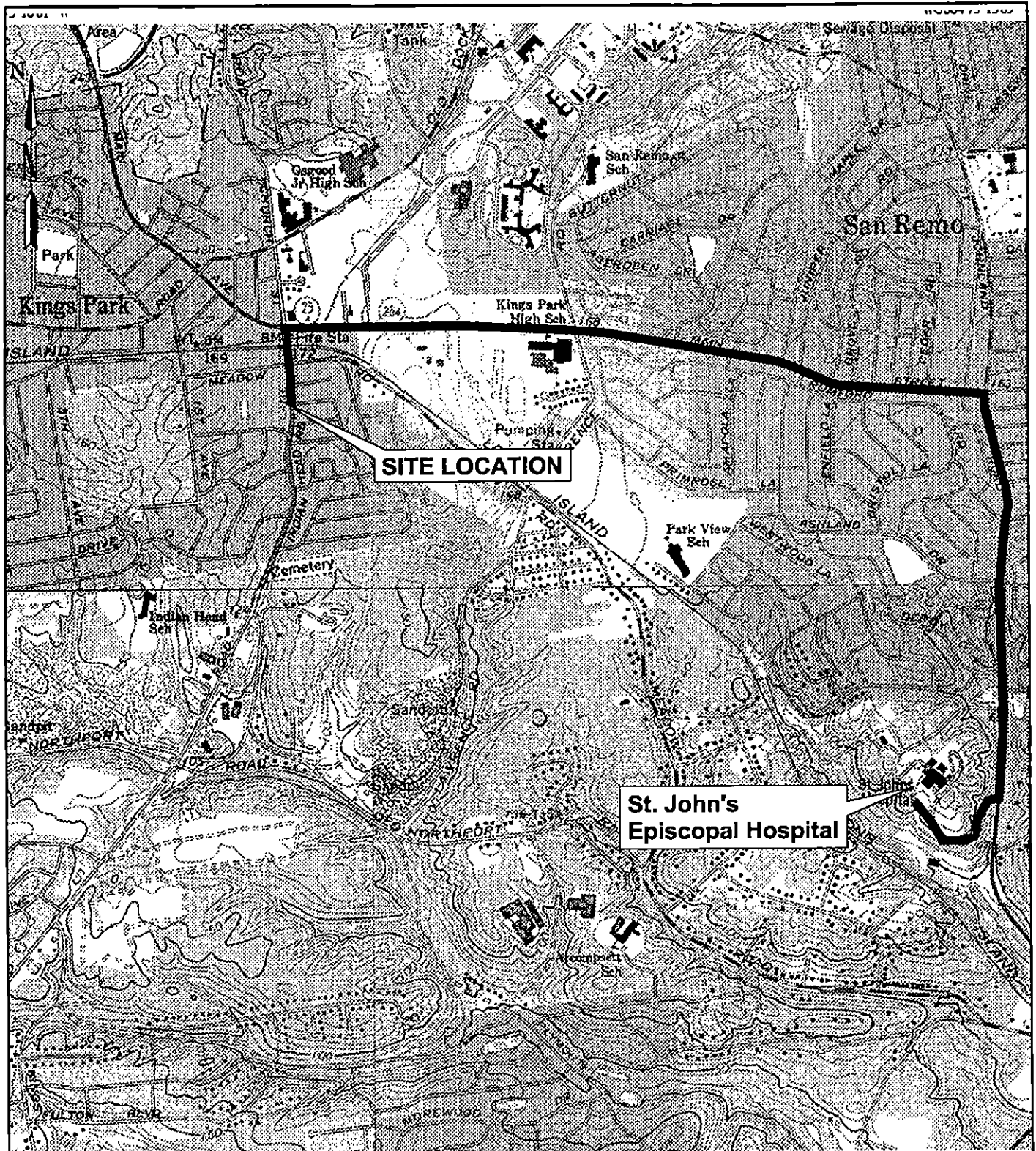


Figure 2

Route to Hospital

MULTI-SITE PSA
Kings Park Cleaners
NYSDEC I.D. No. 152xxx

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Map source: USGS 7.5 minute quadrangle,
Northport, NY, 1967, photorevised 1979, and
Greenlawn, NY, 1967, photorevised 1988.
Printed from Wildflower Productions "TOPO!"



TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
KINGS PARK CLEANERS

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Water Sampling/Well Installation	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.
2. Well Sampling	D	Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron and Nitrile Gloves in case of splash.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

**TABLE 3
ACTION LEVELS
Kings Park Cleaners**

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Kings Park Cleaners site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

TURF SPECIALISTS

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Turf Specialists **HASP Preparer:** Edith Hollister
Address: 444 Saint James Street **City/State:** Holbrook, NY 11741
Job No.: 650-704, 650-705, 650-706

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Brett MacDonald
On-Site Health and Safety Officer: Brett MacDonald

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

Hazardous waste disposal includes: Fertilizers, Dursban, 2-4 D with Amine, Sevin, and Round up.

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors and/or dust would provide the mechanism for exposure. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workbooks and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are

TABLE 1

CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE TURF SPECIALISTS

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Carbaryl	alpha-Naphthyl N-methyl carbamate; 1-Naphthyl N-Methyl carbamate, Sevin	5 mg/m3 A4	5 mg/m3	5 mg/m3	100 mg/m3	NA	NA	NA	-	<0.00004	-	?	0.01%		yes	Miosis, blurred vision, tear; rhin, salv; sweat; abdom cramps, nau, vomit, diarr; tremor; cyan; convuls; irrit skin; possible repro effects
Chlorpyrifos	Dursban, (3,5,6-trichloro-2-pyridinyl) ester	0.2 mg/m3, A4,skin,BEI	0.2 mg/m3, skin							0.00002			0.0002		0	Wheez,laar spasms,salv;bluish lips, skin;miosis,blurred vision;nau, vomit, abdom cramps, diar
2,4-D	2,4-Dichlorophenoxyacetic acid; Dichlorophenoxyacetic acid	10 mg/m3 A4	10 mg/m3	10 mg/m3	100 mg/m3	NA	NA	NA	-	0.4 @ 320 °F	7.63	?	0.05%		yes	Weak, stupor, hyporeflexia, musc twitch; convuls; derm; in animals: liver, kidney inj
Glyphosate	Round-up, N-(Phosphonomethyl)glycine												1.2		0	

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TURF SPECIALISTS

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bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
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		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
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TURF SPECIALISTS

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lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occuring behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal musus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheal neuropathy	ST	Short-term exposure limit
mod	Moderate	periorb	Periorbital (siutated around the eye)	subs	Substernal (occuring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocutes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneuitis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbronc	Tracheogronchitis

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
TURF SPECIALISTS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NE corner of St. James Street and Grundy Avenue.

MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

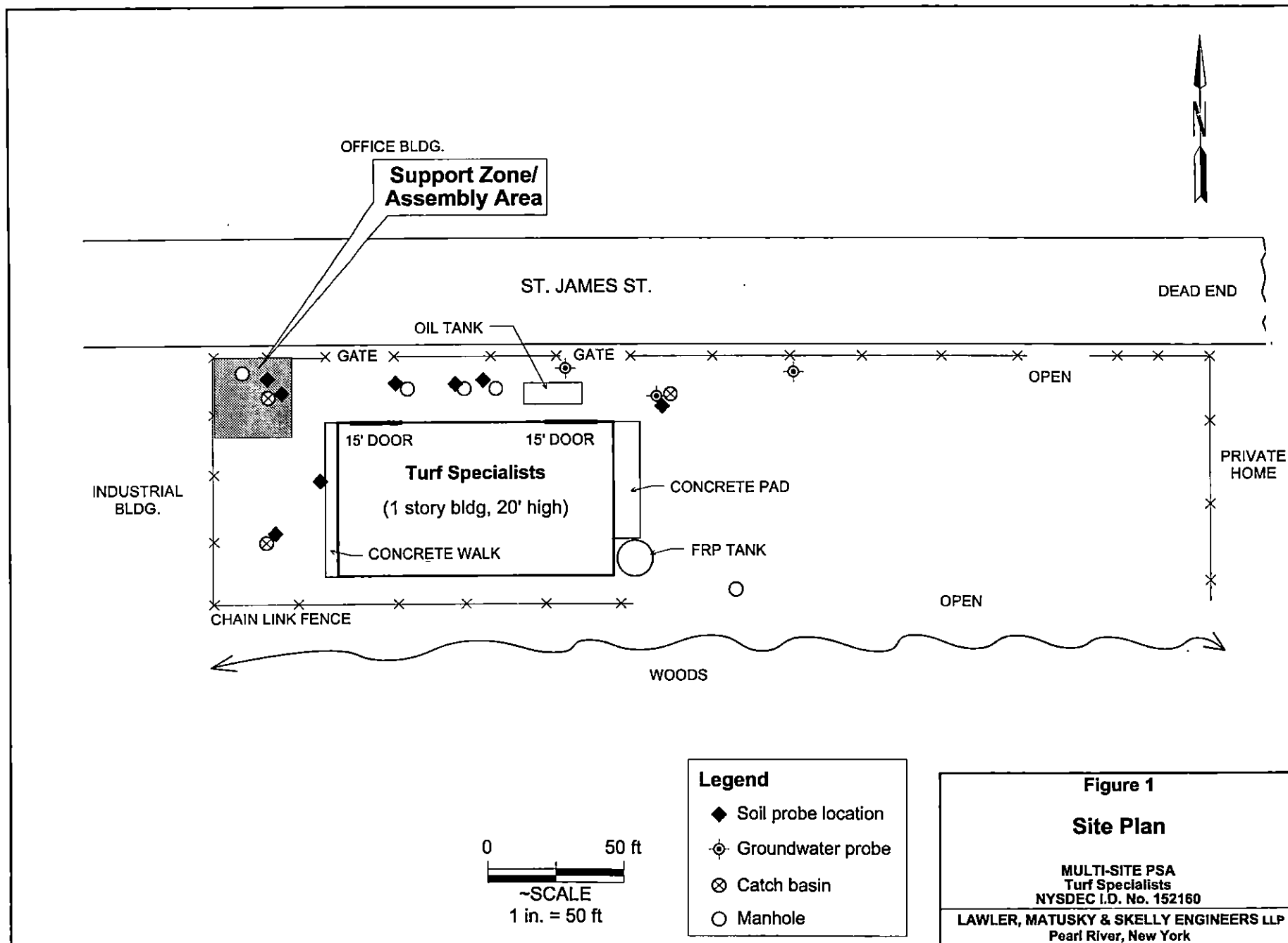
Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used to monitor for VOCs. A DataRAM or RAM-1 will be used to monitor for dust.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.

Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Suffolk County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
Brookhaven Memorial Hospital 101 Hospital Rd, Patchogue, NY 11772-4897	911 516-654-7100

See Figure 2.

Head WEST on SAINT JAMES ST, from 444 Saint James St go 0.1 mi TURN LEFT onto GRUNDY AV go 0.1 mi TURN LEFT onto VETERANS MEMORIAL HWY [HWY 454] go 1.1 mi FOLLOW as road goes into RAMP to SUNRISE HWY (EAST) [HWY 454] go 0.2 mi FOLLOW as road goes into SUNRISE HWY (EAST) [HWY 454] go 0.9 mi CONTINUE onto RAMP to HWY 27 (EAST) [SUNRISE HWY] go 0.1 mi FOLLOW as road goes into HWY 27 (EAST) [SUNRISE HWY] go 2.1 mi BEAR RIGHT onto SUNRISE HWY (EAST) go 0.6 mi CONTINUE onto SUNRISE HWY go 0.1 mi TURN RIGHT onto ROBINSON AV go 0.8 mi BEAR LEFT onto ORCHID RD go Less than .1 mi TURN LEFT onto PATCHOGUE YAPHANK RD go 0.4 mi to Brookhaven Memorial Hospital.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Suffolk County Health Department	516-854-2537
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)

Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

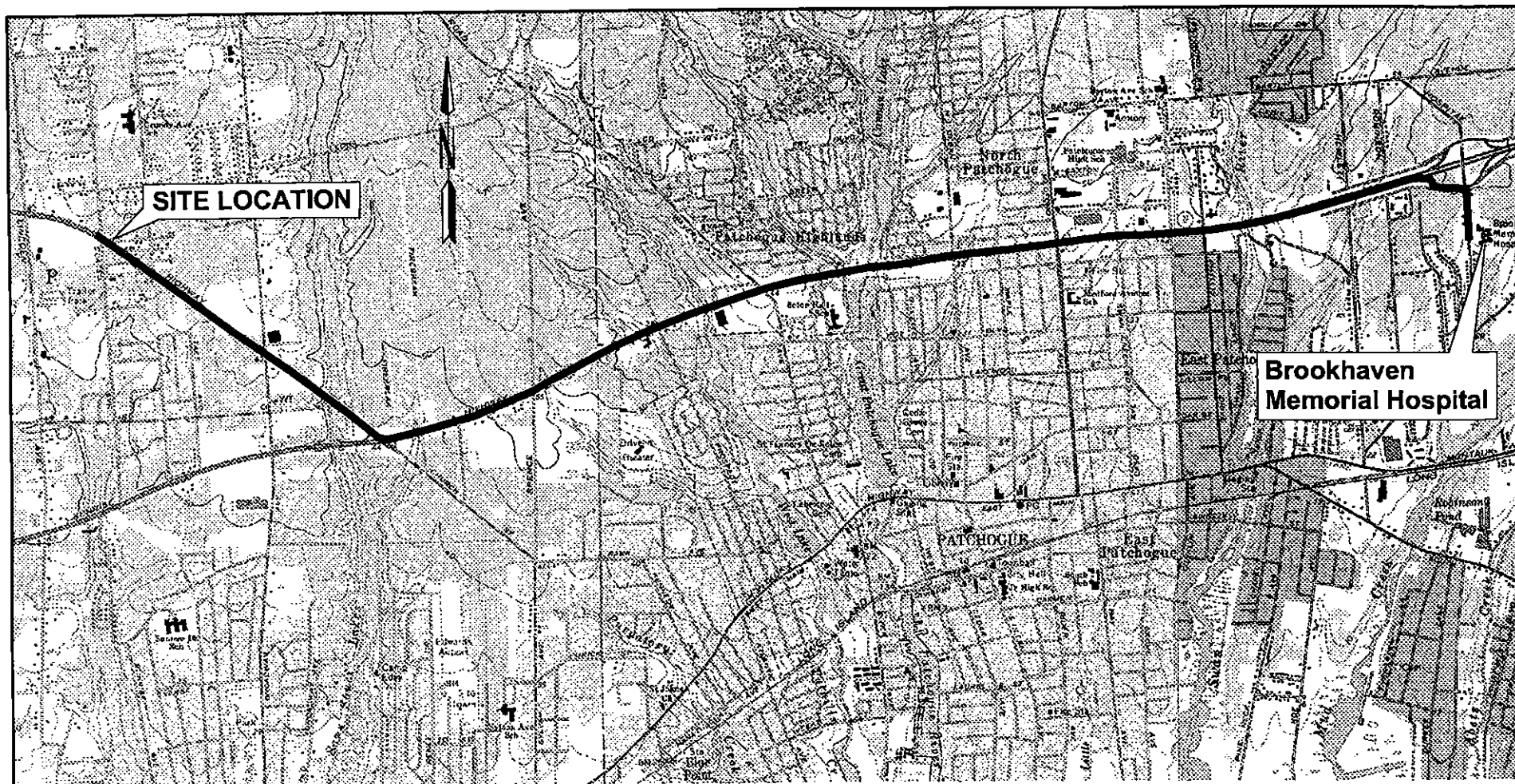
(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Water may be used to keep down dust levels.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.



Map source: USGS 7.5 minute quadrangle,
Patchogue, NY, photorevised 1977.
Printed from Wildflower Productions "TOPO!"

0 1 mi
SCALE IN MILES

Figure 2

Route to Hospital

**MULTI-SITE PSA
Turf Specialists
NYSDEC I.D. No. 152160**

**LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York**

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
TURF SPECIALISTS

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Water Sampling	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.

NOTE: In areas with known high metals contamination use full face respirator equipped with HEPA filter if dust levels are excessive ($> 150 \mu\text{g}/\text{m}^3$ in the breathing zone), and can't be controlled with engineering controls.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

**TABLE 3
ACTION LEVELS
Turf Specialists**

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.
DataRAM or RAM-1	Dust	>150 µg/m ³	Use engineering controls to reduce levels, then if necessary, upgrade to Level C.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Turf Specialists site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

33 WHEELER ROAD PARKING LOT

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: 33 Wheeler Road Parking Lot

HASP Preparer: Edith Hollister

Address: 33 & 37 Wheeler Road

City/State: Central Islip, NY 11722

Job No.: 650-707, 650-708, 650-709

APPROVALS

Project Manager: Michael Musso

Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Neal Grasso

On-Site Health and Safety Officer: Neal Grasso

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 22 April 1999

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

In soil: The parking lot fill material exceeds the regulatory limit for TCLP lead. TCLP selenium was also found above the regulatory limit. Benzene, chlorobenzene, ethylbenzene, toluene, and xylenes were also detected in the soil.

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure to volatiles whereas inhalation of dust would provide the mechanism of exposure to metals. Benzene is the compound of highest concern both from the point of view of its confirmed carcinogenicity and its high vapor pressure. Lead has also been identified as a compound of concern because of the high levels found in soil samples. ACGIH has classified lead as a confirmed animal carcinogen. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workbooks and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other

TABLE 1

**CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
33 WHEELER RD. PARKING LOT**

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Benzene	Benzol; Cyclohexatriene; Coal tar Naphtha; Phenylhydride	0.5, A1, skin, BEI	0.1	1	Ca 500	1.2	7.8	12	928	75	2.8	9.24	0.07%	4.68	yes	Irrit eyes, skin, nose, resp sys; gidd, head, nau, staggered gait; ftg, anor, lass; derm; bone marrow depres; [carc]
Chlorobenzene	Monochlorobenzene, Chlorobenzol, Phenyl chloride, MCB; Benzene chloride	10 A3, BEI	-	75	1000	1.3	9.6	82	1099	9	3.9	9.07	0.05%	0.21-60	yes	Irrit eyes, skin, nose; drow, Inco; CNS depres; in animals: liver, lung, kidney inj
Ethylbenzene	Ethylbenzol, Phenylethane	100, BEI	100	100	800	0.8	6.7	55	810	7	3.7	8.76	0.01%	0.25-200	yes	Irrit eyes, skin, muc memb; head; derm, narcó, coma
Lead	Lead metal, Plumbum	0.05 mg/m3 A3, BEI	0.1 mg/m3	0.050 mg/m3	100 mg/m3	NA	NA	NA	NA	NA	0	-	NA	insol	yes	Weak, lass; insom; facial pallor; pal eye anor, low-wgt; malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; kidney disease; irrit eyes; hypotension

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Selenium	Elemental selenium, Selenium alloy	0.2 mg/m3	0.2 mg/m3	0.2 mg/m3	1 mg/m3	NA	NA	NA	NA	1	-	NA	insol		yes	Irrit eyes, skin, nose, throat; vis dist; head; chills, fever; dysp, bron; metallic taste, garlic breath, GI dist; derm; eye, skin burns; in animals: anemia; liver nec, cirr; kidney, spleen damage
Toluene	Methyl benzene, Methyl benzol, Phenyl methane, Toluol	50 skin A4, BEI	100	200	500	1.1	7.1	40	896	21	3.1	8.82	0.07% @ 74 °F	0.17-40	yes	Irrit eyes, nose; fig, weak, conf, euph, dizz, head; dilated pupils, lac; ner; musc fig; insom; pares; derm; liver, kidney damage
Xylenes (all isomers)	Synonyms vary depending on isomer	100 A4, BEI	100	100	900	0.9/1.1/ 1.1	6.7/7/ 7	90/82/81	867/982/ 984	7/9/9	3.7	8.56/8 .56/8. 44	0.02/slig ht/0.02 %	1.1-3.7	yes	Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
33 WHEELER RD. PARKING LOT

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Ceiling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
A2	Suspected human carcinogen	chol	Cholinesterase	fasc	Fasciculation
A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
abdom	Abdominal	conf	Confusion	ftg	Fatigue
abnor	Abnormal/Abnormalities	conj	Conjunctivitis	-func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

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33 WHEELER RD. PARKING LOT

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irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurring behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal mucus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
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methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheral neuropathy	ST	Short-term exposure limit
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mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
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unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

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SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NE corner of Wheeler Road and Monsen Street.

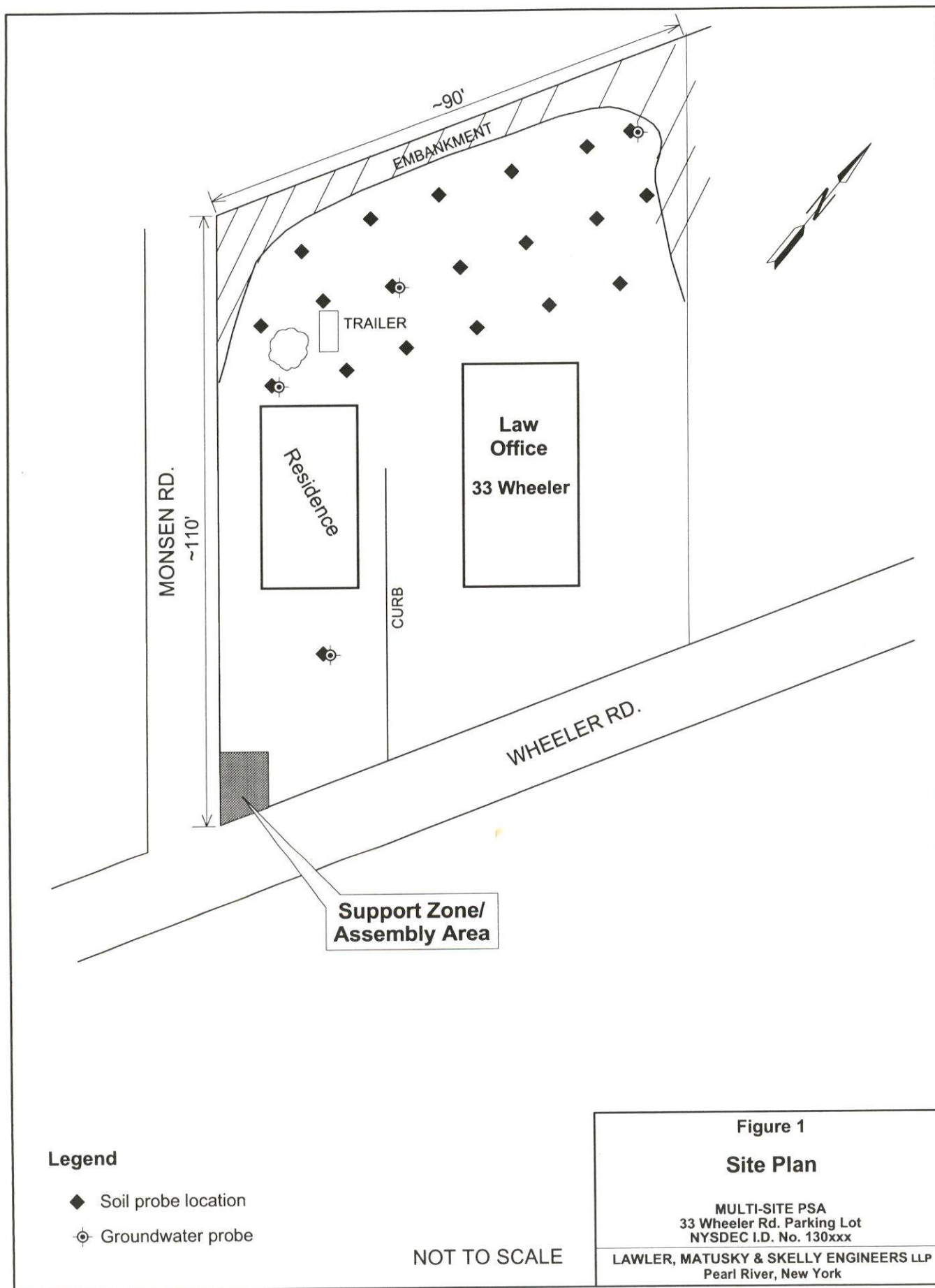
MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

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An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used to monitor for VOCs. A DataRAM or RAM-1 will be used to monitor for dust .



Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable

Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Suffolk County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
St John's Episcopal Hospital	911
50 Route 25A, Smithtown, NY 11787-1348	516-862-3000

See Figure 2.

Head NORTH-WEST on WHEELER RD, From 33 Wheeler Rd go 3.0 mi CONTINUE onto SMITHTOWN ISLIP TOWN LINE RD [HWY 111] go Less than .1 mi CONTINUE onto HAUPPAUGE RD [HWY 111] go 2.3 mi TURN LEFT onto MAIN ST [HWY 25] go 1.3 mi BEAR RIGHT onto SMITHTOWN TO SAINT JOHN LAND RD [HWY 25A] go 0.6 mi TURN RIGHT onto UNNAMED ROAD to WILLOW RIDGE DR go 0.1 mi TURN LEFT onto WILLOW RIDGE DR go 0.2 mi to St John's Episcopal Hospital.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	516-542-2323
Suffolk County Health Department	516-854-2537
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
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LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

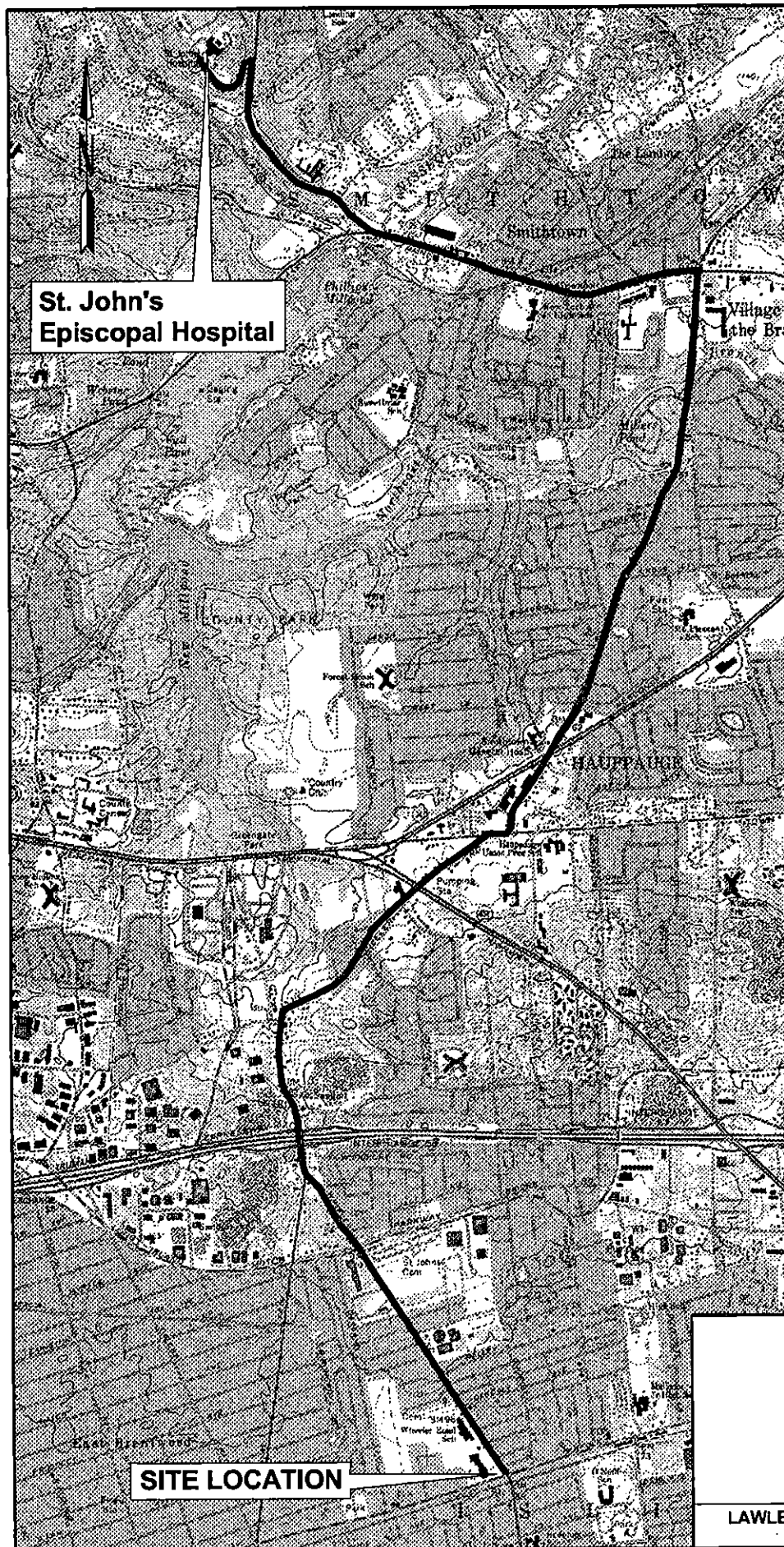
Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases. Water may be used to keep down dust levels.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP



Map source:
 USGS 7.5 minute quadrangle,
 Central Islip, NY, 1967,
 photorevised 1979.
 Printed from Wildflower
 Productions "TOPO!"

Figure 2

Route to Hospital

MULTI-SITE PSA
 33 Wheeler Rd. Parking Lot
 NYSDEC I.D. No. 152161

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
 Pearl River, New York

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
33 WHEELER ROAD PARKING LOT

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Water Sampling	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.

NOTE: In areas with known high metals contamination use full face respirator equipped with HEPA filter if dust levels are excessive ($> 150 \mu\text{g}/\text{m}^3$ in the breathing zone), and can't be controlled with engineering controls.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

TABLE 3
ACTION LEVELS
33 Wheeler Road Parking Lot

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.
DataRAM or RAM-1	Dust	>150 µg/m ³	Use engineering controls to reduce levels, then if necessary, upgrade to Level C.

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the 33 Wheeler Road Parking Lot site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

GABRIEL MANUFACTURING CO., INC.

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Gabriel Manufacturing Co., Inc. **HASP Preparer:** Karen Wright
Address: 125 South Liberty Dr. **City/State:** Stony Point, NY 10980
Job No.: 650-711, 650-712, 650-713

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Scott Englert
On-Site Health and Safety Officer: Scott Englert

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 23 April 1999

HAZARDOUS SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

In the groundwater: VOCs identified as being contained in groundwater are dichlorodifluoromethane (DCDFM), trichlorofluoromethane (TCFM), 1,1,1-trichloroethane (1,1,1-TCA), and 1,1-dichloroethane(DCA). DCDFM and TCFM are confirmed as being disposed of on-site.

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workboots and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

TABLE 1

CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
GABRIEL MANUFACTURING CO., INC.

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Dichlorodifluoromethane	Fluorocarbon-12; Freon F-12; Halon; RCRA Waste #U075	1000 A4	-	1000	15000	NA	NA	NA	-	5.7 atm	-	11.75	0.03%	-	yes	Dizz, tremor, asphy, uncon, card arrhy, card arrest; liq: frostbite
1,1-Dichloroethane	Ethylidene chloride; 1,1- Ethylidene dichloride; Asymmetrical dichloroethane	100 A4	100	100	3000	5.4	11.4	2	824	182	3.42	11.06	0.6%	120	yes	Irrit skin; CNS depres; liver, kidney lung damage
1,1,1-Trichloroethane	Methyl chloroform; 1,1,1-TCA	350 A4, BEI	C 350	350	700	7.5	12.5	?	-	100	4.55	11.00	0.4%	20-400	yes	Irrit eyes, skin; head; lass; CNS depres; poor equi; derm; card arrhy; liver damage
Trichlorofluoromethane	Refrigerant 11; Freon 11; Monofluorotrichloromethane; Trichloromonofluoromethane; Fluorotrichloromethane	C 1000 A4	C 1000	1000	2000	NA	NA	NA	-	690	-	11.77	0.1%	135-209	yes	Inco; trem; derm, card arrhy, card arrest; asphy; liq: frostbite

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
GABRIEL MANUFACTURING CO., INC.

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Celling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
A2	Suspected human carcinogen	chol	Cholinesterase	fasc	Fasciculation
A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
abdom	Abdominal	conf	Confusion	ftg	Fatigue
abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrhythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
Asphy	Asphyxia	derm	Dermatitis	hemorr	Hemorrhage
aspir	Aspiration	diarr	Diarrhea	hyperpig	Hyperpigmentation
BP	Blood pressure	dist	Disturbance	hypox	Hypoxemia (reduced oxygen in the blood)
breath	Breathing	dizz	Dizziness	inco	Incoordination
bron	Bronchitis	drow	Drowsiness	incr	Increase(d)
broncopneu	Bronchopneumonia	dysfunc	Dysfunction	inebro	Inebriation
bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
		emphy	Emphysema	inj	Injury
		eosin	Eosinophilia	insom	Insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
GABRIEL MANUFACTURING CO., INC.

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurring behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal mucus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheral neuropathy	ST	Short-term exposure limit
mod	Moderate	periorb	Periorbital (situated around the eye)	subs	Substernal (occurring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocytes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneutis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbrnc	Tracheobronchitis

TABLE 1

**CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
GABRIEL MANUFACTURING CO., INC.**

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

During typical activities, surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the SE corner of the site.

MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

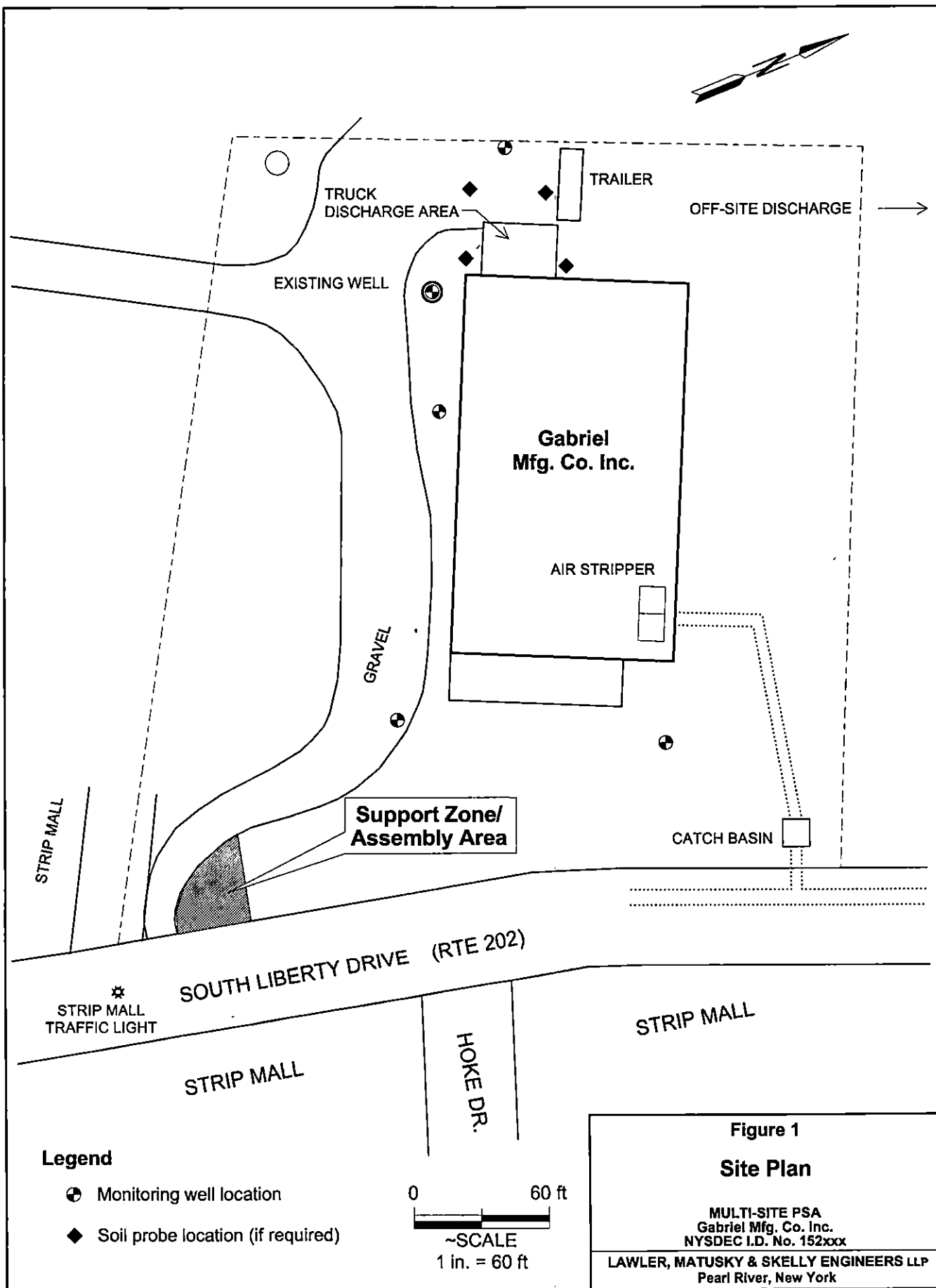
Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable



Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Rockland County Health Department at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
Nyack Hospital 160 North Midland Ave., Nyack, NY 10960	911 914-348-2000

See Figure 2.

Turn RIGHT onto ROUTE 9W (South Liberty Avenue) and travel about 5 miles to junction with ROUTE 303. Turn LEFT onto ROUTE 303. Go about 5.4 miles to 5th AVENUE and turn LEFT. Go 0.1 miles and turn RIGHT onto MIDLAND AVENUE. HOSPITAL will be on the RIGHT.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	800-336-6997
Rockland County Health Department	914-425-5525
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

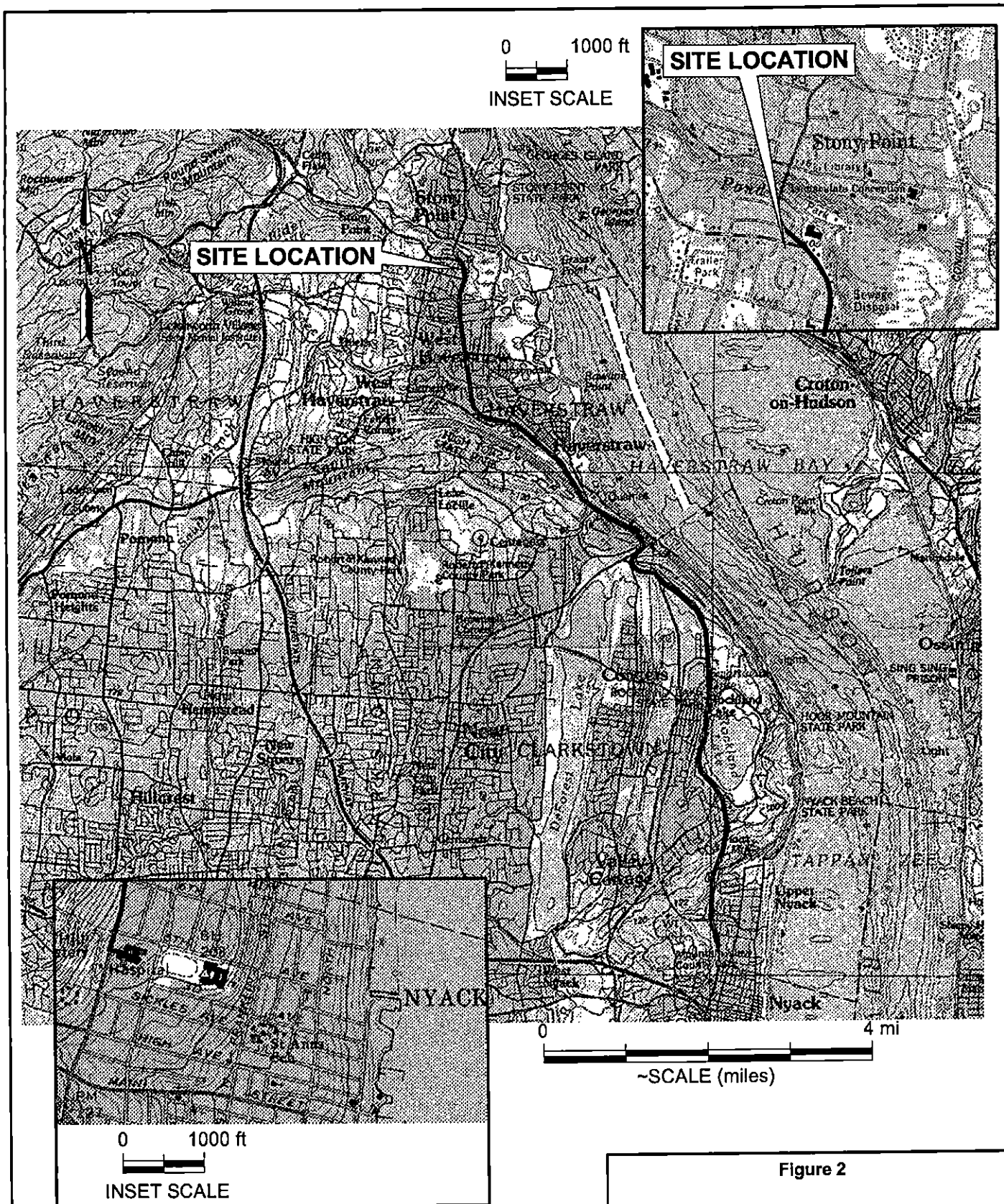
(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.



Map source:
USGS 7.5 minute quadrangle,
Haverstraw, NY, 1967, photorevised 1979, and
Nyack, NY-NJ, 1967, photorevised 1979.
Printed from Wildflower
Productions "TOPO!"

Figure 2

Route to Hospital

MULTI-SITE PSA
Gabriel Manufacturing
NYSDEC I.D. No. 152161

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
GABRIEL MANUFACTURING CO., INC.

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil/Well Installation	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.
2. Well Sampling	D	Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron and Nitrile Gloves in case of splash.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

TABLE 3
ACTION LEVELS
Gabriel Manufacturing Co., Inc.

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the Gabriel Manufacturing Co., Inc. site. I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

CAMAROTA CLEANERS

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Camaroda Cleaners **HASP Preparer:** Karen Wright

Address: 323 Park Avenue **City/State:** Mechanicville, NY 12118

Job No.: 650-714, 650-715, 650-716

APPROVALS

Project Manager: Michael Musso
Safety Officer: Karen A. Wright

PROJECT PERSONNEL:

On-Site Coordinator: Charles Mayers
On-Site Health and Safety Officer: Charles Mayers

Phone: (914) 735-8300

DATE OF PLAN PREPARATION: 24 April 1999

HAZARDOUS SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

VOCs identified as being contained in soil borings is tetrachloroethylene (PCE). PCE found at high levels in upgradient well indicates there may be another source.

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

The major route of exposure to potential contaminants will be respiratory. Inhalation of vapors would provide the mechanism for exposure. The program will use engineering controls and personnel protective equipment to reduce the amount of potential exposure. Air monitoring and personnel protection devices will serve to prevent exposure from chemicals. See Table 1.

Other Hazards: Site hazards include those that exist on all sites where heavy equipment, industrial, and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions. Drilling operations pose special dangers from overhead lines, buried equipment and utilities, and danger from tools and accessory equipment.

The drill rig presents a hazard with its moving parts and overhead equipment. All field personnel including drill rig operators must wear steel-toe workboots and hard hats. All persons unrelated to the project must remain outside the exclusion zone. If persons have business in the exclusion area other than the LMS investigation, they must remain at a safe distance away from the rig as determined by the site health and safety officer.

During typical activities, surfaces can be expected to become uneven and slippery, causing unsure footings and requiring additional care by personnel engaged in operations. Additional site hazards are

TABLE 1

**CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
CAMAROTA CLEANERS**

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG TEMP (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP.	TOXIC EFFECTS
Tetrachloroethylene	Perchloroethylene, Perchloroethylene, Perk, Tetrachloroethene	25 A3, BEI	Ca	100	Ca 150	NA	NA	NA	-	14	5.8	9.32	0.02%	4.7-50	yes	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som; skin eryt; liver damage; [carc]

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
CAMAROTA CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
()	Notice of intended change	BUN	Blood urea nitrogen	equi	Equilibrium
-	Unknown	C	Ceiling limit	eryt	Erythema (skin redness)
[carc]	Potential occupational carcinogen	Ca	Potential carcinogen	euph	Euphoria
A1	Confirmed human carcinogen	card	Cardiac	fail	Failure
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A3	Animal carcinogen	cirr	Cirrhosis	FEV	Forced expiratory volume
A4	Not classifiable as human carcinogen	CNS	Central nervous system	fib	Fibrosis
A5	not suspected as human carcinogen	conc	Concentration	fibr	Fibrillation
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abnor	Abnormal/Abnormalities	conj	Conjunctivitis	func	Function
ACGIHTLV	American Conferece of Governmental Industrial Hygienists Threshold Limit Value	constip	Constipation	GI	Gastrointestinal
album	Albuminuria	convuls	Convulsions	gidd	Giddiness
anes	Anesthesia	corn	Corneal	halu	Hallucinations
anor	Anorexia	CVS	Cardiovascular system	head	Headache
anos	Anosmia (loss of the sense of smell)	cyan	Cyanosis	hema	Hematuria (blood in urine)
appre	Apprehension	decr	Decreased	hemato	Hematopoietic
arry	Arrythmias	depres	Depressant/Depression	hemog	Hemoglobinuria
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bronspas	Bronchospasm	dysp	Dyspnea (breathing difficulty)	inflamm	Inflammation
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		eosin	Eosinophilia	insom	insomnia
		epilep	Epileptiform	irreg	Irregular/Irregularities
		epis	Epistaxis (nosebleed)	irrit	Irritation

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
CAMAROTA CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
irrity	Irritability	narco	Narcosis	prot	Proteinuria
jaun	Jaundice	nau	Nausea	pulm	Pulmonary
kera	Keratitis (inflammation of the cornea)	nec	Necrosis	RBC	Red blood cell
lac	Lacrimation (discharge of tears)	neph	Nephritis	repro	Reproductive
lass	Lassitude (weakness, exhaustion)	ner	Nervousness	resp	Respiratory
LEL	Lower Exposure Limit	NIOSHIDLH	National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health Concentrations	restless	Restlessness
leth	Lethargy (drowsiness or indifference)	NIOSHREL	National Institute for Occupational Safety and Health Recommended Exposure Limit	retster	Retrosternal (occurig behind the sternum)
leucyt	Leukocytosis (increased blood leukocytes)			rhin	Rhinorrhea (discharge of thin nasal musus)
leupen	Leukopenia (reduced blood leukocytes)	numb	Numbness	salv	Salivation
li-head	Lightheadedness	opac	Opacity	sens	Sensitization
liq	Liquid	OSHAPEL	Occupational Safety and Health Administration Permissible Exposure Limit	sez	Seizure
local	Localized			short	Shortness
low-wgt	Weight loss	palp	Palpitations	sneez	Sneezing
mal	Malaise (vague feeling of discomfort)	para	Paralysis	sol	Solid
malnut	Malnutrition	pares	Paresthesia	soln	Solution
methemo	Methemoglobinemia	perf	Perforation	som	Somnolence (sleepiness, unnatural drowsiness)
misc	Miscible	peri neur	Peripheal neuropathy	ST	Short-term exposure limit
mod	Moderate	periorb	Periorbital (siutated around the eye)	subs	Substernal (occurring beneath the sternum)
molt	Molten	phar	Pharyngeal	sweat	Sweating
monocy	Monocytosis (increased blood monocutes)	photo	Photophobia (abnormal visual intolerance to light)	sys	System
mppcf	Million particles per cubic foot	pneu	Pneumonia	tacar	Tachycardia
muc memb	Mucous membrane	pneuitis	Pneumonitis	tend	Tenderness
musc	Muscle	PNS	Peripheral nervous system	terato	Teratogenic
N.D.	Not yet determined	polyneur	Polyneuropathy	throb	Throbbing
				tight	Tightness
				trachbronc	Tracheogronchitis

TABLE 1
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE
CAMAROTA CLEANERS

Abbreviatio	Explanatio	Abbreviatio	Explanatio	Abbreviatio	Explanatio
twitch	Twitching				
UEL	Upper Exposure Limit				
uncon	Unconsciousness				
unk	Unknown				
vap	Vapor				
venfib	Ventricular fibrillation				
verti	Vertigo (an illusion of movement)				
vesic	Vesiculation				
vis dist	Visual disturbance				
vomit	Vomiting				
weak	Weakness				
wheez	Wheezing				

presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone. To the extent possible, the support and contaminant reduction zones will be established upwind of the exclusion zone. The areas will be defined and marked with traffic cones and/or safety tape prior to each days activities. See Figure 1.

Support Zone: The support zone will be located up-wind of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, representatives of regulatory agencies and observers. No particular training or personal protection devices are needed in the clean area.

Contaminant Reduction Zone: The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as necessary, needed in the exclusion zone. Also when exiting the restricted area, personnel will remove contaminated coveralls, boots, gloves, etc.

Exclusion Zone: The exclusion zone is in the immediate work area and that adjacent area defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources.

SITE ACCESS: (describe procedures to control site access)

The site is generally flat. All personnel will sign in each day in the log book maintained by the on-site health and safety officer. In the event of an emergency the project personnel and subcontractors should assemble at the predetermined assembly area.

The predetermined assembly area for this site or task is:

If a predetermined assembly area has not been assigned by the project manager or on-site health and safety officer the assembly area will be at the NW corner of the site (junction of Park Avenue and Second Avenue).

MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

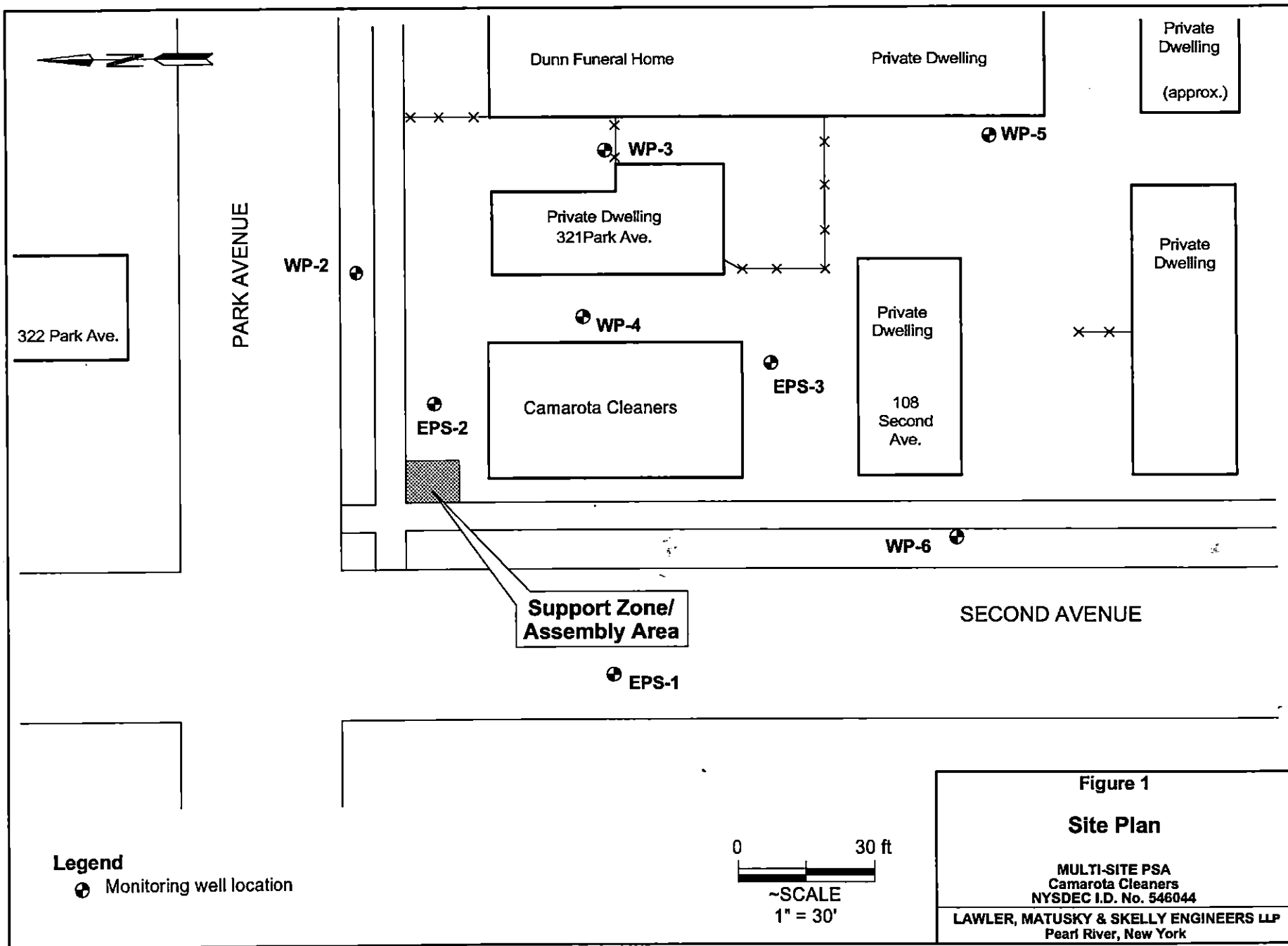
Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as, indicate the need for increased monitoring frequency at the edge of the exclusion zone. All air monitoring during boring installation will be conducted by LMS.

Site Work Zones:

An HNU PI-101 photoionization detector, or equivalent, which is calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern will be used.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Not Applicable



Personnel monitoring procedures:

Not Applicable

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Personnel protection equipment will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with water and Alconox followed by a DI rinse and air drying.

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

Any personnel protective equipment will be bagged and returned to the LMS laboratory for disposal or cleaning. All decontamination water and/or purge water will be released onto the ground in an unpaved area at the site.

EMERGENCY PROCEDURES

Preparatory meetings will be held to insure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

Skin Contact - Wash with soap and water.

Inhalation - Remove to fresh air, monitor for ABCs.

Ingestion - Call Poison Control Center and monitor ABCs.

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform First Aid, if required.
Contact local ambulance if professional help is needed.

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team, i.e. fire or police.

In event of potential or actual ionizing radiation exposure:

Not Applicable

In event of environmental accident (spread of contamination outside sites):

Stop spread of chemical as best as possible and notify LMS, NYSDEC and Saratoga County at first opportunity.

EMERGENCY SERVICES (complete here or have separate list available on-site)
Emergency Medical Facility (include map or written description of route to hospital)

<u>Location</u>	<u>Telephone</u>
Saratoga Hospital 211 Church St., Saratoga Springs, NY 12866	911 518-587-3222

See Figure 2.

Head WEST on PARK AVE., from Start Point (323 Park Ave, Mechanicville, NY). Go less than 0.1 mi and TURN RIGHT onto N 2ND AVE. Go 0.3 mi and TURN SHARPLY RIGHT onto VIALLE AVE. Go 0.3 mi and TURN LEFT onto SARATOGA AVE. [HWY 67 (WEST)]. Go 0.4 mi and BEAR RIGHT onto HWY 67 (WEST). Go 1.5 mi and FOLLOW HWY 67 (WEST) as it TURNS RIGHT. Go 4.2 mi and TURN RIGHT onto US 9 (NORTH). Go 9.5 mi to Saratoga Hospital & Nursing.

Ambulance Service	911
Fire Department	911
Police Department	911
Poison Control Center	800-336-6997
Saratoga County Emergency Services	518-885-2232
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges	800-424-8802
National Response Center (for all emergencies)	800-424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	800-457-7362
NYSDEC Project Manager Elaine Zuk	518-457-0639
LMS Physician Dr. Frank Franklin	201-767-8400

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)
Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

Not Applicable.

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Underground utilities must be identified prior to commencement of drilling. Blowers may be employed to reduce and disperse any releases of toxic gases.

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

See Table 2 for action levels. See Table 3 for levels of personal protective equipment.

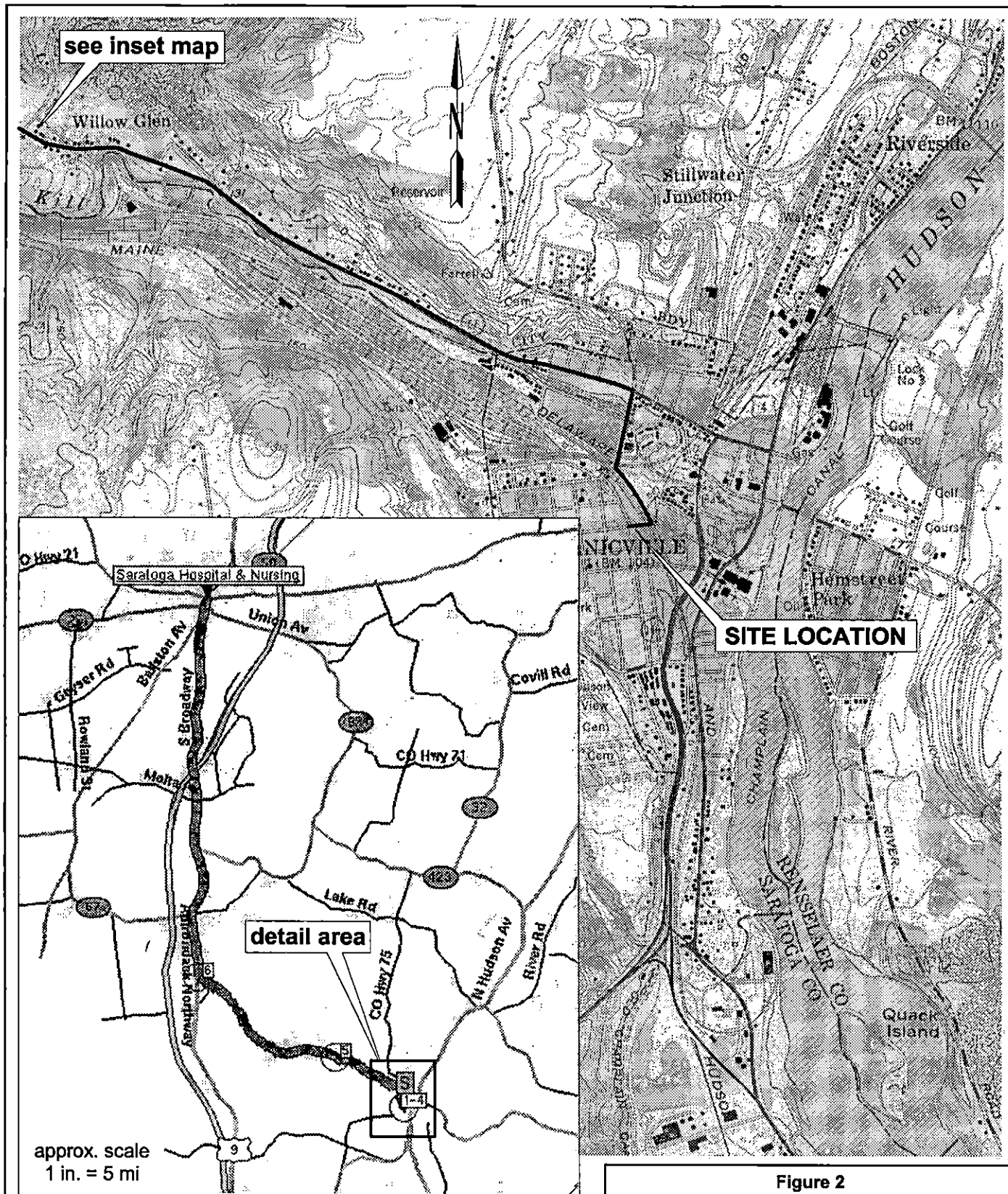


Figure 2

Route to Hospital

MULTI-SITE PSA
Camarota Cleaners
NYSDEC I.D. No. 546044

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Map source: USGS 7.5 minute quadrangle,
Mechanicville, NY, 1954, photorevised 1980.
Inset map printed from
<http://MapsOnUs.switchboard.com>

0 1000 ft
SCALE

TABLE 2
TASK SPECIFIC LEVELS OF PROTECTION
CAMAROTA CLEANERS

TASK	LEVEL OF PROTECTION	DESCRIPTION
Subsurface Soil Sampling	D	Hard Hat, Safety Glasses, Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron, Overboot, and Nitrile Gloves in case of contact with contaminated material.
2. Well Sampling	D	Safety Shoes, and Latex Gloves. Upgrade to coated Tyvek or coated Tyvek apron and Nitrile Gloves in case of splash.

If HNU or OVA reading in breathing zone is greater than > 5 ppm above background, must upgrade to Level C respiratory protection (organic vapor cartridge and HEPA filter). If readings exceed 25 ppm in the breathing zone, stop work and call LMS.

**TABLE 3
ACTION LEVELS
Camarota Cleaners**

Instrument	Hazard Monitored	Level	Action Required
HNU PID or OVA FID	Organic Vapors	Continuously 5 units or > above background for 5 min. in breathing	Stop work. Evacuate exclusion zone and initiate engineering controls. If levels remain, upgrade from modified Level D to Level C or move to Support Zone.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard. Withdraw from the area immediately until LEL <10%.

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

See Figure 1.

TRAINING

(Provide description of minimum training, reference OSHA Sections).

29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3. One person onsite will have standard Red Cross first aid training and adult CPR.

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____
(company name) have read the Health and Safety Plan (HASP) for the Camarota Cleaners site.
I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the
requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated
procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

STANDARD OPERATING PROCEDURES MANUAL

FOR

HEALTH AND SAFETY

STANDARD OPERATING PROCEDURES MANUAL
FOR
HEALTH AND SAFETY

October 1986

(Revised July 1987)
(Revised May 1989)
(Revised August 1989)
(Revised March 1990)
(Revised May 1994)
(Revised May 1997)

by

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Environmental Science & Engineering Consultants
One Blue Hill Plaza
Pearl River, New York 10965

APPROVED BY:

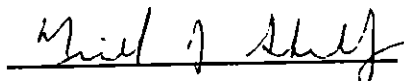

Michael J. Skelly, Ph.D., P.E.
Partner

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CHAPTER 1

INTRODUCTION

Lawler, Matusky & Skelly Engineers LLP (LMS) has company-wide policies and procedures to ensure safe work practices. In addition, there are specific procedures relating to work at sites where there may be risk of exposure to chemicals or hazardous wastes due to the nature of the project. The overall health and safety program at LMS includes the activities of in-house staff who monitor and control health and safety policies and procedures, employee physicals to monitor employee health and detect any adverse reactions or toxicity associated with hazardous work, and site-specific precautions and procedures designed to protect employees during field assignments. This document summarizes all three elements of the company's program. The document has been prepared so that it fulfills the requirements of 29 CFR Part 1910.120 (Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response - Final Rule published 6 March 1989, effective date 6 March 1990). This amendment to Subpart H of 29 CFR Part 1910 was mandated by Section 126 of the Superfund Amendments and Reauthorization Act of 1986 (SARA) (PL 99-499). Sections of 29 CFR 1910.1200 on Hazard Communications applicable to hazardous waste work were adhered to. The NIOSH/OSHA/USCG/EPA report "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" has been used as a guideline in preparing LMS' Health and Safety Plan (HASP).

1.1 SITE CHARACTERIZATION

The first step in formulating any HASP involves characterization of the site in terms of its hazards. These potential hazards include, but are not limited to, the following:

- Chemical exposure - through inhalation, skin absorption, ingestion, or puncture wounds; exposure can be acute or chronic
- Explosion and fire - caused by chemical reactions, ignition, or agitation and sudden release of materials under pressure
- Oxygen deficiency - low oxygen (<16%) causes impaired attention, judgment, and coordination, and increased breathing and heart rate
- Ionizing radiation - three types of radiation are of concern: alpha, beta, and gamma

- Biological hazards - caused by disease-causing organisms found in, or waste from, hospital and research facilities, or contact with poisonous plants, insects, animals, and indigenous pathogens
- Normal safety hazards - holes or ditches, precariously positioned objects, sharp objects, slippery surfaces, steep grades, uneven terrain, and unstable surfaces
- Electrical hazards - overhead power lines, downed electrical wires, and buried cables pose danger of shock or electrocution
- Heat stress - caused by working in hot weather and wearing protective clothing that does not dissipate body heat and moisture effectively
- Cold exposure - working in cold weather can cause hypothermia and/or frostbite
- Noise - excessive noise caused by machinery may startle workers, be annoying or distracting, cause physical damage to the ear, and interfere with communication

To characterize any site, the type and quantity of hazard must be determined. Previous investigations of the site and available maps are reviewed. Previous investigators, government agencies, and/or previous or current owners/operators of the site are all potential sources of information, which can include hazardous waste uses and disposal operations; types and quantities of hazardous waste; cleanup or remediation measures undertaken; sampling results on groundwater, surface water, air, soil, sediment, etc.; and any drums or other hazardous waste containers used or disposed of on-site.

This information is reviewed before entry onto the site and a preliminary health and safety plan is developed. A preliminary plan generally consists of the wearing of safety shoes, hard hat, and safety glasses on the site, the use of an air monitoring device to monitor the air, and access to a respirator if needed. If the hazards are largely unknown, a reconnaissance of the perimeter of the site can be made to determine off-site conditions and to identify possible conditions that may be immediately dangerous to life and health (IDLH). As a general rule, LMS does not act as an emergency responder.

Visible indicators of possible IDLH conditions are:

- Enclosed spaces or large containers or tanks that must be entered (confined spaces)
- Potentially explosive or flammable situations indicated by bulging drums, effervescence, gas generation, or instrument readings

- The presence of extremely hazardous materials indicated by labels or other information
- Vapor clouds and evidence of dead animals or plants

The preliminary site reconnaissance can be used to evaluate air quality, collect off-site samples, and visually observe any unusual conditions. Air quality can be evaluated by several methods, including the use of portable air monitoring equipment such as radiation dosimeters, photo-ionization detectors (PIDs), flame ionization detectors (FIDs), combustible gas indicators (CGIs), instrumental GC/MS sample collection, and indicator tubes. Data previously collected and any data obtained as a result of the perimeter survey or on-site survey can be used to help determine health and safety procedures and personnel protection equipment (PPE) needs for the field work.

Where no background data are available or there is cause to suspect that data do not correctly reflect site hazards, initial reconnaissance surveys of suspected hazardous waste sites should be done under Level B personnel protection (see Section 2.4). Otherwise, the needs for personnel protection can be determined by examination of existing information. At the very least, each worker shall have the equipment available described previously (hard hat, safety shoes, safety glasses, air monitoring equipment, and respirator). If the situation dictates, each worker shall also have available a 5-min escape self-contained breathing apparatus (SCBA).

On-site reconnaissance is generally performed before the initiation of fieldwork to locate sampling points and to further assess site hazards. This information is used to develop the field sampling plan (FSP) and site-specific HASP. Depending upon the site, activities during the site reconnaissance may include:

- Monitoring for possible chemical exposures, oxygen deficiencies, and explosive atmospheres
- Monitoring for ionizing radiation
- Visual observation of other hazardous conditions
 - types of containers, impoundments, or other storage systems
 - condition of waste container and storage systems
 - physical condition of materials
 - natural wind barriers
 - potential pathways of dispersion
 - indicators of potential exposure to hazardous substances, such as dead plants and animals, pools of liquid
 - safety hazards

HAZARDOUS SUBSTANCE DATA SHEET

NAME OF SUBSTANCE: _____

COMMON: _____

CHEMICAL: _____

I. PHYSICAL/CHEMICAL PROPERTIES**SOURCE**

Normal Physical State: _____	Gas _____	Liquid _____	Solid _____
Molecular Weight _____			g/ml _____
Density _____			°F/°C _____
Specific gravity _____	@		°F/°C _____
Solubility: Water (ppm) _____	@		°F/°C _____
Solubility: _____	@		°F/°C _____
Boiling Point _____			°F/°C _____
Melting Point _____			°F/°C _____
Vapor Pressure (mmHg) _____	@		°F/°C _____
Vapor Density _____	@		°F/°C _____
Flash Point OC/CC _____			°F/°C _____
Other: _____			_____

II. HAZARDOUS CHARACTERISTICS**A. TOXICOLOGICAL HAZARD****HAZARD****CONCENTRATIONS****SOURCE**

Inhalation	Yes	No	_____	_____
Ingestion	Yes	No	_____	_____
Skin/Eye Absorption	Yes	No	_____	_____
Skin/Eye Contact	Yes	No	_____	_____
Carcinogenic	Yes	No	_____	_____
Teratogenic	Yes	No	_____	_____
Mutagenic	Yes	No	_____	_____
Aquatic	Yes	No	_____	_____
Other: _____	Yes	No	_____	_____

B. FIRE HAZARD**HAZARD****CONCENTRATIONS****SOURCE**

Combustibility	Yes	No	_____	_____
Toxic Byproducts:	Yes	No	_____	_____
Other: _____	Yes	No	_____	_____
	Yes	No	_____	_____
Flammable/Explosive	Yes	No	_____	_____
LFL/LEL			_____	_____
UFL/UEL			_____	_____

C. REACTIVITY HAZARD**HAZARD****CONCENTRATIONS****SOURCE**

Water	Yes	No	_____	_____
Other: _____	Yes	No	_____	_____

HAZARDOUS SUBSTANCE DATA SHEET

D. CORROSIVE HAZARD	HAZARD	pH	SOURCE
Acid	Yes No	_____	_____
Base	Yes No	_____	_____
Neutralizing agent:	Yes No	_____	_____

E. RADIOACTIVE HAZARD	HAZARD	EXPOSURE RATE	SOURCE
Background	Yes No	_____	_____
Alpha Particles	Yes No	_____	_____
Beta Particles	Yes No	_____	_____
Gamma Radiation	Yes No	_____	_____

III. INCIDENT RELATED:

Quantity Involved _____

Release Information _____

Monitoring/Sampling Recommended _____

IV. RECOMMENDED PROTECTION:

Public _____

Environment _____

Worker _____

V. RECOMMENDED SITE CONTROL:

Exclusion Zone _____

Contamination Reduction Zone _____

Support Zone _____

Lyme disease. To avoid contact with ticks all personnel should wear Tyvek taped to overboots, gloves, and a hat. Insect repellent specially designed for ticks should also be utilized. After fieldwork is completed each person should examine himself or herself for ticks and remove. Other biological hazards such as snakes, mosquitos, and poisonous plants can be controlled effectively by careful site observations.

CHAPTER 2

SITE HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 SITE CONTROL

2.1.1 Site Security

Depending on the location and current use of a particular site, access may be limited to further reduce the potential for contaminant transport. Access and site control may include the following restrictions:

- Unnecessary personnel should be excluded from the general areas.
- The number of people and amount of equipment on-site should be kept to a minimum.
- Work zones should be well managed to control access of people and equipment.

Site security can be maintained by:

- Erection of a fence or locked gate.
- Establishing a system (such as sign-in sheets) to keep track of individuals on-site.
- Posting warning signs around perimeter of site.
- Employing a security guard service.
- Enlisting help of local enforcement agencies.
- Locking equipment in a trailer, shed, or other storage facility.

2.1.2 Site Work Zones

Work zones are developed and mapped as part of the characterization and hazard assessment of any site. Typical zones that may be established, depending on health and safety hazards, include:

- **Exclusion Zone** - The area where contamination occurs or could occur. Most of the field sampling is conducted in this zone. The outside boundary of the Exclusion Zone, called the Hotline, is established by the criteria outlined in Table 2-1. This Hotline should be clearly marked by lines, placards, hazard tape and/or signs, or a physical barrier. Access control points should be established at the periphery of the Exclusion Zone to regulate flow of personnel and equipment into and out of the zone. The buddy system should be used by anyone who enters the Exclusion Zone, and a communication system should be developed for all work done within the Exclusion Zone.

TABLE 2-1
ESTABLISHING THE HOTLINE

-
- Visually survey the immediate site environs.
 - Determine the locations of:
 - hazardous substances
 - drainage, leachate, and spilled material
 - visible discolorations
 - Evaluate data from the initial site survey indicating the presence of:
 - combustible gases
 - organic and inorganic gases, particulates, or vapors
 - ionizing radiation
 - Evaluate the results of soil and water sampling.
 - Consider the distances needed to prevent an explosion or fire from affecting personnel outside the Exclusion Zone.
 - Consider the distances that personnel must travel to and from the Exclusion Zone.
 - Consider the physical area necessary for site operations.
 - Consider meteorological conditions and the potential for contaminants to be blown from the area.
 - Secure or mark the Hotline.
 - Modify its location, if necessary, as more information becomes available.
-

- **Contamination Reduction Zone (CRZ)** - The transition area between the contaminated area and the clean area, designed to reduce the probability that the clean Support Zone will be contaminated or affected by other site hazards. Decontamination procedures take place in a designated area within the CRZ called the Contamination Reduction Corridor. The boundary between the CRZ and Support Zone, called the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone.
- **Support Zone** - Located outside the CRZ, this zone includes the location of support facilities, such as a trailer or storage shed. Support facilities should be located upwind of the Exclusion Zone if possible. This zone is a nonrestrictive work zone within which normal work clothes can be worn.

Figure 2-1 is a schematic of the site work zones. The level of protection needed for the Exclusion Zone and/or CRZ at any site is established during the reconnaissance and hazard assessment phases of the work.

2.2 ON-SITE HEALTH AND SAFETY OFFICER

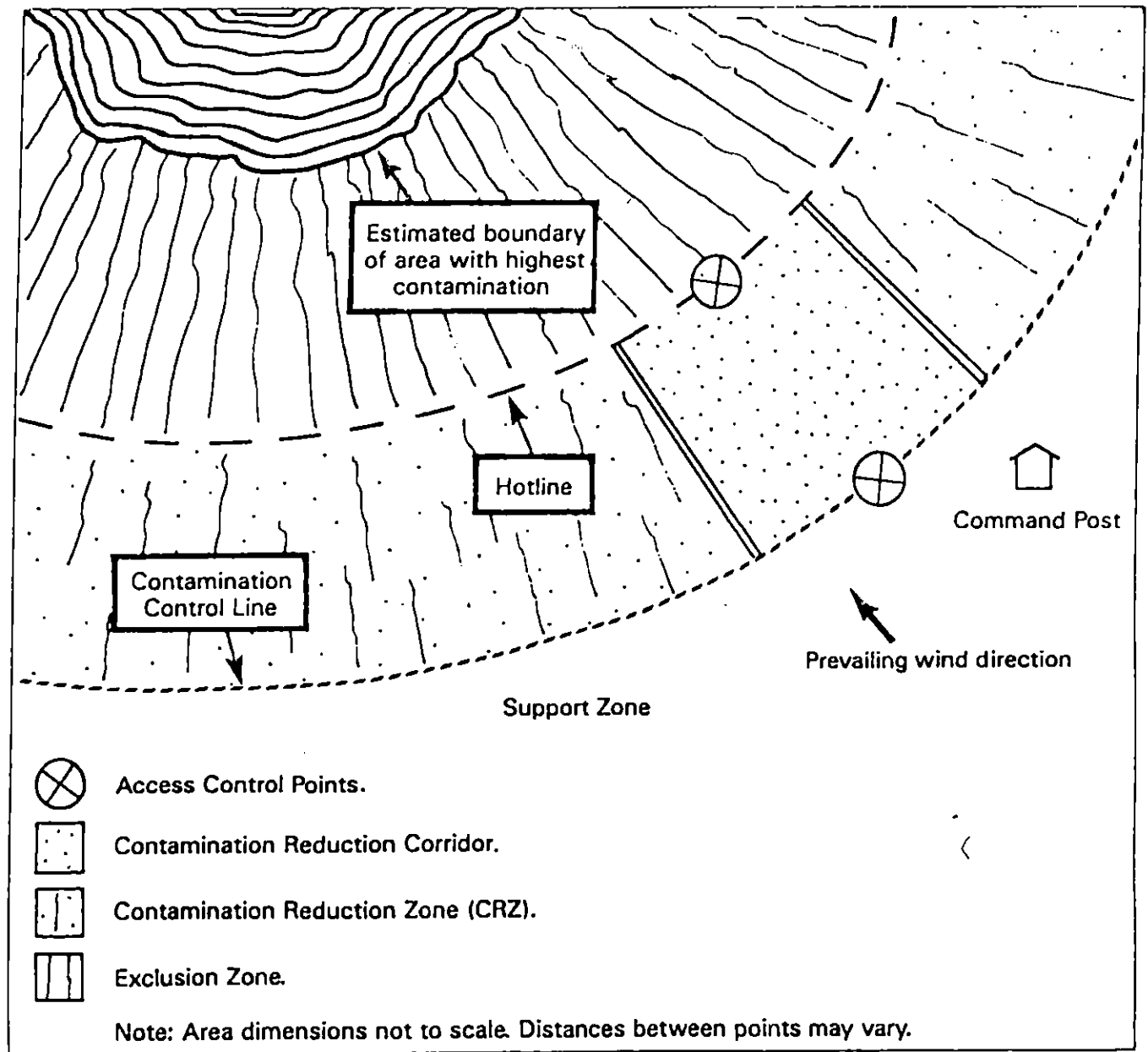
The on-site Health and Safety Officer (HSO) determines safety procedures and levels of personnel protection necessary for each activity performed at a site. The on-site HSO is designated by the LMS project manager for each site, and has the qualifications listed below:

1. At least 8 hrs of Red Cross (or equivalent) training in first aid and cardiopulmonary resuscitation (CPR) training (if he/she does not have the above, someone else on site will have it).
2. At least 40 hrs of training or the equivalent and 3 days of actual field experience in hazardous waste work. Of the 40 hrs, at least 2 hrs of SCBA training will be required and, at minimum, equivalent working use of Level B and Level C equipment.
3. A knowledge of site hazards (physical and chemical dangers of materials previously found on site).
4. Familiarity with the contents and objectives of the site-specific HASP.
5. A working knowledge of the capabilities and limitations of the air monitoring equipment.
6. Familiarity with the methods used in the performance of each work activity at the site and support areas (necessary to provide a perspective on safety-related implications associated with the work).

FIGURE 2 - 1

SITE WORK ZONES

(Note that decontamination facilities are located in the Contamination Reduction Zone.)



7. Medical surveillance requirements, including the recognition of symptoms and signs that might indicate overexposure to hazards.

2.2.1 Responsibilities and Duties

The HSO has the following responsibilities:

1. Establish, on a daily (or immediate) basis, levels of personnel protection for each work activity that are necessary to fulfill the requirements of the work plan. Levels of protection will be established on the basis of daily or more frequent air monitoring results or the specific provisions of the work plan, whichever provides the highest safety factor. The site specific HASP will have generalized levels of protection preestablished for each task and action guidelines to upgrade or downgrade levels of protection. The HSO will have the authority to change the generalized levels of protection based on daily air monitoring readings.
2. Assure that the established safety guidelines are implemented.
3. Assure that air monitoring and safety equipment is in proper working order.
4. Assure that personnel are using the safety equipment properly.
5. Assure that decontamination procedures are carried out effectively.
6. Hold preentry briefings and any additional meetings regarding health and safety.
7. Conduct safety and health inspections to ascertain that the HASP is being followed.

It is within the authority of the HSO to refuse individuals access to the site, eject personnel from the site, or cease operations because of noncompliance with the objectives and guidelines established herein or contamination levels beyond the scope of personnel preparedness.

2.2.2 Additional Training in Management of Hazardous Waste Operations

In addition to the above, the on-site HSO will have 8 hrs of training in managing hazardous waste operations. All personnel supervising one or more people will also have 8 hrs of supervisory training. The requirement is not dependent on levels of protection needed on the site.

2.3 AIR MONITORING

On-site air monitoring is necessary to identify and quantify the levels of contaminants found at a site. These measurements are used to:

- Select PPE
- Delineate areas where protection is needed
- Assess potential health effects
- Determine need for specific medical monitoring

Previous chemical observations may not necessarily reflect levels of contamination present at the site under constantly changing environmental conditions, such as wind velocity and direction, atmospheric pressure, or precipitation. Sole reliance on previous air monitoring is thus unacceptable in establishing safety guidelines. When possible, conditions in the working environment should be reassessed constantly to provide adequate levels of personnel protection. The use of selected air monitoring equipment throughout on-site operations will provide information from which levels of protection can be established. The types of air monitoring equipment generally used by LMS are described in Table 2-2.

If site conditions warrant, additional instruments (e.g., OVA with GC mode) are available to measure particulates or to identify and quantify organic compounds. If necessary, quantitative air samples can also be collected in the field and analyzed in the laboratory. The volatile air fraction is collected on sorbent tubes, usually Tenax or charcoal, and the nonvolatile air fraction is collected either on filters or tubes. Personnel can also be monitored with the use of personal sampling equipment carried by each worker. Direct-reading colorimeter tubes, available for a wide variety of chemicals, can measure the presence and concentrations of certain gases and vapors where site conditions warrant. For most sites the HNU PID, OVA FID, and combustible gas indicator (CGI) are the primary instruments used for air monitoring.

The HNU PID detects concentrations of organic gases as well as a few inorganic gases based on ionization potential. In a PID gas molecules are subject to ultraviolet (UV) radiation, which ionizes many gaseous compounds. Each molecule is transformed into charged ion pairs, creating a current between two electrodes. Every molecule has a characteristic ionization potential (IP), which is the energy required to remove an electron from the molecule, yielding a positively charged ion and the free electron. The primary use of the PID is as a quantitative instrument, but it can be used to detect specific contaminants while masking, i.e., not detecting, other compounds such as methane. This ability is dependent on the UV lamp utilized. The manufacturer's manual should be consulted before use to determine whether a site-specific compound in question can be detected by that lamp. Appendix A contains information on the

TABLE 2-2.

AIR MONITORING EQUIPMENT

INSTRUMENT	MANUFACTURER	MODEL No.	CALIBRATION PROCEDURE	HAZARDOUS MATERIAL	COMMENTS
1. Portable Photoionization Analyzer (PID)	HNU System, Inc.	PI 101	Calibrate with each use	Many organic and some inorganic gases and vapors	10.2 eV lamp
	HNU System, Inc.	HW 101	Calibrate with each use	Many organic and some inorganic gases and vapors	10.2 eV lamp
2. Flame Ionization Detector (FID)	Foxboro	Century OVA-128	Calibrate with each use	Many organic and some inorganic gases and vapors	survey mode only
3. Combustible Gas Indicator (CGI)	Gas Tech	GX-3	Calibrate with each use	Combustible gases and vapors	-
4. Oxygen Meter	Gas Tech	GX-3	Calibrate with each use	Oxygen concentration	-
5. Combustible Gas Indicator (CGI)	Neotronics	Exotox 40	Calibrate with each use	Combustible gases and vapors	-
	Neotronics	Exotox 60	Calibrate with each use	Combustible gases and vapors	-
6. Oxygen meter	Neotronics	Exotox 40	Calibrate with each use	Oxygen concentration	-
	Neotronics	Exotox 60	Calibrate with each use	Oxygen concentration	-
7. Hydrogen Sulfide Meter	Neotronics	Exotox 40	Calibrate with each use	Hydrogen sulfide concentration	-
	Neotronics	Exotox 60	Calibrate with each use	Hydrogen sulfide concentration	-
8. Carbon Monoxide	Neotronics	Exotox 60	Calibrate with each use	Carbon monoxide concentration	-
9. Radiation Detector	Dosimeter	3700	Manufac. Calb.	Radiation	-
10. Haz-mat kit Colorimetric Tube	National Draeger	4054208	-	Detection of gases & vapors	-
11. Aerosol/Particulate Monitor	MIE	MiniRam PDM-3	Manuf. calib. check zero	Real time aerosol monitor	
	MIE	RAM-1	Check zero calib. before use	Real time aerosol monitor	
	MIE	DATA RAM	Check zero calib. before use	Real time aerosol monitor	

best lamps to use with the HNU PID for various compounds, the ionizing potential for some compounds, and scan potentiometer readings for some compounds. The latter is used when calibration to a specific compound is desired. Other PIDs are available, including the Photovac Tip.

At sites where methane may be found in high concentrations, the HNU PID is the instrument of choice to measure organic gases as it will not record methane; high levels of methane can mask the presence of other volatile organics. An explosimeter can be used to measure methane if there is a possibility of explosion. On the other hand, an OVA FID can detect many more organic species than the HNU PID and may be preferable in atmospheres contaminated with organic species (particularly unsaturated, paraffinic, and ammonia hydrocarbons). The OVA FID also has a methane filter that filters out all organics but methane.

In situations where high, potentially explosive levels of methane may occur, such as during intrusive investigations at a landfill (e.g., drilling), increased surveillance with air monitoring equipment, particularly an explosimeter, may be necessary. The specific air monitoring procedures, appropriate instrumentation, and levels of personnel protection to be used in these circumstances are detailed on a site-by-site basis.

The frequency, location, and type of air monitoring must be determined for each site. Site air monitoring should be done at least once daily before work begins to ascertain whether conditions have changed since the development of the HASP or since the previous work day's measurements. Each sampling location should be monitored before and during sampling to determine whether any changes in protection levels are needed. Any significant changes in the operation or type of contaminant being handled will indicate a need for additional or more frequent air monitoring.

Detector tubes may also be used to identify and isolate specific compounds in the air. A hand pump is used to draw air into the tube. A colorimetric indicator in the tube determines the approximate concentration of the compound. These tubes are particularly important to identify specific constituents when the nature of hazardous wastes on the site is largely unknown.

Depending on the situation, workers at a high risk of exposure, i.e., those in the Exclusion Zone, may be equipped with personal air monitors. Depending on the personnel protection selected, these monitors should be located outside the respirator or near the mouth. Collection of a sample over an 8-hr period enables comparison to ACGIH TWA-TLV values.

2.4 PERSONNEL PROTECTIVE EQUIPMENT

The appropriate level of protection required by workers on-site will be determined from information gathered from the background data review and observations made during the initial site reconnaissance. The various levels of protection are designed to protect workers at the site against external and internal body exposure to hazardous materials. The levels of protection range from Level A, the highest, to Level D, the minimum. These levels are described in Appendix B of the final OSHA regulations on Hazardous Waste Operations and Emergency Response, 29 CFR 1910.120. Personnel protection equipment appropriate for a site may overlap two or more general protective categories, e.g., a site may require Level D respiratory protection but Level C dermal protection. Table 2-3 lists the personnel protection equipment available for use by LMS employees. (Appendix B contains respirator approval documents.)

2.4.1 Level A Protection

Level A protection should be worn when a high level of respiratory, skin, eye, and mucous membrane protection is needed. It should also be used when skin contact with the hazardous substance may result in an IDLH situation. Readings on a PID or FID instrument 500 to 1000 ppm above background may indicate a need for Level A. Some or all of the following types of equipment are appropriate for Level A (in accordance with 29 CFR Part 1910.120):

- Positive-pressure (pressure-demand), full-faced, self-contained breathing apparatus, or pressure-demand supplied-air respirator with escape SCBA, approved by NIOSH
- Fully encapsulating chemical-resistant suit capable of maintaining positive pressure and preventing inward test gas leakage of more than 0.5%
- Inner, chemical-resistant gloves
- Outer, chemical-resistant gloves
- Chemical-resistant boots, with steel toe and shank depending on suit boot construction, worn over or under suit boot
- Cotton long-john type underwear (optional)
- Hard hat (under suit) (optional)
- Coveralls (under suit) (optional)
- Disposable protective suit, gloves and boot covers

TABLE 2-3 (Page 1 of 2)

PERSONNEL PROTECTIVE EQUIPMENT

BODY PART PROTECTED	EQUIPMENT	TYPE OF CLOTHING OR ACCESSORY	MANUFACTURER	PART No.		MSHA/MOSM APPROVAL No.	OSHA STANDARDS		MAINTENANCE	
				MASK	CARTRIDGE		REGULATION	SOURCE	PART	REGULATION
Respiratory	Respirator with cartridges	Ultra-Twin mask with GMC-H cartridges	MSA	471286	464027	TC-23C-153	29CFR1910.134	ANSI 2288.2 - 1969 Standard Practice for Respiratory Protection	Mask	CFR1910.134 (F)
		Ultra-Twin mask with GMA-H cartridges	MSA	471286	464024	TC-23C-155	29CFR1910.134		Cartridges	Replace if excessive breathing resistance upon inhalation or odor, taste, or irritation is noted
		Comfo II half mask with GMC-H cartridges	MSA	466486	464027	TC-23C-159	29CFR1910.134			
		Comfo II half mask with GMC-H cartridges	MSA	466486	464024	TC-23C-161	29CFR1910.134			
		Comfo II half mask with GMA-H cartridges	North	76008A	N7500-83 (7683)	TC-23C-210				
			American Optical	50358-0000	101388	TC-23C-417				
Full Body	Protective clothing	Tyvek coverall - uncoated Tyvek coverall - poly-ethylene coated Tyvek Apron - poly-ethylene coated Tyvek coverall - Saranax coated	Charkate	6001H 8001H 8201 HEW		Not applicable	29CFR1910.132	41CFR Part 50-204.7 General Requirement for Personnel Protective Equipment	Coverall	Replace when torn or chemical permeation is noted
Head	Hard hat	Safety hard hat	Willson		82AC-Blue		29CFR1910.135	ANSI 289.1-1969 Safety Requirements for Industrial Head Protection	Hard hat	ANSI 289.1 - 1969

TABLE 2-3 (Page 2 of 2)

PERSONNEL PROTECTIVE EQUIPMENT

BODY PART PROTECTED	EQUIPMENT	TYPE OF CLOTHING OR ACCESSORY	MANUFACTURER	PART No.		MSHA/MOSM APPROVAL No.	OSHA STANDARDS		MAINTENANCE	
				MASK	CARTRIDGE		REGULATION	SOURCE	PART	REGULATION
Respiratory	Respirator with cartridges	Ultra-Twin mask with GMC-H cartridges	MSA	471286	464027	TC-23C-153	29CFR1910.134	ANSI 2288.2 - 1969 Standard Practice for Respiratory Protection	Mask	CFR1910.134 (F)
Eyes/Face	Face shield	Clear propionate visor	Willson		M86 Clear		29CFR1910.133 (a)	ANSI 287.1-1968 Eye and Face Protection	Shield	CFR1910.133 (a 2vii)
	Safety glasses	Clear Spectra safety glasses	Willson		11130031	Goggles				
	Safety goggles	Encon chemical splash and impact goggles	Midland		01-4002-67					
Hands	Gloves	Flexam latex disposable	Pharmaseal		8852		29CFR1910.132	41CFR Part 50.204.7 General Requirement for Personnel Protective Equipment	Gloves	Dispose of when torn or chemical permeation has occurred
		Sol-vex nitrile	Edmont		37-155					
		Scorpio neoprene	Edmont		8-352					
		N-Dex Nitrile disposable	Best		7005					
		Silver Shield	North		SS104					
Foot	Safety boots	Leather boot with steel toe and shank	Knapp		K 586, K 588, K 365		29CFR1910.136	ANSI 241.1 - 1967 Men's	Safety boot	Wash after each field use
		Latex Disp. Booties	La Crosse							
		Super-tuff pullover rubber boot	Rainfair		2400-9070					
		Winter Steel Toes Poly disposable poly-ethylene booties	Edmont		35-350			Safety Toe Footwear	Boot liner	Dispose of after use

2.4.2 Level B Protection

Level B protection should be selected when the highest level of respiratory protection is needed, but a lower level of skin and eye protection are required. Level B protection is the minimum level recommended for initial site entries when hazards have not been positively identified and defined by monitoring, sampling, and other reliable methods of analysis. It should be used in IDLH conditions and may need to be used in cases when instrument readings (PID and FID) are 5-500 ppm above background. Some or all of the following types of equipment are appropriate for Level B (in accordance with 29 CFR Part 1910.120):

- Positive-pressure (pressure-demand) full-face, self-contained breathing apparatus or pressure-demand supplied-air respirator with escape SCBA (NIOSH-approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket, hooded two-piece chemical-resistant splash suit, disposable chemical-resistant coveralls)
- Coveralls, under splash suit (optional)
- Outer, chemical-resistant gloves
- Inner, chemical-resistant gloves
- Outer, chemical-resistant boots with steel toe and shank
- Disposable, chemical-resistant outer boot covers (optional)
- Hard hat (optional)
- Face shield (optional)

2.4.3 Level C Protection

Level C protection should be selected when the type and approximate concentrations of airborne substances are known, the criteria for using air-purifying respirators have been met, and skin and eye exposure is likely. The air must be monitored periodically. Instrument readings (PID and FID) 0.5-5 ppm above background may indicate a need for Level C. Some or all of the following types of equipment are appropriate for Level C (in accordance with 29 CFR Part 1910.120):

- Full-face or half-mask air-purifying canister-equipped respirator (NIOSH-approved)

- Hooded chemical-resistant clothing (one-piece coverall, hooded two-piece chemical splash suit; disposable chemical-resistant coveralls)
- Outer, chemical-resistant gloves
- Inner, chemical-resistant gloves
- Steel toe and shank, chemical-resistant boots (optional)
- Disposable, chemical-resistant outer boot covers (optional)
- Cloth coveralls (inside chemical-protective clothing) (optional)
- Hard hat (optional)
- Escape mask (optional)
- Coveralls (optional)
- Face shield (optional)

2.4.4 Level D Protection

Some or all of the following types of equipment are appropriate for Level D (in accordance with 29 CFR Part 1910.120):

- Coveralls or work clothing
- Gloves (optional)
- Boots, shoes, chemical-resistant steel toe and shank
- Disposable, chemical resistant outerboot covers (optional)
- Safety glasses or chemical splash goggles (optional)
- Hard hat (optional)
- Escape mask (optional)
- Face shield (optional)

All LMS employees entering a hazardous waste site must use, as a minimum, the following safety equipment:

- Hard hat (if danger from overhead hazard exists)
- Safety shoes
- Safety glasses or goggles (if danger from splash or other eye hazard exists)

2.4.5 Determination of Level of Protection

The level of protection to be used is based on an analysis of the analytical data compared to the TLV, PEL, REL, and IDLH concentrations. The concentrations can be identified by direct reading instruments, including detector tubes. Other information used to evaluate the level of protection include LEL, UEL, relative breakthrough time of respirator, odor threshold, and whether a cartridge is available to filter the appropriate compound. Use of a respirator is indicated if the chemical has an adequate warning property (such as an odor) to indicate breakthrough and can be filtered out by the appropriate cartridge. Table 2-4 lists common chemicals with their TLV, breakthrough value, odor threshold, maximum use concentration (MUC), and IDLH value. NIOSH recommendations for respirator usage are found in the NIOSH Pocket Guide to Chemical Hazards. Full-face respirators have a protection factor (PF) of 50, half-face respirators, 10, and SCBA pressure-demand apparatus, 10,000+. The PF multiplied by the TLV gives the MUC for a respirator or the MUC is the IDLH (whichever is lower). Appendix C contains the OSHA PELs (29 CFR Part 1910.1000) and the NIOSH RELs. The lowest TLV (ACGIH, PEL or REL) should be used when evaluating levels of protection.

In areas where there is an oxygen-deficient atmosphere, or where the MUC exceeds the IDLH concentration, a SCBA or pressure-demand supplied-air respirator must be used. Respirators must be fit-tested before use (fit-testing procedures are described in Appendix D).

In areas where several compounds are known to be present, a matrix of all available information is developed. Data used for comparison include any air, water, or soil/sediment data. The highest numbers in any medium for each compound are extracted and a level of protection identified for each compound. Table 2-5 presents the partition coefficient for several common chemicals. These numbers for both soil-air and water-air can be used to derive the theoretical maximum concentration in the air for a given concentration in water or soil. The highest level of protection identified will be used at the site. This can be modified by predetermining action levels, i.e., concentration of the substance at which lower levels of protection can be utilized. On-site direct instrument readings and detector tubes can be used to determine concentrations of the substance. If possible, the HNU should be calibrated to the specific compound in question. As long as the reading is less than the TLV for that compound, Level D protection may be used. Level C is used up to the IDLH level (or maximum level read by the instrument), and if a cartridge is available and there is an adequate warning property. Level B is used above the IDLH or above the maximum level read by the instrument. Figure 2-2 outlines a decision flowchart that can be used when respirator use is considered. Other references that can be used are NIOSH Personnel Protective Equipment for Hazardous Materials Incidents: A Selection Guide, and NIOSH Respirator Decision Logic.

TABLE 2-4 (Page 1 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH ^a ADOPTED VALUES TWA		ACGIH ^a ADOPTED VALUES STEL		TIME TO REACH 1% BREAK- THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA- TION (ppm)	NIOSH ^b IDLH (ppm)
			(ppm)	(mg/m ³)	(ppm)	(mg/m ³)			
Acetaldehyde	0.031-2.3	Green, sweet	C25,A3	C45,A3	-	-	-	-	2000 Ca
Acetic acid	0.2-24	Sour	10	25	15	37	-	500	50
Acetone	100.0	Chemical sweet, pungent	(750)	(1780)	(1000)	(2380)	37	2500	2500
Acrolein	0.1-16.6	Burnt sweet, pungent	0.1	0.23	0.3	0.69	-	2	2
Acrylonitrile - skin	19-100, fatigue	Onion-garlic pungency	2,A2	4.3,A2	-	-	49	85	85 Ca
Allyl chloride	0.47	Garlic-onion pungency, green	1,A3	3,A3	2, A3	6, A3	31	20	20
Amine, dimethyl	0.021-6	Fishy	5,A4	9.2,A4	15,A4	27.6,A4	-	250	500
Amine, monomethyl	0.021-10, fatigue	Fishy, pungent	5	6.4	15	19	12	100	100
Amine, trimethyl	0.00021-1.7	Fishy, pungent	5	12	15	36	-	-	-
Ammonia	0.32-55	Pungent	25	17	35	24	-	300	300
Aniline - skin	0.5-70	Pungent	2,A3	7.6,A3	-	-	-	100	100 Ca
Benzene	4.68	Solvent	(10,A2)	(32,A2)	-	-	73	500	500 Ca
Benzyl Chloride	0.04-0.31	Solvent	1,A3	5.2,A3	-	-	-	10	10
Benzyl sulfide	0.0021-0.07	Sulfidy	-	-	-	-	-	-	-
Bromine	0.05-3.5	Bleach, pungent	0.1	0.66	(0.2)	(1.3)	-	3	3
Butyric acid	0.00056-0.001	Sour	-	-	-	-	-	-	-
Carbon disulfide - skin	0.0011-7.7	Vegetable sulfide	10	31	-	-	-	500	500
Carbon tetrachloride (chlorination of CS ₂)-skin	21.4-200	Sweet, pungent	5,A2	31,A2	10,A2	63,A2	-	200	200 Ca
Carbon tetrachloride (chlorination of CH ₄)	100.0								
Chloral	0.047	Sweet	-	-	-	-	-	-	-
Chlorine	0.01-5	Bleach, pungent	0.5,A4	15,A4	1,A4	2.9,A4	-	10	10
M,O-Cresol	0.25-0.68	Tarlike pungent	5	22	-	-	-	250	250
P-Cresol - skin	0.00042-0.0455	Tarlike pungent	5	22	-	-	-	250	250
Dimethylacetamide - skin	46.8	Amine, burnt, oily	10,A4	36,A4	-	-	-	300	300
Dimethylformamide - skin	100.0	Fishy, pungent	10,A4	30,A4	-	-	-	500	500
Dimethyl sulfide	0.001-0.02	Vegetable sulfide	-	-	-	-	-	-	-
Diphenylether (perfume grade)	0.001-0.1		-	-	-	-	-	-	-
Diphenyl sulfide	0.0021-0.0047	Burnt rubbery	-	-	-	-	-	-	-
Ethanol (synthetic)	10.0-5100	Sweet	1000,A4	1880,A4	-	-	28	3300	3300
Ethyl acrylate - skin	0.00024-1	Hot plastic, earthy	5,A2	20,A2	15,A2	61,A2	-	250	300 Ca
Ethyl mercaptan	0.00051-0.075	Earthy, sulfidy	0.5	1.3	-	-	-	25	500
Formaldehyde	0.1-1.0	Hay (strawlike), pungent	C 0.3, A2	C 0.37,A2	-	-	-	-	20 Ca
Hydrochloric acid gas	1-10.0	Pungent	C5	C7.5	-	-	-	-	50
Hydrogen sulfide (from Na S)	0.0047	Eggy sulfide	10	14	15	21	-	-	100

A2 - Suspected human carcinogen.
A3 - Animal carcinogen.

() - Indicates a change has been proposed.
a - 1996 values.
b - 1994 values.

Ca - Potential human carcinogen.
C - Ceiling limit.

TABLE 2-4 (Page 2 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH ^a ADOPTED VALUES TWA		ACGIH ^a ADOPTED VALUES STEL		TIME TO REACH 1% BREAK- THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA- TION (ppm)	NIOSH ^b IDLH (ppm)
			(ppm)	(mg/m ³)	(ppm)	(mg/m ³)			
Hydrogen sulfide gas	0.00001-0.8, fatigue		10	14	15	21	-	-	100
Methanol - skin	53.3-5900	Sweet	200	262	250	328	0.2	6000	6000
Methyl chloride - skin	10-100		50,A4	103,A4	100,A4	207,A4	0.05	2000	2000 Ca
Methylene chloride	25-320		50,A3	174,A3	-	-	10	2300	2300 Ca
Methyl ethyl ketone	4.8-25	Sweet	200	590	300	885	82	3000	3000
Methyl isobutyl ketone	0.28-8	Sweet	50	205	75	307	-	500	500
Methyl mercaptan	0.0021-1.1	Sulfidy, pungent	0.5	0.98	-	-	-	25	150
Methyl methacrylate	0.05-0.34	Pungent, sulfidy	100,A4	410,A4	-	-	-	1000	1000
Monochlorobenzene	0.21-60	Chlorinated, moth balls	10,A3	46,A3	-	-	107	500	1000
Nitrobenzene - skin	0.0047-6	Shoe polish, pungent	1,A3	5,A3	-	-	-	50	200
Perchloroethylene (tetrachloroethylene)	4.68-50	Chlorinated solvent	25,A3	170,A3	100,A3	685,A3	107	150	150 Ca
Phenol - skin	0.047-5	Medicinal	5,A4	19,A4	-	-	-	250	250
Phosgene	0.125-1.0	Haylike	0.1	0.4	-	-	-	2	2
Phosphine	0.02-3	Oniony, mustard	0.3	0.42	1	1.4	-	7.5	50
Pyridine	0.012-5	Burnt, pungent, diamine	5	16	-	-	119	250	1000
Styrene (inhibited)	0.1	Solventy, rubbery	-	-	-	-	-	-	-
Styrene (uninhibited) - skin	0.047-200	Solventy, rubbery, plasticity	(50)	(213)	(100)	(426)	-	700	700
Sulfur dichloride	0.001	Sulfidy	-	-	-	-	-	-	-
Sulfur dioxide	0.47-5		2,A4	5.2,A4	5,A4	13,A4	-	100	100
Toluene (from coke) - skin	4.68	Floral, pungent, solventy	50,A4	188,A4	-	-	94	500	500
Toluene (from petroleum)	0.17-40, fatigue	Moth balls, rubbery	-	-	-	-	-	-	-
Toluene diisocyanate	0.2-2.14	Medicated bandage, pungent	0.005,A4	0.036,A4	0.02,A4	0.14,A4	-	0.25	2.5 Ca
Trichloroethylene	21.4-400	Solventy	50,A5	269,A5	100,A5	537,A5	55	1000	1000 Ca
M - Xylene	1.1-3.7	Sweet	100,A4	434,A4	150,A4	651,A4	-	900	900
O - Xylene	1.8, fatigue	Sweet	100,A4	434,A4	150,A4	651,A4	-	900	900
P - Xylene	0.47-0.53	Sweet	100,A4	434,A4	150,A4	651,A4	-	900	900
Ethyl benzene	0.25-200		100	434	125	543	5.6	800	800
Cumene - skin	0.047-1.2		50	246	-	-	81	900	900
Isophorone	0.54		C 5,A3	C 28,A3	-	-	-	200	200
Allyl alcohol - skin	0.75-7.2		2	4.8	4	9.5	66	20	20
N-propanol - skin	0.08-200		200	492	250	614	70	800	800
Sec-butanol	43		100	303	-	-	96	2000	2000
Butanol - skin	1-15		(C 50)	(C 152)	-	-	115	-	1400
2-methoxyethanol - skin	-		5	16	-	-	116	-	-

C - Ceiling Limit.

A5 - Not suspected as a human carcinogen.

A3 - Animal carcinogen.

A2 - Suspected human carcinogen.

Ca - Potential human carcinogen.

^a - 1996 values.^b - 1994 values.

A1 - Confirmed Human Carcinogen.

() - Indicates a change has been proposed.

TABLE 2-4 (Page 3 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH ^a ADOPTED VALUES TWA		ACGIH ^a ADOPTED VALUES STEL		TIME TO REACH 1% BREAK- THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA- TION (ppm)	NIOSH ^b IDLH (ppm)
			(ppm)	(mg/m ³)	(ppm)	(mg/m ³)			
Isoamyl alcohol	10-35		100	381	125	452	97	500	500
Vinyl chloride	260		5,A1	13,A1	-	-	3.8	-	Ca
Ethyl chloride - skin	-		100,A3	264,A3	-	-	5.6	3800	3800
O-chlorotoluene	-		50	259	-	-	102	-	-
Trans-1,2-dichloroethylene	0.085-500		200	793	-	-	33	1000	1000
1,1-dichloroethylene	-		5,A3	20,A3	20,A3	79,A3	-	-	Ca
Cis-1,2-dichloroethylene	0.085-500		200	793	-	-	30	1000	1000
1,2-dichloroethane	-		10,A4	40,A3	-	-	54	50	50 Ca
1,2-dichloropropane	50		75,A4	347,A4	110,A4	508,A4	65	400	400
O-dichlorobenzene	2-50		25,A4	150,A4	50,A4	301,A4	109	200	200
p-dichlorobenzene	15-30		10,A3	60,A3	-	-	-	150	150 Ca
Chloroform	50-307		10,A3	49,A3	-	-	33	500	500 Ca
1,1,1-trichloroethane (methyl chloroform)	20-400		350,A4	1910,A4	450,A4	2460,A4	40	700	700
1,1,2-trichloroethane - skin	-		10,A4	55,A4	-	-	72	100	100 Ca
1,2,3-trichloropropane - skin	100		10,A4	60,A3	-	-	111	100	100 Ca
1,1,2,2-tetrachloroethane - skin	3-5		1,A4	6.9,A4	-	-	104	50	100 Ca
Pentachloroethane	-		-	-	-	-	93	-	-
Methyl acetate	200		200	606	250	757	33	3100	3100
Vinyl acetate	0.056-50		10,A3	35,A3	15,A3	53,A3	55	-	-
Ethyl acetate	0.12-0.55		400,A4	40,A4	-	-	67	2000	2000
Isopropyl acetate	0.9-400		250	1040	310	1290	65	1800	1800
Propyl acetate	0.15-200		200	835	250	1040	79	1700	1700
Sec-butyl acetate	4-7		200	950	-	-	83	1700	1700
Butyl acetate	0.037-20		150,A4	713,A4	200,A4	950,A4	77	1700	1700
2-methoxyethyl acetate - skin	-		5	24	-	-	93	-	-
Amyl acetate	0.00090-0.08		100	532	-	-	73	1000	1000
2-ethoxyethyl acetate - skin	0.056-50		5	27	-	-	80	-	500
Sec-Hexyl acetate	100		50	295	-	-	67	500	500
2-pentanone (methyl propyl ketone)	8		200	705	250	881	104	1500	1500
Mesityl oxide	0.051-12		15	60	25	100	122	750	1400
3-heptanone (ethyl butyl ketone)	-		50	234	-	-	91	1000	1000
2-heptanone (methyl n-amyl ketone)	-		50	233	-	-	101	800	800
Cyclohexanone - skin	0.12-0.24		25,A4	100,A4	-	-	126	700	700
5-methyl-3-heptanone (ethyl amyl ketone)	-		25	131	-	-	86	100	100

Ca - Potential human carcinogen.

A1 - Confirmed human carcinogen.

A2 - Suspected human carcinogen.

C - Ceiling limit.

^a - 1996 values.^b - 1994 values.

TABLE 2-4 (Page 4 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH ^a ADOPTED VALUES TWA		ACGIH ^a ADOPTED VALUES STEL		TIME TO REACH 1% BREAK- THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA- TION (ppm)	NIOSH ^b IDLH (ppm)
			(ppm)	(mg/m ³)	(ppm)	(mg/m ³)			
Methyl cyclohexane	500		400	1610	-	-	69	1200	1200
Diisobutyl ketone	0.31		25	145	-	-	71	500	500
4-methyl cyclo hexanone	-		50	229	75	344	111	600	600
Pentane	2.2-1000		600	1770	(750)	(2210)	61	1500	1500
Hexane	1400-1500		50	176	-	-	52	1100	1100
Cyclohexane	0.41-300		300	1030	-	-	69	1300	1300
Heptane	50-220		400	1640	500	2050	78	750	750
5-ethylidene-2-norbornene	0.007-0.073		C 5	C 25	-	-	87	-	-
Nonane	-		200	1050	-	-	76	-	-
Ethyl amine - skin	0.021-0.83		5	9.2	15	27.6	40	250	600
Isopropylamine	0.71-10		5	12	10	24	66	250	750
Propyl amine	-		-	-	-	-	90	-	-
Diethylamine - skin	0.06-0.498		5,A4	15,A4	15,A4	45,A4	88	200	200
Butyl amine - skin	0.24-5		C 5	C 15	-	-	110	-	300
Triethyl amine	0.28		1,A4	41,A4	3,A4	12,A4	81	200	200
Diisopropyl amine - skin	0.38-0.85		5	21	-	-	77	200	200
Cyclo hexyl amine	-		10,A4	41,A4	-	-	112	-	-
1-nitropropane	300		25,A4	91,A4	-	-	143	1000	1000
Methyl iodide - skin	4300		2	12	-	-	12	100	100 Ca
1,2-dibromoethane - skin	-		A3	A3	-	-	141	-	-
Acetic anhydride	0.14-81.2		5	21	-	-	124	200	200
Bromobenzene	-		-	-	-	-	142	-	-
Dichlorodifluoro methane	-		1000,A4	4950,A4	-	-	-	-	15000
1,1-dichloroethane	120		100,A4	405,A4	-	-	-	3000	3000
Dibromochloromethane	-		-	-	-	-	-	-	-
PCB-1242 - skin	-		-	1	-	-	-	5 mg/m ³	5 mg/m ³ Ca
PCB-1254 - skin	-		-	0.5,A3	-	-	-	5 mg/m ³	5 mg/m ³ Ca
Arsenic	0.21-<1		-	0.1,A1	-	-	-	5 mg/m ³	5 mg/m ³ Ca
Gasoline	0.005-10		300,A3	890,A3	500,A3	1480,A3	-	-	-
Petroleum Distillates (naptha)	<500		300,A3	1370,A3	-	-	-	1100	1100

Ca - Potential human carcinogen.
A1 - Confirmed human carcinogen.

C - Ceiling limit.
a - 1996 values.
b - 1994 values.

A2 - Suspected human carcinogen.

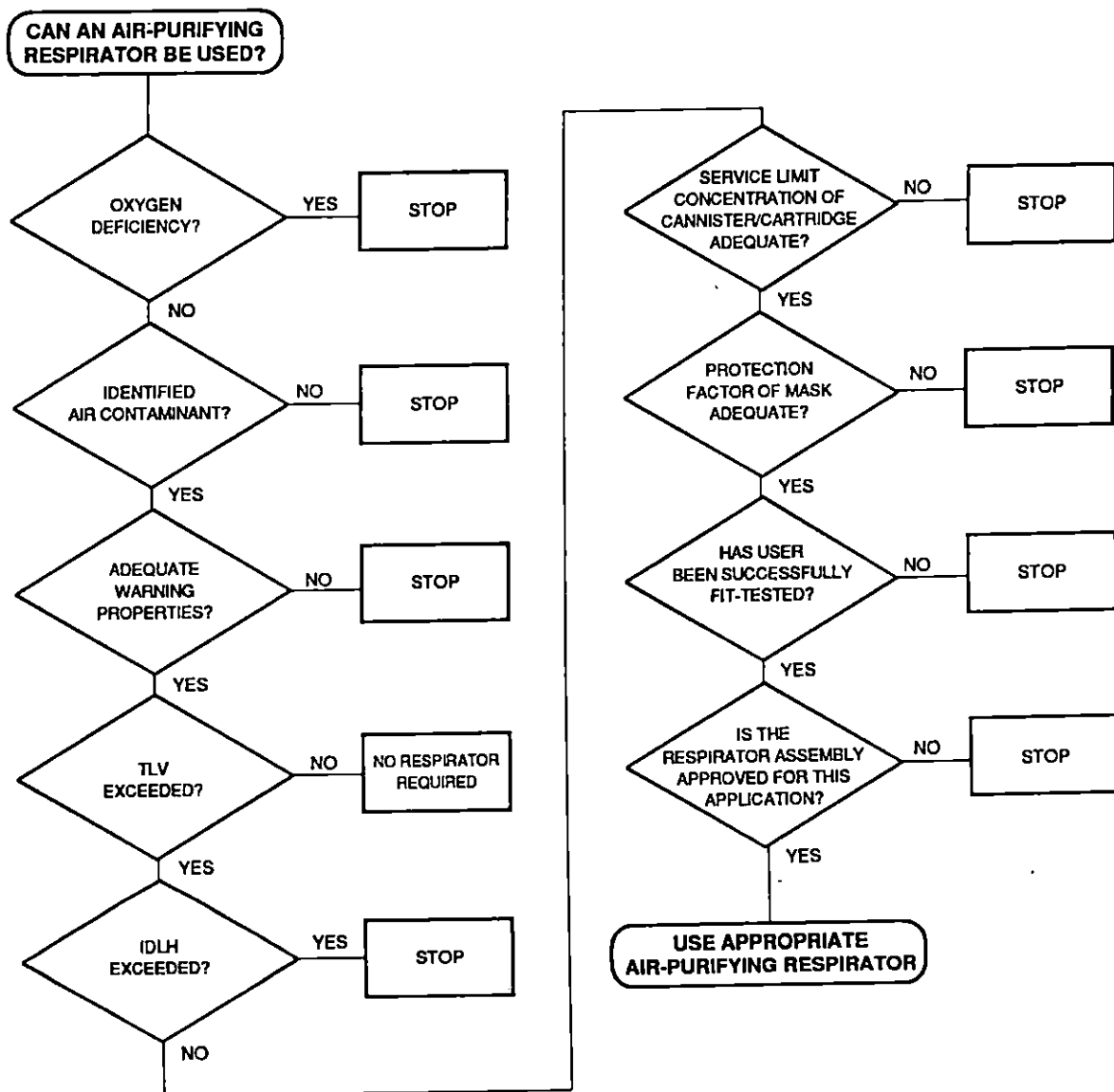
() - Indicates a change has been proposed.

TABLE 2-5

PARTITION COEFFICIENTS

CHEMICAL	SOIL/AIR	WATER/AIR
VOLATILES		
Benzene	1.21	0.19
Carbon tetrachloride	2.72	1.0
Chlorobenzene	0.98	0.17
Chloroethane		0.62
Chloroform	1.14	0.14
1,1-dichloroethane	2.33	0.21
1,2-dichloroethane	0.85	0.046
1,1-dichloroethylene		7.1
Ethylbenzene	0.28	0.24
Methylene chloride	2.7	0.1
Tetrachloroethylene	2.8	0.96
Toluene	0.6	0.24
Trans-1,2-dichloroethylene	4.4	0.24
1,1,1-trichloroethane	0.53	0.15
Trichloroethylene	2.02	0.42
Vinyl chloride		270
Meta-xylene	0.49	0.22
Ortho-xylene	0.13	0.11
Para-xylene	0.12	0.11
BASE/NEUTRALS		
Anthracene	0.0067	0.058
Benzo (a) pyrene	1.38×10	2.7×10
Bis(2-ethylhexyl)phthalate	4×10	3.2×10
Chrysene	8.9×10	6.1×10
1,2-dichlorobenzene	0.056	0.071
1,3-dichlorobenzene	0.087	0.11
1,4-dichlorobenzene	0.068	0.087
Diethylphthalate	0.00073	0.0007
Di-n-butylphthalate	0.0043	0.11
Di-n-octylphthalate	0.0001	1.4
Naphthalene	0.012	0.015
PCBs		
Aroclor 1242	0.0055	0.023
Aroclor 1254	0.0011	0.12
Aroclor 1260	0.0005	0.295
Aroclor 1248	0.0023	0.145
Aroclor 1232	0.038	0.035
Aroclor 1221	0.01	0.005
Aroclor 1016	0.02	0.013

FIGURE 2-2
SELECTION CONSIDERATIONS FLOW CHART



Reference: Safety & Operations at Hazardous Material Sites
Geo Environmental Consultants, Inc.

The splash and dermal hazards associated with each chemical must also be evaluated together. Depending on this evaluation, protective clothing is selected. The permeability of the clothing with respect to the chemical is used to determine whether a type of clothing is appropriate. The same is true of glove selection.

The LMS personnel protection equipment program, in addition to the above selection criteria, consists of the following:

- Facilities for storage of equipment, routine maintenance of equipment, and inspection of equipment
- Sanitizing of respirators after use
- Annual fit-testing for respirators and instruction on their use
- Instruction in donning and doffing equipment

2.5 SAFETY EQUIPMENT

Table 2-6 lists the basic safety equipment available for use by LMS employees. Depending on site requirements, other safety equipment may be rented or purchased.

2.6 EMERGENCY PROCEDURES

2.6.1 Emergency Procedures and Notifications

For each site, an emergency response plan will be developed. As part of this plan, the following elements will be included:

- Site typography, layout, and prevailing weather conditions
- Procedures for reporting incidents to local, state, and Federal agencies
- Coordination with disaster, fire, and/or other emergency response teams
- Rehearsal of plan and emergency evacuation procedures
- Appointment of person or persons responsible for providing guidance during emergency response

In the event of personnel exposure to potentially toxic or hazardous contaminants by skin contact, inhalation, or ingestion, the following procedures are employed:

- Wash and rinse the affected area with copious amounts of soap and water for at least 15 min. Decontaminate the person, then transport, if necessary, to the nearest hospital or poison control center.

TABLE 2-6
SAFETY EQUIPMENT

EQUIPMENT	MANUFACTURER	MODEL No.	EXPIRATION DATE	COMMENTS
1. First aid kit	ACME/Chaston Hazco	9053 #50 (#H2050)	Weekly inspection. Refill as needed.	Enables field worker to provide preliminary first aid care.
	America LaFrance	PCD-20R BC		
2. Fire extinguisher	Pemall Sears Badger World Fire	PA57, ABC 90.6462, ABC 5 MB-5M, ABC W-10, ABC	Yearly inspection. Refill after discharge.	To extinguish small fires (e.g., generators, truck).
3. Two-way radio	Midland International		Not applicable.	Enables field workers to communicate with personnel at site headquarters.
4. Safety belts, harnesses, and lifeline	Atlas Safety Equipment Co., Inc.	244-belt 510-lifeline	Not applicable.	Enables personnel to work in elevated areas or to enter confined areas. Prevents falls.
	Miller Retrieval System Miller Safety Harness (Full Body)	58-50G 8428		

- In the case of inadvertent inhalation of high (potentially toxic) levels of contaminants, the person should be moved to fresh air, decontaminated (if necessary), and transported to a medical facility.
- If a potentially toxic or hazardous substance, or an unidentified substance, has been ingested, the person should be decontaminated if necessary and transported to the nearest poison control center or emergency medical facility.

In the event of a personal injury, emergency first aid should be applied on-site as needed. At least one individual trained in first aid is on-site during all operations. The injured person should be decontaminated and transported to the nearest medical facility, if necessary.

In the event of a fire or explosion, the site should be evacuated immediately and local fire, police, and other appropriate emergency response groups should be notified as soon as possible. For each site, a centralized evacuation location is developed where the HSO will check that all personnel are accounted for (by use of the sign in/sign out log book). In the event of inferred or actual ionizing radiation exposure, the exposed individual should be decontaminated and transported immediately to an emergency medical facility.

In the event of an environmental incident caused by a spill or other spread of contamination outside the Exclusion Zone, personnel should attempt to secure the spread of contamination if possible. Local authorities should be notified and the immediate area may be evacuated. The on-site HSO is in charge of contacting the emergency response groups, directing first aid procedures, and securing the site.

2.6.2 Routes to Emergency Facilities and Evacuation Plan

The emergency route to the nearest hospital from the site is determined prior to field mobilization. This information and pertinent emergency telephone numbers are provided to all personnel prior to site entry and are conspicuously displayed at the command post.

In the event of an emergency situation such as a fire, explosion, significant release of toxic gases, etc., a horn or other predetermined signal is used for approximately 30 sec to indicate the initiation of evacuation procedures. All personnel in both restricted and nonrestricted areas evacuate and assemble near the command post or other safe area as identified by the on-site HSO. This safe location is selected on a daily basis depending on the direction of the wind. The on-site HSO, task coordinator, or other appropriate designee has the authority to initiate proper action for efficient and safe site evacuation and assessment of emergency situations. Under no circumstances are incoming personnel or visitors allowed to proceed into the area once the emergency signal has been given. The on-site HSO must see that access for

emergency equipment is provided, and that all field equipment has been shut down and vacated once the alarm has been sounded.

CHAPTER 3

DECONTAMINATION PROCEDURES

Decontamination, the process of removing or neutralizing contaminants that have accumulated on personnel and equipment, is critical to health and safety at hazardous waste sites. It protects the worker from hazardous substances that may contaminate and eventually permeate protective clothing, respirator equipment, tools, vehicles, and other equipment used on-site. Decontamination also minimizes the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and prevents uncontrolled transportation of contaminants from the site.

The two primary decontamination procedures are physical and chemical removal. Physical removal is done by such means as dislodging/displacement, rinsing, wiping off, evaporation, high pressure, and heat. Chemical removal dissolves the contaminant, reduces the adhesion forces, solidifies the liquid or gel, and rinses and/or disinfects/sterilizes.

All personnel decontamination operations are performed inside the Contamination Reduction Corridor and are supervised by the on-site HSO or designee. The decontamination area will be equipped as needed with sprayers, brushes, basins, plastic bags, and storage areas for used disposable outerwear (bagged). Water used in decontamination will be collected in basins and disposed of in accordance with site-specific requirements.

The level and types of decontamination procedures required depend on several site-specific factors, including:

- The chemical, physical and toxicological properties of the wastes
- The pathogenicity of any infectious wastes
- The amount, location, and containment of contaminants
- The potential for, and level of, exposure based on assigned worker duties, activities, and functions
- The potential for wastes to permeate, degrade, or penetrate material used for personnel protection clothing and equipment, vehicles, tools, buildings, and structures
- The proximity of incompatible waste
- The movement of personnel and/or equipment among different zones

- The type and nature of possible emergency situations
- The methods available for protecting workers during decontamination
- The impact of the decontamination process and components on workers' safety and health

The on-site HSO inspects personnel protection equipment or clothing that will be reused to determine whether decontamination procedures are sufficient to allow passage into other support areas. Any equipment that cannot be adequately cleaned will be double-bagged and marked as such until more thorough decontamination can be performed. (The Support Zone could be the vehicle used to store sampling equipment.)

The following facilities will be provided in the support zone:

- Potable water storage facility or potable water tap (near command post)
- Handwashing facilities
- First aid kit, eyewash station, fire extinguisher, and possibly emergency shower facilities
- Storage for unused or decontaminated work clothes and safety equipment (respirators, etc.)

3.1 PERSONNEL DECONTAMINATION PROCEDURES

Decontamination procedures to be employed for various levels of personnel protection are, in order of their occurrence, as follows:

- Level D decontamination consisting of, as appropriate:
 1. Wash boots with soap and potable water; rinse with potable water.
 2. Bag all disposable clothing.
 3. Field-wash hands and face.
- Level C decontamination consisting of, as appropriate:
 1. Wash boots and outer gloves with soap and potable water; rinse with potable water.
 2. Remove tape.

3. Wash and rinse rubber boot.
 4. Remove outer glove.
 5. Remove Tyvek (bag).
 6. Remove rubber boot.
 7. Remove respirator.
 8. Remove inner glove.
 9. Field-wash hands and face with potable water.
- Level B decontamination consisting of, as appropriate:
 1. Wash disposable boot and outer glove with soap and potable water; rinse with potable water.
 2. Remove tape.
 3. Remove outer disposable boot.
 4. Remove outer glove.
 5. Wash and rinse rubber boot.
 6. Remove and rinse SCBA.
 7. Remove Tyvek (bag).
 8. Remove rubber boot.
 9. Remove and rinse respirator.
 10. Remove inner glove.
 11. Field-wash hands and face with potable water.

Depending on the site situation, the effectiveness of the decontamination procedure can be tested by one of the following methods:

- Visual observation to see whether there is any sign of contamination. This can be done with natural light and ultraviolet light.

- Wipe sampling can be conducted on selected surfaces. These samples can then be analyzed for the suspected chemical.
- The final rinse solution can be analyzed to determine whether high levels of chemicals are in the solution.
- The protective clothing can be analyzed for permeability.

A commercial laundry needed to clean any clothing must be informed of any potentially harmful effects of exposure to hazardous substances.

3.2 EQUIPMENT DECONTAMINATION

Under most circumstances, support vehicles used in the Exclusion Zone must be cleaned thoroughly before they leave the site; the level of cleaning is determined by specific site conditions. In general, vehicle cleaning consists of high-pressure hot water or steam wash and potable water rinse of the underbody, frame, and tires. Devices that tend to concentrate airborne contaminants, such as the air cleaner of the vehicle, may require treatment as hazardous materials (i.e., placed in plastic bags and left on-site or disposed of at a designated facility). Vehicle interiors and cargo exposed to potentially contaminated materials may be hand-washed, rinsed with potable water (sponge-wash), and dried with paper towels. Vehicle decontamination procedures will be performed in the Contamination Reduction Corridor.

Other support equipment, such as tools, pumps, and generators, may be cleaned with high-pressure hot water or steam, as needed, during the field effort and as described in the Field Sampling Plan (FSP) for each site.

Personnel protection during equipment decontamination is similar to that required in the work area where the equipment is used. For example, a drilling rig used in a task requiring Level C protection may need to be cleaned under the decontamination guidelines for Level C depending on the reasons for selection of the equipment for the level of protection.

3.3 EMERGENCY DECONTAMINATION

Emergency decontamination should be performed on a individual who has been exposed to hazardous materials and needs transportation to a medical facility. If the victim's life is at stake, decontamination should be delayed until the victim's condition has stabilized. If however, the contamination could also endanger a rescuer or firstaider, decontamination must be done immediately. In the event the victim has been transported to the medical facility without decontamination, medical personnel must be alerted for their own protection.

3.4 DECONTAMINATION DISPOSAL

The appropriate procedures for disposing of decontamination liquids and disposable clothing will be determined for each site on a case-by-case basis.

CHAPTER 4

GENERAL HEALTH AND SAFETY GUIDELINES

4.1 MEDICAL PROGRAMS

4.1.1 Physical Examinations and Testing

A medical surveillance program is established for each hazardous waste work site to ensure the safety of LMS employees. It is based on the specific site needs, location of contaminants, waste materials, estimated duration of site work, and potential exposures to hazardous materials. This program complements the existing medical examination program required for all personnel who are or may be involved in hazardous waste site investigations, and is in compliance with current regulations prescribed by appropriate governmental agencies and client requirements.

Employees engaged in hazardous waste site investigations are required to undergo a prescribed annual medical examination developed and designed in conjunction with Dr. F.A. Franklin, an occupational health physician and medical director of Company Medical Associates of Northvale, New Jersey. The examination is in accordance with currently prescribed governmental regulations. Dr. Franklin, a member of the American Occupational Medical Association, is a graduate of Seton Hall University and the University of Rome, Italy. He interned at Maryland Medical Center and has been director of Company Medical Associates since 1980. Company Medical Associates offers a full range of services, and provides industrial customers with accurate, up-to-date, and certifiable physical examinations, support services, and 24-hr emergency service.

The annual employee physical examination consists of:

1. A medical history that includes past work exposure to hazardous chemicals or any other history of blood, nerve, or inherited medical problems. This includes a history of renal or liver dysfunction, drugs routinely taken, alcohol intake, and systemic infections. Exposure to other materials such as cleaning agents, insecticides, and other toxins outside the current work situation, will also be documented.

2. Laboratory testing, including:

- a. A complete blood count (SMAK-23) with red cell count, white cell count with differential platelet count, hematocrit, hemoglobin, red cell indices (MCU, MCH, MCHC, serum, bilirubin, and reticulocyte count), and additional tests where, in Dr. Franklin's opinion, abnormalities in the components of the blood are detected
- b. Urinalysis with microscopic report
- c. Chest X ray (frequency at the discretion of Dr. Franklin)
- d. Electrocardiogram with cardiologist interpretation
- e. Pulmonary function test, including tests of lung ventilation to measure forced expiratory volume in 1 sec and forced vital capacity; other factors such as FEF, MMEFR, FRC, RV, and TLC may be included
- f. Complete physical examination of all body systems
- g. Vision examination and Titmus vision test
- h. Audiometric screening
- i. Narrative report by Dr. Franklin on all findings and fitness for the job
- j. Copies of all technical material sent with narrative; originals to be on file with Company Medical Associates

During the project, and after its completion, the individual receives periodic examinations equal in content to the original physical examination. Additional exams may be done in cases of abnormal conditions found in the initial or baseline exam, real or possible exposure on the site due to spill, sudden release of chemicals or failure of personnel protection equipment, complaints from the individuals indicating a potential problem, or as part of a routine medical examination surveillance program as required under 29 CFR Part 1910. Dr. Franklin will certify in writing the worker's fitness for work on the site and provide a copy of certification to the employee. LMS may require additional fitness tests for specific work assignments.

In addition to the above, if the hazards at a specific site warrant, additional testing will be done before commencement and after completion of work on the site. Table 4-1 lists common chemical toxicants found at hazardous waste sites, their health effects, and recommended medical monitoring. In addition, the ACGIH publishes biological exposure indices for several compounds and their testing procedure. This reference is also utilized when additional

TABLE 4-1 (Page 1 of 3)

COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR HEALTH EFFECTS, AND MEDICAL MONITORING

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Aromatic Hydrocarbons	Benzene Ethyl benzene Toluene Xylene	Commercial solvents and intermediates for synthesis in the chemical and pharmaceutical industries	Blood Bone marrow CNS ^a Eyes Respiratory system Skin Liver Kidney	All cause: CNS ^a depression: decreased alertness, headache, sleepiness, loss of consciousness, defatting dermatitis. Benzene suppresses bone marrow function, causing blood changes. Chronic exposure can cause leukemia. Note: Because other aromatic hydrocarbons may be contaminated with benzene during distillation, benzene-related health effects should be considered when exposure to any of these agents is suspected.	Occupational/general medical history empha- sizing prior exposure to these or other toxic agents. Medical exami- nation with focus on liver, kidney, nervous system, and skin. Laboratory testing: CBC ^b Platelet count Measurement of kidney and liver function
Asbestos (or asbestiform particles)		A variety of industrial uses, including: Building Construction Cement work Insulation Fireproofing Pipes and ducts for water, air, and chemicals Automobile brake pads and linings	Lungs Gastrointestinal system	Chronic effects: Lung cancer Mesothelioma Asbestosis Gastrointestinal malignancies Asbestos exposure coupled with cigarette smoking has been shown to have a synergistic effect in the development of lung cancer.	History and physical examination should focus on the lungs and gastrointestinal system. Laboratory tests should include a test for occult blood evaluation as a check for possible hidden gastrointestinal malignancy. A high quality chest Xray and pulmonary function test may help to identify long-term changes asso- ciated with asbestos diseases; however, early identification of low-dose exposure is unlikely.
Dioxin (see Herbicides)					
Halogenated Aliphatic Hydrocarbons	Carbon tetrachloride Chloroform Ethyl bromide Ethyl chloride Ethylene dibromide Ethylene dichloride Methyl chloride Methyl chloroform Methylene chloride Tetrachloro- ethane Tetrachloro- ethylene (perchloro- ethylene) Trichloro- ethylene Vinyl chloride	Commercial solvents and intermediates in organics synthesis	CNS ^a Kidney Liver Skin	All cause: CNS ^a depression: de- creased alertness, head- aches, sleepiness, loss of consciousness. Kidney changes: decreased urine flow, swelling (especially around eyes), anemia. Liver changes: fatigue, malaise, dark urine, liver enlargement, jaundice. Vinyl chloride is a known carcinogen; several others in this group are potential carcinogens.	Occupational/general medical history empha- sizing prior exposure to these or other toxic agents. Medical examination with focus on liver, kidney, nervous system, and skin. Laboratory testing for liver and kidney func- tion; nervous system, carboxyhemoglobin where relevant.

^aCNS = Central nervous system.^bCBC = Complete blood count.

TABLE 4-1 (Page 2 of 3)

COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR HEALTH EFFECTS, AND MEDICAL MONITORING

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Heavy Metals	Arsenic Beryllium Cadmium Chromium Lead Mercury	Wide variety of industrial and commercial uses	Multiple organs and systems, including: Blood Cardiopulmonary Gastrointestinal Kidney Liver Lung CNS ^a Skin	All are toxic to the kidneys. Each heavy metal has its own characteristic symptom cluster. For example, lead causes decreased mental ability, weakness (especially hands), headache, abdominal cramps, diarrhea, and anemia. Lead can also affect the blood-forming mechanism, kidneys, and the peripheral nervous system. Long-term effects ^c also vary. Lead toxicity can cause permanent kidney and brain damage; cadmium can cause kidney or lung disease. Chromium, beryllium, arsenic, and cadmium have been implicated as human carcinogens.	History-taking and physical exam; search for symptom clusters associated with specific metal exposure, e.g., for lead look for neurological deficiency, anemia, and gastro-intestinal symptoms. Laboratory testing: Measurements of metallic content in blood, urine, and tissue (e.g., blood lead level; urine screen for arsenic, mercury, chromium, and cadmium). CBC ^b Measurement of kidney and liver function where relevant. Chest X ray or pulmonary function testing where relevant.
Herbicides	Chlorophenoxy compounds: 2,4-dichlorophenoxyacetic acid (2,4-D) 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) Dioxin (tetrachloro-dibenzo-p-dioxin, TCDD), which occurs as a trace contaminant in these compounds, poses the most serious health risk.	Vegetation control	Kidney Liver CNS ^a Skin	Chlorophenoxy compounds can cause chloracne, weakness or numbness of the arms and legs, and may result in long-term nerve damage. Dioxin causes chloracne and may aggravate pre-existing liver and kidney diseases.	History and physical exam should focus on the skin and nervous system. Laboratory tests include: Measurement of liver and kidney function where relevant. Urinalysis
Organochlorine Insecticides	Chlorinated ethanes: DDT Cyclodienes: Aldrin Chlordane Dieldrin Endrin Chlorocyclohexanes Lindane	Pest control	Kidney Liver CNS ^a	All cause acute symptoms of apprehension, irritability, dizziness, disturbed equilibrium, tremor, and convulsions. Cyclodienes may cause convulsions without any other initial symptoms. Chlorocyclohexanes can cause anemia. Cyclodienes and chlorocyclohexanes cause liver toxicity and permanent kidney damage.	History and physical exam should focus on the nervous system. Laboratory tests include: Measurement of kidney and liver function. CBC ^b for exposure to chlorocyclohexanes.

^aCNS = Central nervous system. ^bCBC = Complete blood count.

^cLong-term effects generally manifest in 10 to 30 years.

TABLE 4-1 (Page 3 of 3)

**COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR
HEALTH EFFECTS, AND MEDICAL MONITORING**

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Organo- phosphate and Carbamate Insecticides	Organophosphate: Diazinon Dichlorvos Dimethoate Trichlorfon Malathion Methyl parathion Parathion Carbamate: Aldicarb Baygon Zectran	Pest control	CNS ^a Liver Kidney	All cause a chain of internal reactions leading to neuromuscular blockage. Depending on the extent of poisoning, acute symptoms range from headaches, fatigue, dizziness, increased salivation and crying, profuse sweating, nausea, vomiting, cramps, and diarrhea to tightness in the chest, muscle twitching, and slowing of the heartbeat. Severe cases may result in rapid onset of unconsciousness and seizures. A delayed effect may be weakness and numbness in the feet and hands. Long-term, permanent nerve damage is possible.	Physical exam should focus on the nervous system. Laboratory tests should include: RBC ^b cholinesterase levels for recent exposure (plasma cholinesterase for acute exposures). Measurements of delayed neurotoxicity and other effects.
Polychlori- nated Biphenyls (PCBs)		Wide variety of industrial uses	Liver CNS ^a (speculative) Respiratory system (speculative) Skin	Various skin ailments, including chloracne; may cause liver toxicity; carcinogenic to animals.	Physical exam should focus on the skin and liver. Laboratory tests include: Serum PCB levels. Triglycerides and cholesterol. Measurement of liver function.

^aCNS = Central nervous system.

^bRBC = Complete blood count.

monitoring is required. Upon termination of employment, the employee is given an exit physical examination equivalent to the annual exam.

LMS and Dr. Franklin maintain all medical records in a confidential manner, accessible only by authorized personnel. Authorized persons include designated senior management of LMS, medical staff of Company Medical Associates, the individual and his/her representative, and governmental representatives. Upon request, the individual may obtain a copy of his medical file from LMS or Company Medical Associates. Upon death, retirement, resignation, or other termination of service, the records are retained by LMS and Company Medical Associates according to prescribed governmental regulation. LMS retains employee medical records for at least 30 years after the employment period.

4.1.2 Emergency Medical Treatment

Provisions for emergency treatment will be made at each site. Site conditions will determine the design of the emergency medical plan. The following is LMS' standard emergency treatment plan, used to guide all site HASPs:

- a. At least one employee on-site must be trained in first aid and cardiopulmonary resuscitation (CPR) and be so certified by the American Red Cross (or equivalent).
- b. All site employees must be trained in emergency decontamination procedures.
- c. Predesignated roles and responsibilities as defined by the on-site Health and Safety Officer must be assumed in an emergency.
- d. An emergency/first aid station capable of providing (1) stabilization for patients requiring off-site treatment and (2) general first aid, must be established on-site. This station must be located in a clean area adjacent to the decontamination area to facilitate emergency decontamination. A standard first aid kit, or equivalent supplies as required by site conditions, must be available for use. Additional equipment could include emergency deluge shower, stretchers, ice, emergency eyewash, decontamination solutions, and fire-extinguishing blankets.
- e. Company Medical Associates provides an on-call physician on a 24-hr basis. If the site is out of the immediate area, other trained medical personnel must be made available.
- f. On-site Health and Safety Officer(s) and sampling crew chiefs must be trained in monitoring heat stress (see Section 4.1.2.1).

- g. Emergency transportation to, treatment at, and contamination control procedures with the local medical facility are to be established. Site location is the determining factor regarding the scope of this provision of our emergency medical treatment.

4.1.2.1 Heat Stress. Wearing personnel protection equipment can cause heat stress. The same properties of PPE that prevent chemicals from contacting the skin also severely limit the body's ability to dissipate heat. There are six major categories of heat-related disorders:

1. Transient heat fatigue, a state of discomfort and psychological strain arising from prolonged heat exposure, is usually developed by workers unused to heat. Task performance, concentration, alertness, and vigilance decline. Gradual acclimation to heat can lessen the stress.
2. Heat rash, also known as prickly heat, is caused by the body's inability to remove sweat by evaporation. The sweat ducts become plugged, sweat glands are inflamed, and a rash that can become infected develops. Resting in a cool place at regular intervals and showering after each work shift prevent the condition.
3. Fainting is usually caused by a worker's standing erect and immobile in the hot sun. Blood pools in the lower section of the body, thereby reducing the amount of blood pumped to the brain. Moving around prevents the blood from pooling.
4. Heat cramps are painful spasms of the working muscles of individuals who sweat profusely in heat, and who drink large quantities of water but fail to replace the body's salt loss. The lack of salt causes painful cramps that can be relieved by drinking half a glass of water containing half a teaspoon of salt every 15 min. Muscles should be massaged gently to relieve spasm. Cramps can also be prevented by drinking an electrolyte mixture (such as Gatorade®) while working. Persons with heart problems or low-sodium diets must consult a physician for relief of heat cramps.
5. Heat exhaustion is caused by excessive sweating. The worker will continue to sweat but experience extreme weakness, fatigue, giddiness, nausea, or headache. The worker may vomit or faint in severe cases. The skin is clammy and moist, complexion is pale or flushed, and body temperature is normal or slightly higher. The victim should lie down in a cool place, with feet elevated 8-12 in. Lightly salted liquids, i.e., half a glass of water with half a teaspoon of salt, should be administered every 15 min. (See above caution on heart patients.) Cool, wet cloths can also be applied. If vomiting occurs, discontinue fluids and take victim to nearest hospital.
6. Heat stroke, the most dangerous form of heat-related injury, is life threatening. Help must be obtained immediately or the worker may die. Heat stroke is caused by the breakdown of the body's thermoregulating system under stress and results in disruption of the sweating mechanism. Body temperature will rise

significantly and rapidly, i.e., $> 105^{\circ}\text{F}$; the skin will be hot, dry, and usually red in spots; pulse will be rapid and strong. An ambulance should be summoned, but the victim should be moved immediately to a cool place, his/her clothes soaked with water, and his/her body vigorously fanned to promote cooling and quickly reduce body temperature. Alternatively, the victim can be undressed and placed in a tub of cold (not ice) water, sponged with cool water or rubbing alcohol, or given continuous applications of cold packs. Although high body temperature can cause permanent brain damage and/or death, the victim must not be overchilled.

Prevention is the first and foremost means of handling heat stress problems. Monitoring workers' temperatures, adjusting their schedules, providing shelter and cooling devices, and encouraging workers to maintain optimal physical fitness all help prevent heat stress. Workers should drink 1-1.6 gal of fluid per day (a cup or two every 15-20 min) to maintain body fluids and body weight. Measurements of worker heart rate and oral temperature are other ways to monitor heat stress. Heart rate should not exceed 110 beats/min at the beginning of the rest period and temperature should not exceed 100.6°F . ACGIH has adopted TLVs for heat exposure. The Wet Bulb Globe Temperature Index (WBGT) must be calculated and compared to the TLVs, which are calculated as follows:

- Outdoors with solar load:

$$\text{WBGT} = 0.7 \text{ NWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$

- Indoors or outdoors with no solar load:

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

where

NWB = National Wet-Bulb Temperature Index

DB = Dry-Bulb Temperature

GT = Globe Temperature

The TLVs are listed in Table 4-2. The ACGIH TLVs cannot be used when impermeable or semi-impermeable clothing is worn. Therefore, Table 4-3 gives a suggested work/rest period for various adjusted temperatures, for both normal and impermeable work ensembles. The level of effort required to perform the specific work will further modify this table.

4.1.2.2 Cold Stress. Exposure to cold can cause frostbite-crystals to form in the skin or hypothermia (lowering of body temperature). Temperature, humidity, and wind velocity can affect the degree of hazard from cold exposure. The wind chill factor estimates the combined cooling effect of wind and low air temperatures on exposed skin. The ACGIH provides a chart

TABLE 4-2**PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(VALUES ARE GIVEN IN °C WBGT)**

WORK - REST REGIMEN	WORK LOAD		
	LIGHT	MODERATE	HEAVY
Continuous work	30.0	26.7	25.0
75% Work - 25% Rest, each hour	30.6	28.0	25.9
50% Work - 50% Rest, each hour	31.4	29.4	27.9
25% Work - 75% Rest, each hour	32.2	31.1	30.0

TABLE 4-3

**SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING
FOR FIT AND ACCLIMATIZED WORKERS^a**

ADJUSTED TEMPERATURE^b	NORMAL WORK ENSEMBLE^c	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 min of work	After each 15 min of work
87.5-90°F (30.8-32.2°C)	After each 60 min of work	After each 30 min of work
82.5-87.5°F (28.1-30.8°C)	After each 90 min of work	After each 60 min of work
77.5-82.5°F (25.3-28.1°C)	After each 120 min of work	After each 90 min of work
72.5-77.5°F (22.5-25.3°C)	After each 150 min of work	After each 120 min of work

^aFor work levels of 250 kilocalories/hour.

^bCalculate the adjusted air temperature (ta adj) by using this equation:

ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percentage of time the sun is not covered by clouds thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

^cA normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

of the wind chill factor and also TLVs for cold exposure (see Table 4-4). In general the TLVs only take effect when the temperature is -15 F (-26°C) or below and are used to prevent hypothermia. Frostbite can usually be prevented by ensuring that the extremities (ears, nose, toes, and fingers) are kept warm.

In case of frostbite, noted where the skin is white to grayish yellow in color, the affected part should be rapidly warmed in running or circulating water that is between 102-105°F. Do not rub or massage frozen part. In the case of hypothermia, the victim should be moved to a warm room as quickly as possible and wrapped in blankets or placed in a tub of warm (102-105°F) water.

4.2 TRAINING

Anyone who enters a hazardous waste work site must recognize and understand the potential hazards to health and safety. All workers at the site will be required to fulfill a minimum safety training program.

The objective of the training program will be:

- To make workers aware of the potential hazards they may encounter.
- To provide the knowledge and skills necessary for the worker to perform the work with minimal risk to health and safety.
- To make workers aware of the purpose and limitations of safety equipment.
- To ensure that workers can safely avoid or escape from emergencies.

This program is in accordance with 29 CFR 1910.120 (e) (3) and personnel successfully completing the course are issued a certificate of training.

At a minimum, the training consists of 40 hrs of instruction (or equivalent experience) plus 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Equivalent experience must be applicable experience using equipment, clothing, etc. A maximum of 16 of the 40 hrs of required training can be equivalent experience. Field experience from 1984 to the current year can be used in the calculation of equivalent experience.

Training consists of instruction, lectures, or hands-on experience as appropriate in the following categories:

TABLE 4-4

**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
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	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.											

Reference: 1993-1994 ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

- Personnel responsible for site safety and health
- Safety, health, and other hazards present on-site
- Use of PPE
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on-site
- Medical surveillance requirements, including symptoms and signs that might indicate overexposure to hazards
- Site control measures
- Decontamination procedures
- Site's standard operating procedures
- Contingency plans for emergencies
- Confined space entry procedures

In addition, each person shall receive 8 hrs of refresher training annually in the above areas.

At least one person on-site (if he or she is supervising others) must have received an additional 8 hrs of instruction in supervision of health and safety. One person on-site must also have at least 8 hrs of first aid and CPR. Personnel who do not regularly work on hazardous waste sites, such as section directors, design engineers etc., but have occasional reason to visit a site, must have 24 hrs of training and 1 day of actual field experience under the direct supervision of a trained experienced supervisor. The training consists of the above itemized list.

4.2.1 Hazard Evaluation

Site-specific training is based on the evaluation of field and laboratory results collected during the preliminary site investigations and a risk assessment of on-site hazards. Training consists of an overview of site hazards (both physical and chemical) and the appropriate steps to control these hazards.

4.2.2 Equipment Use, Operations, Limitations

Hands-on instruction is used to familiarize workers with the safe and proper operation of field equipment (e.g., purge pumps, coring equipment). Specific equipment limitations will be emphasized.

4.2.3 Decontamination

Decontamination training includes:

- A review of the specific site decontamination plan.
- A review of standard operating procedures established to minimize contact with waste and thus the potential for contamination.
- A review of the types of contamination monitored at the site and the appropriate decontamination procedures. Training includes a walk-through demonstration of the decontamination methods, including:
 - Removal of physical contaminants from clothing and equipment.
 - Removal of chemical contaminants from clothing and equipment by using a wash/rinse process with cleaning solutions.
 - Appropriate disposal techniques for equipment and personnel gear.

4.2.4 Safety Plans and Emergency Procedures

Training includes the review of the generic and site-specific HASP with all on-site workers, with emphasis on safe practices, standard operating procedures, and site safety maps. Methods to reduce the possibility of contamination of workers include:

- Working upwind of the contamination
- Reducing dust by watering down the work area (provided that contaminants are not water-active)
- Ventilating confined spaces
- Use of pressurized cabs or control booths on equipment
- Use of remote-operated materials handling equipment
- Reducing number of employees in contaminated areas

Emergency procedures training includes how to request emergency assistance, self-rescue, personnel response to emergencies, and emergency drills.

4.3 GENERAL WORK PRACTICES

- Eating, drinking, chewing gum or tobacco, smoking, or any other practice that increases the probability of hand-to-mouth transfer and ingestion of material are prohibited except in predesignated areas on-site.
- Workers must wash hands and face thoroughly upon leaving the work area and before eating, drinking, or any other such activities.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Facial hair that interferes with satisfactory fit of the mask-to-face seal is not allowed on personnel required to wear respiratory protective equipment.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, workers should avoid personal and equipment contact with puddles, mud, and other discolored surfaces.
- Medicine and alcohol can exaggerate the effects of exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists, unless specifically approved by a qualified physician.
- Eyeglasses are not compatible for use with full-face respiratory equipment. Contact lenses tend to trap vapors between the eyes and the lenses, thus allowing vapor absorption to the body via eye tissue. In addition, dislodged contacts cannot be readjusted without wash removal. Therefore, instead of contacts, prescription lens inserts, which are available for most full-face respirators, should be used.
- Hearing protection should be worn when excessive noise is present, particularly when using the Acker Soil Mechanic or working around an air rotary drill rig.
- The buddy system should always be used, and each buddy should watch for signs of fatigue, exposure, etc.
- No work is to be conducted on-site without appropriate supervision and air quality monitoring.
- On sites requiring drum handling or where buried drums are suspected, a site-specific HASP is to be written to incorporate drum handling and opening

procedures. This must be written in accordance with 29 CFR 1910.120 (y) (1-9).

- Illumination must be provided at each site and the intensity will be the minimum required by 29 CFR 1910.120 (m).
- Unless transportation to toilet facilities is readily available, all sites must be provided toilet facilities in accordance with 29 CFR 1910.120 (n). Also to be provided are an adequate supply of potable water and washing facilities.

4.4 ADDITIONAL GUIDELINES FOR IMPLEMENTING A HEALTH AND SAFETY PROGRAM FOR INVESTIGATION WORK

The LMS Safety Department consists of a Safety Director and two or more Safety Officers. The following describes the job description of each category and Figure 4-1 depicts the organization.

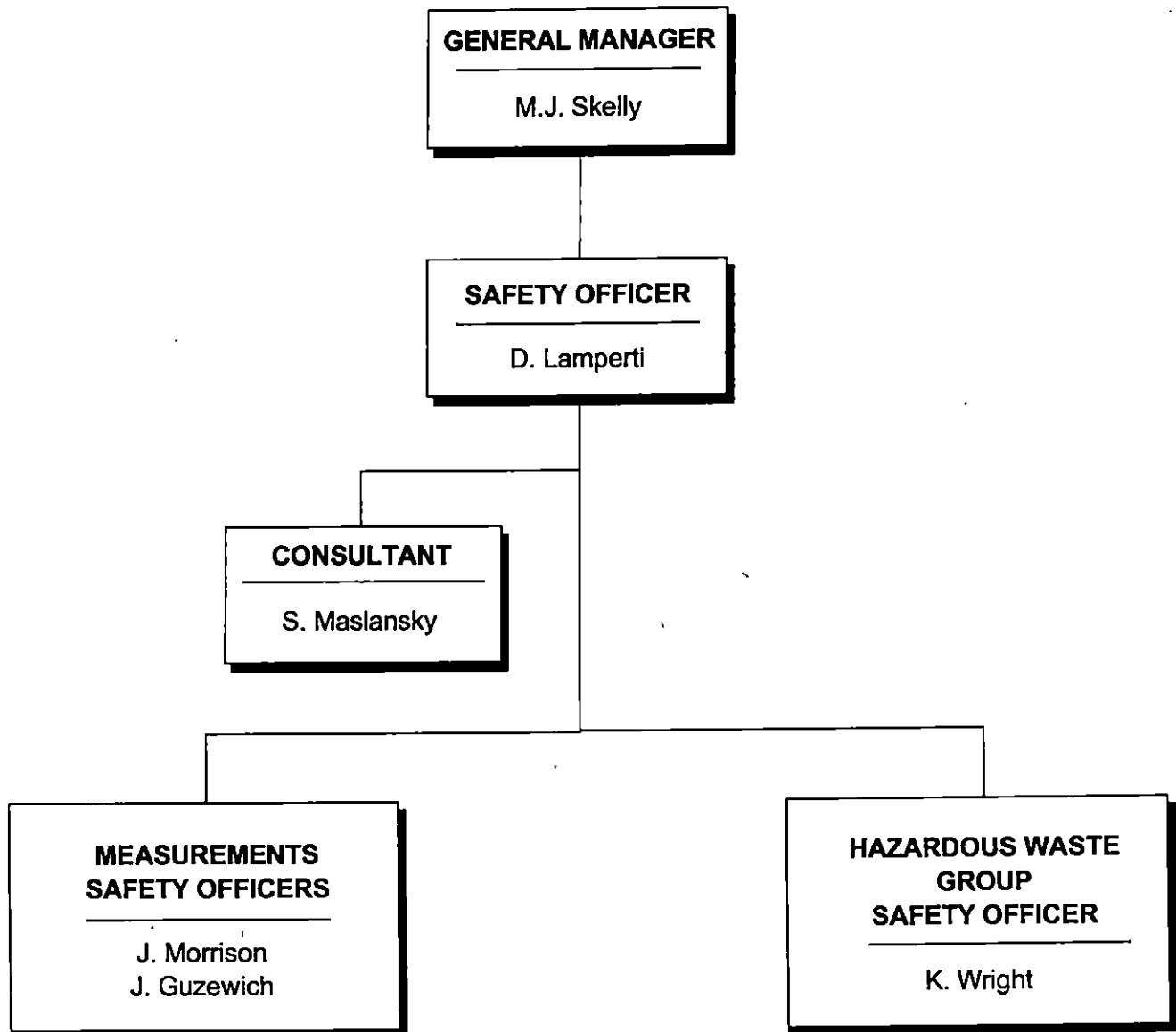
SAFETY DIRECTOR

- Prepares policy manual and guidelines with input from Safety Officers
- Defines administrative procedures
- Coordinates outside safety activities, physical, training courses, and safety consultants
- Reviews and approves safety plans after input from Safety Officers and Project Manager
- Monitors regulations and insurance changes
- Ensures involvement of Safety Officers with operations decisions

SAFETY OFFICER

- Provides technical and practical input to policies and procedures
- Reviews operations to ensure compliance with policies and definition of appropriate safety measures (degree of involvement will depend upon size and complexity of project or activity - needs to be informed of all potentially hazardous site activity)
- Prepares or reviews site-specific HASPs
- Reviews in-house procedures and recommends changes to increase efficiency or improve safety

FIGURE 4-1
HEALTH AND SAFETY ORGANIZATION



- Ensures that current and appropriate information is included in site-specific decisions
- Recommends training programs, participates in or runs same
- Ensures all necessary equipment is available and functioning
- Conducts periodic safety audits

Additional guidelines for health and safety include:

- Procedures for on-site activities at hazardous waste sites such as the drilling and installation of monitoring wells, collection of soil, sediment, groundwater and surface water samples, must be reviewed by an LMS Section Director and by a Safety Officer.
- The Safety Officer(s) determines, based on existing information, the level of protection to be utilized and instrumentation needed for on-site sampling or investigative work. The Safety Officer(s) is to be kept informed of any new data or information affecting the level of protection as it is acquired.
- The personnel assigned to do field work involving hazardous waste must have successfully completed all the prescribed safety training, the minimum which is a 40-hr HazMat Training program, plus 3 days of actual field experience (equivalent experience up to 16 hrs can be substituted for part of the 40 hrs HazMat Training). Acceptable equivalent training must be approved by a Safety Officer. When instrumentation is to be utilized in the field, the person or persons assigned must have the necessary training to use the equipment properly and interpret the results correctly.
- All employees must have read this LMS Standard Operating Procedures Manual for Health and Safety.
- All personnel performing field work must wear the minimum safety equipment of work shoes. Safety glasses/goggles may also be part of the minimum equipment required at a particular site. Hard hats are required in areas where an overhead hazard exists. Contact lenses are not to be worn with a respirator or self-contained breathing apparatus (SCBA).
- A specific HASP must be prepared for each site by a Safety Officer or his/her designee that defines measures for each level and type of activity and is read by all site-assigned employees. At a minimum this must be equivalent to the attached LMS site-specific health and safety plan form (Appendix E). The designated Safety Officer must be provided with an approved copy of the site-specific HASP.

- Large jobs, any CERCLA or RCRA projects, or those involving special safety concerns, require a specific HASP and must be reviewed by the Group Manager, Section Director(s) and LMS Safety Department.
- Employees must familiarize themselves with all safety procedures for the particular site and seek advice from Safety Officers if they are unclear on any health or safety issues.
- For all investigations on hazardous waste sites, including sampling, all work must be done by at least two trained personnel at all times, without regard to levels of protection required.
- Pump tests done for a residential water supply development project require only one person, provided that the physical hazards are minimal.
- Work performed for a private industrial client where a sign-in and sign-out system is employed, can be done by one person, provided that the work is not considered hazardous. In some instances a subcontractor, such as a drilling company, can provide the second person coverage, but this procedure must be reviewed by the Safety Department.
- Any person working by themselves should check in with his/her supervisor upon leaving the work site and/or completing the work.

CHAPTER 5

RECORD KEEPING AND REPORTING

LMS maintains records of all health and safety-related matters that occur during the course of the investigation for a minimum of 30 years. The records include field analytical data collected using field instruments (e.g., HNU, OVA), employee health monitoring data, health and safety planning documentation, and contingency plan communications and contacts, employee training records, and hazardous waste experience and exposure levels. The records will be provided to the client upon request. Table 5-1 is an example of a site health and safety report, which is prepared daily to ascertain the level of protection to be used. Table 5-2 is a data sheet that can be used to record air monitoring data. Additional logs or data sheets can be designed for each specific location depending on the need.

TABLE 5-1

DAILY HEALTH AND SAFETY REPORT

Date: _____

Background HNU Reading (Measured in Support Zone or
at Command Post)

Background OVA Reading (Measured in Support Zone or
at Command Post)

Background EXP Reading (Measured in Support Zone or
at Command Post)

Background OXY Reading (Measured in Support Zone or
at Command Post)

Background RAD Reading (Measured in Support Zone or
at Command Post)

Work Area and Task: _____

Ambient HNU Readings (Measured in Working Area):

Ambient OVA Readings (Measured in Working Area):

Ambient EXP Readings (Measured in Working Area):

Ambient OXY Readings (Measured in Working Area):

Ambient RAD Readings (Measured in Working Area):

Level of Protection Required: _____

Comments: _____

On-Site Health and Safety Officer: _____

00000000000000000000

HNu Meter: _____
OVA Meter: _____
Explosimeter: _____
Date: _____

[illegible]

(Date) _____

APPENDIX A
INFORMATION ON SENSITIVITY OF THE HNU PID
TO VARIOUS COMPOUNDS

TABLE A-1 (Page 1 of 4)

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm) ^a
acetaldehyde residues	10.2	0-200
acetic acid	10.2	0-20
acetic anhydride	11.7	0-2000
acetone	10.2	0-20
acetylene	11.7	0-20
acids (organic)	10.2/9.5	0-20 ^b
acrolein	10.2	0-20
acrylonitrile	11.7	0-20
alcohol in mouthwash	10.2	0-200
alcohols	11.7/10.2 /9.5	0-20 ^b
aldehydes	11.7/10.2	0-20 ^b
aliphatics	11.7/10.2	0-20 ^b
alkyl halides	11.7/10.2	0-20 ^b
allyl alcohol	10.2	0-20
amides	10.2	0-20 ^b
amines	10.2/9.5	0-20 ^b
ammonia	10.2	0-200
aniline	10.2/9.5	0-20
aromatics	10.2/9.5	0-20 ^b
arsen	10.2	0-20 ^b
asphalt plant emissions	10.2	0-20 ^b
benzene	10.2/9.5	0-20
butane from aerosol cans	11.7/10.2	0-20 ^b
boron tribromide	10.2/9.5	0-20
carbon disulfide	10.2	0-20
carbon tetrachloride	11.7	0-20
chlorinated aromatics	10.2/9.5	0-20 ^b
chlorinated hydrocarbons	11.7/10.2	0-20 ^b
chloroform	11.7	0-200
coffee aroma	10.2	0-20
cyclohexanone	10.2	0-20
dibromochloropropane	10.2	0-20
dichloropropylene	10.2	0-20
dimethyl disulfide	10.2/9.5	0-20
dimethyl sulfide	10.2/9.5	0-20
epichlorohydrin	10.2	0-20
essential oil emissions	10.2	0-20 ^b
esters	10.2	0-20 ^b
ethane	11.7	0-20 ^b
ethanol	10.2	0-200
ethyl methacrylate	10.2	0-20
ethylene	10.2	0-20
ethylene dibromide	10.2	0-20
ethylene dichloride	11.7	0-50
ethylene imine	10.2	0-20
ethylene oxide	10.2	0-50

^aBest range for determining if value is less than TWA-TLV.^bPreferred range for leak detection and survey work.

TABLE A-1 (Page 2 of 4)

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm) ^a
food and feed processing industry (hexane)	10.2	0-2000
formaldehyde	11.7	0-20
formic acid	11.7	0-20
fumigants:		
carbon disulfide	10.2	0-20
carbon tetrachloride	11.7	0-20
ethylene dibromide	10.2	0-20
phosphine	10.2	0-20
furan	10.2	0-20
grain fumigation	11.7/10.2	0-20 ^b
grain storage and transportation	11.7/10.2	0-20 ^b
hazardous waste disposal sites	11.7/10.2/9.5	0-20 ^b
headspace	10.2/9.5	0-20 ^b
heterocyclics	10.2	0-20 ^b
hydrazine	10.2	0-20
hydrogen sulfide	10.2	0-20
hydrogen selenide	10.2	0-20 ^b
industrial hygiene for:		
Determining sampling locations for charcoal tubes	11.7/10.2/9.5	0-20 ^b
General Lab and Plant Surveys	11.7/10.2/9.5	0-20 ^b
Leak Detection	11.7/10.2/9.5	0-20 ^b
industrial hygiene surveys in air:		
acetaldehyde oxime	10.2	0-20
acrylates	10.2	0-20 ^b
aircraft fuel vapor	10.2	0-20 ^b
bromine	10.2	0-20
ethylene oxide	10.2	0-50
iodine vapor	10.2	0-20
phosphine	10.2	0-20
styrene from fiberglass production	10.2/9.5	0-200
toluene	10.2/9.5	0-200
trichloroethylene	10.2	0-200
inorganic gases:		
AsH ₃	10.2	0-20
H ₂ S	10.2	0-20
NH ₃	10.2	0-200
PH ₃	10.2	0-20
ketones	10.2/9.5	0-20 ^b

^aBest range for determining if value is less than TWA-TLV.^bPreferred range for leak detection and survey work.

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm) ^a
leaks from valves and flanges	11.7/10.2/9.5	0-20 ^b
leaks in respiratory protection masks	11.7/10.2	0-20 ^b
lutidines	10.2	0-20 ^b
menthol in tobacco	10.2/9.5	0-20 ^b
methanol	11.7	0-20
methyl bromide	10.2	0-20
methyl isocyanate	10.2	0-20
methyl mercaptan	10.2	0-20
methyl methacrylate	10.2	0-200
methylene chloride	11.7/10.2	0-2000
mineral spirits	10.2	0-2000
monitoring	11.7/10.2/9.5	0-20
naphtha	10.2	0-200
nitrates	11.7/10.2	0-20 ^b
nitrites (C ₂ +)	11.7/10.2	0-20 ^b
nitro alkanes	11.7 10.2	0-20 ^b
nitro benzene	10.2	0-20
n-octane	10.2	0-2000
odors	11.7/10.2/9.5	0-20 ^b
oil vapor residues on aluminum foil	10.2	0-20 ^b
olefins	10.2	0-20 ^b
organic gases	11.7/10.2/9.5	0-20 ^b
pesticides:		
phostoxin	11.7/10.2	0-20 ^b
weevilicide	11.7/10.2	0-20 ^b
serafume	11.7/10.2	0-20 ^b
ethylene dibromide	11.7/10.2	0-20 ^b
phenol	10.2/9.5	0-20
phosphine	10.2	0-20
phosphorous trichloride	10.2	0-20
phostoxin	10.2	0-20
picolines	10.2	0-20 ^b
-pinene	10.2	0-20
propane	11.7	0-2000
propylene	10.2	0-20 ^b
pyridine	10.2/9.5	0-20
pyrole	10.2	0-20 ^b
quality control	11.7/10.2/9.5	0-20 ^b
railroad car leaks - derailments	11.7/10.2/9.5	0-20 ^b
reduced sulfur compounds	10.2	0-20 ^b

^aBest range for determining if value is less than TWA-TLV.^bPreferred range for leak detection and survey work.

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm) ^a
residual hexane	10.2	0-20 ^b
residual solvents in can liners and food	10.2	0-20 ^b
residual solvents on computer tape	10.2	0-20 ^b
residual solvents on paper products	10.2	0-20 ^b
residual solvents from printing ink	10.2	0-20 ^b
respirator cartridge breakthrough	11.7/10.2	0-20 ^b
serafume	11.7	0-20 ^b
solvents in air:		
carbon disulfides	10.2	0-20
chloropropenes	10.2	0-20
dimethyl formamide	10.2	0-20
doping gases:		
arsine	10.2	0-20
phosphine	10.2	0-20
hydrogen selenide	10.2	0-20
boron tribromide	10.2	0-20
ethylene dibromide	10.2	0-20
hexamethyl phosphoric	10.2	0-20
triamide	10.2	0-20
hydrogen sulfide	10.2	0-20
isopropanol	10.2	0-20
methyl methacrylate	10.2	0-200
styrene	10.2/9.5	0-200
tetrahydrofuran	10.2	0-200
tetraethyl lead	10.2	0-200
thionyl chloride	10.2	0-20
TLV monitor	11.7/10.2/9.5	0-20 ^b
toluene in air	10.2/9.5	0-200
total fumigant concentrations	11.7/10.2	0-20 ^b
total reduced sulfur	10.2	0-20 ^b
toxicology chamber monitoring	10.2	0-20 ^b
vinyl acetate	10.2	0-20 ^b
vinyl bromide	10.2	0-20 ^b
vinyl chloride	10.2	0-20
vinylidene	10.2	0-20 ^b

^aBest range for determining if value is less than TWA-TLV.^bPreferred range for leak detection and survey work.

TABLE A-2 (Page 1 of 2)

SELECTED LIST OF SPECIES DETECTED BY HNU

CLASS SPECIES	PHOTOIONIZATION RESPONSE		
	9.5 eV lamp	10.2 eV lamp	11.7 eV lamp
PARAFFINS AND UNSATURATED HYDROCARBONS			
methane	NR	NR	NR
ethylene	NR	L	H
acetylene	NR	NR	H
1-butene	H	H	H
hexane	NR	L	H
CHLORINATED HYDROCARBONS			
methyl chloride	NR	NR	H
carbon tetrachloride	NR	NR	H
chloroform	NR	NR	H
dichloroethane	NR	NR	H
vinylidene chloride	L	H	H
vinyl chloride	L	H	H
trichloroethylene	H	H	H
HETEROCYCLICS & AROMATICS			
phenol	H	H	H
pyridine	H	H	H
benzene	H	H	H
toluene	H	H	H
xylene	H	H	H
styrene	H	H	H
aniline	H	H	H
chlorobenzene	H	H	H
nitrobenzene	NR	L	H
NITROGEN COMPOUNDS			
formamide	NR	H	H
ammonia	NR	L	H
hydrazine	H	H	H
methyl amine	H	H	H
acetonitrile	NR	NR	NR
acrylonitrile	NR	NR	H

NR: no response

H: high response

L: low response

TABLE A-2 (Page 2 of 2)

SELECTED LIST OF SPECIES DETECTED BY HNU

CLASS SPECIES	PHOTOIONIZATION RESPONSE		
	9.5 eV lamp	10.2 eV lamp	11.7 eV lamp
SULFUR COMPOUNDS			
sulfur dioxide	NR	NR	NR
hydrogen sulfide	NR	H	H
carbonyl sulfide	NR	NR	H
carbon disulfide	H	H	H
methyl mercaptan	H	H	H
dimethyl sulfide	H	H	H
dimethyl disulfide	H	H	H
ALDEHYDES, KETONES, ALCOHOLS, ACIDS, ESTERS			
formaldehyde	NR	NR	H
acetaldehyde	NR	H	H
propionaldehyde	L	H	H
acrolein	L	H	H
crotonaldehyde	L	H	H
acetone	L	H	H
methanol	NR	NR	H
ethanol	NR	L	H
formic acid	NR	NR	H
acetic acid	NR	L	H
methyl methacrylate	L	H	H
OTHERS			
ethylene dibromide	NR	H	H
ethylene oxide	NR	L	H
tetraethyl lead	H	H	H
phosphine	NR	H	H
arsine	NR	H	H
iodine	H	H	H

NR: no response
H: high response
L: low response

TABLE A-3 (Page 1 of 2)

**RELATIVE PHOTOIONIZATION SENSITIVITIES
OF VARIOUS GASES TO A 10.2 HNU LAMP**

GAS	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approximate)
p-xylene	11.4	3.0
m-xylene	11.2	
benzene	10.0	9.8
	(reference standard - see note 2)	
toluene	10.0	
diethyl sulfide	10.0	
diethyl amine	9.9	9.0
styrene	9.7	9.8
trichloroethylene	8.9	8.2
tetrachlorethylene		6.1
carbon disulfide	7.1	8.0
isobutylene	7.0	8.0
acetone	6.3	
tetrahydrofuran	6.0	5.5
methyl ethyl ketone	5.7	3.8
methyl isobutyl ketone	5.7	4.7
cyclohexanone	5.1	1-3
naptha (85% aromatics)	5.0	3.3
vinyl chloride	5.0	4.3
methyl isocyanate	4.5	
iodine	4.5	
methyl mercaptan	4.3	1.0
EDB	2.7	
dimethy sulfide	4.3	4.0
allyl alcohol	4.2	
propylene	4.0	3.5
mineral spirits	4.0	
2,3-dichloropropene	4.0	
cycloexene	3.4	
crotonaldehyde	3.1	
acrolein	3.1	1.0
methyl methacrylate	3.0	2.4
pyridine	3.0	3.0
hydrogen sulfide	2.8	3.0
ethylene dibromide	2.7	1.9
n-octane	2.5	
acetaldehyde oxims	2.3	
hexane	2.2	1-2

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

Note 2: Meter is calibrated to benzene but iosbutylene is utilized as calibration gas.

TABLE A-3 (Page 2 of 2)

**RELATIVE PHOTOIONIZATION SENSITIVITIES
OF VARIOUS GASES TO A 10.2 HNU LAMP**

GAS	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approximate)
phosphine	2.0	1-2
heptane	1.7	
allyl chloride (3-chloropropane)	1.5	
ethylene oxide	1.0	2.0
acetic anhydride	1.0	
pinene	0.7	
dibromochloropropane	0.7	
epichlorohydrin	0.7	
nitric oxide	0.6	2.5-3
pinne	0.5	
citral	0.5	
ammonia	0.3	
acetic acid	0.1	
nitrogen dioxide	0.02	
methane	0.0	
acetylene		
hydrazine		
decane		
n,n-dimethanol amine		6.6
n,n-dimethyl formamide		3.5
1,2-dibromomethane		

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

Note 2: Meter is calibrated to benzene but isobutylene is utilized as calibration gas.

TABLE A-4

**RELATIVE PHOTOIONIZATION SENSITIVITIES
OF VARIOUS GASES TO A 11.7 HNU LAMP**

DIRECT GAS (approx.)	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approx.)
Carbon Disulfide	33.8	
Heptane	22.1	
Hexane	18.9	
Pentane	14.1	
1,2 Dichloroethane	12.9	
Benzene	12.2	5.0
MIBK	10.6	
Isobutylene	10.0 (reference Std.)	
Toluene	10.0	
Methyl Chloride	9.8	
Methylene Chloride	9.4	
1,1,1,-Trichloroethane	9.0	
Carbon Tetrachloride	9.0	
Ethylene Dichloride	9.0	
Butane	8.7	
THF	7.9	
Acrylonitrile	7.1	2.0
MEK	6.3	
Chloroform	6.0	
1,1,2,2-Tetrachloroethane	6.0	
Acetone	5.7	
Propane	5.5	
Isopropanol	4.5	
Acrolein	3.4	1.0
Ethane	3.0	
Ethanol	3.0	
Methanol	1.0	
1,1,2-Trifluoroethane	0.3	
Acetonitrile	0.1	

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

TABLE A-5

**RELATIVE PHOTOIONIZATION SENSITIVITIES
OF VARIOUS GASES TO A HNU 9.5 LAMP**

DIRECT GAS (approx.)	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approx.)
Xylene	10.0 (reference Std.)	1.0
Benzene	10.0	
Styrene	10.0	
Toluene	7.7	
Phenol	3.9	
Aniline	2.9	
MEK	2.2	
Pyridine	0.65	
Acetone	<0.6 ^a	
Methyl Methacrylate	<0.2 ^a	
Heptane	0	
Hexane	0	
Ammonia	0	
Pentane		

^aCommercial products containing impurities; response for pure materials is probably less.

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

TABLE A-6 (Page 1 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

SOME ATOMS AND SIMPLE MOLECULES				PARAFFINS AND CYCLOPARAFFINS	
	IP(eV)		IP(eV)	Molecule	IP(eV)
H	13.595	I ₂	9.28	methane	12.98
C	11.264	HF	15.77	ethane	11.65
N	14.54	HCl	12.74	propane	11.07
O	13.614	HBr	11.62	n-butane	10.63
Si	8.149	HI	10.38	i-butane	10.57
S	10.357	SO ₂	12.34	n-pentane	10.35
F	17.42	CO ₂	13.79	i-pentane	10.32
Cl	13.01	COS	11.18	2,2-dimethylpropane	10.35
B	11.84	CS ₂	10.08	n-hexane	10.18
I	10.48	N ₂ O	12.90	2-methylpentane	10.12
H ₂	15.426	NO ₂	9.78	3-methylpentane	10.08
N ₂	15.580	O ₃	12.80	2,2-dimethylbutane	10.06
O ₂	12.075	H ² O	12.59	2,3-dimethylbutane	10.02
CO	14.01	H ₂ S	10.46	n-heptane	10.08
CN	15.13	H ₂ Se	9.88	2,2,4-trimethylpentane	9.86
NO	9.25	H ₂ Te	9.14	cyclopropane	10.06
CH	11.1	HCN	13.91	cyclopentane	10.53
OH	13.18	C ₂ N ₂	13.8	cyclohexane	9.88
F ₂	15.7	NH ₃	10.15	methylcyclohexane	9.85
Cl ₂	11.48	CH ₃	9.840		
Br ₂	10.55	CH ₄	12.98		

TABLE A-6 (Page 2 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALKYL HALIDES			
Molecule	IP(eV)	Molecule	IP(eV)
HCl	12.74	1-bromo-2-methylpropane	10.09
Cl ²	11.48	2-bromo-2-methylpropane	9.98
CH ₄	12.98	1-bromopentane	10.10
methylchloride	11.28	HI	10.38
dechloromethane	11.35	I ₂	9.28
trichloromethane	11.42	methyliodide	9.54
tetrachloromethane	11.47	diiodomethane	9.34
ethylchloride	10.98	ethyliodide	9.33
1,2-dichloroethane	11.12	1-iodopropane	9.26
1-chloropropane	10.82	2-iodopropane	9.17
2-chloropropane	10.78	1-iodobutane	9.21
1,2-dichlorobutane	10.87	2-iodobutane	9.09
1,3-dichlorobutane	10.85	1-iodo-2-methylpropane	9.18
1-chloropropane	10.67	2-iodo-2-methylpropane	9.02
2-chloropropane	10.65	1-iodopropane	9.19
1-chloro-2-methylpropane	10.66	F ₂	15.7
2-chloro-2-methylpropane	10.61	HF	15.77
HBr	11.62	CFCl ₃ (Freon 11)	11.77
Br ₂	10.55	CF ₂ Cl ₂ (Freon 12)	12.31
methylbromide	10.53	CF ₃ Cl (Freon 13)	12.91
dibromomethane	10.49	CHClF ₂ (Freon 22)	12.45
tribromomethane	10.51	CFBr ₃	10.67
CH ₂ BrCl	10.77	CF ₂ Br ₂	11.07
CHBr ₂ Cl	10.59	CH ₃ CF ₂ Cl (Genetron 101)	11.98
ethylbromide	10.29	CFCl ₂ CF ₂ Cl	11.99
1,1-dibromoethane	10.19	CF ₃ CCl ₃ (Freon 113)	11.78
1-bromo-2-chloroethane	10.63	CFHBrCH ₂ Br	10.75
1-bromopropane	10.18	CF ₂ BrCH ₂ Br	10.83
2-bromopropane	10.075	CF ₃ CH ₂ I	10.00
1,3-dibromopropane	10.07	n-C ₃ F ₇ I	10.36
1-bromobutane	10.13	n-C ₃ F ₇ CH ₂ Cl	11.84
2-bromobutane	9.98	n-C ₃ F ₇ CH ₂ I	9.96

TABLE A-6 (Page 3 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALIPHATIC ALCOHOL, ETHER, THIOL, AND SULFIDES		ALIPHATIC ALDEHYDES AND KETONES	
Molecule	IP(eV)	Molecule	IP(eV)
H ₂ O	12.59	CO ₂	13.79
methyl alcohol	10.85	formaldehyde	10.87
ethyl alcohol	10.48	acetaldehyde	10.21
n-propyl alcohol	10.20	propionaldehyde	9.98
i-propyl alcohol	10.16	n-butyraldehyde	9.86
n-butyl alcohol	10.04	isobutyraldehyde	9.74
dimethyl ether	10.00	n-valeraldehyde	9.82
diethyl ether	9.53	isovaleraldehyde	9.71
n-propyl ether	9.27	acrolein	10.10
i-propyl ether	9.20	crotonaldehyde	9.73
H ₂ S	10.46	benzaldehyde	9.53
methanethiol	9.440	acetone	9.69
ethanethiol	9.285	methyl ethyl ketone	9.53
1-propanethiol	9.195	methyl n-propyl ketone	9.39
1-butanethiol	9.14	methyl i-propyl ketone	9.32
dimethyl sulfide	8.685	diethyl ketone	9.32
ethyl methyl sulfide	8.55	methyl n-butyl ketone	9.34
diethyl sulfide	8.430	methyl i-butyl ketone	9.30
di-ni-propyl sulfide	8.30	3,3-dimethyl butanone	9.17
		2-heptanone	9.33
		cyclopentanone	9.26
		cyclohexanone	9.14
		2,3-butanedione	9.23
		2,4-pentanedione	8.87

TABLE A-6 (Page 4 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALIPHATIC ACIDS AND ESTERS		ALIPHATIC AMINES AND AMIDES	
Molecule	IP(eV)	Molecule	IP(eV)
CO ₂	13.79	NH ₃	10.15
formic acid	11.05	methyl amine	8.97
acetic acid	10.37	ethyl amine	8.86
propionic acid	10.24	n-propyl amine	8.78
n-butyric acid	10.16	i-propyl amine	8.72
isobutyric acid	10.02	n-butyl amine	8.71
n-valeric acid	10.12	i-butyl amine	8.70
methyl formate	10.815	s-butyl amine	8.70
ethyl formate	10.61	t-butyl amine	8.64
n-propyl formate	10.54	dimethyl amine	8.24
n-butyl formate	10.50	diethyl amine	8.01
isobutyl formate	10.46	di-n-propyl amine	7.84
methyl acetate	10.27	di-i-propyl amine	7.73
ethyl acetate	10.11	di-n-butyl amine	7.69
n-propyl acetate	10.04	trimethyl amine	7.82
isopropyl acetate	9.99	triethyl amine	7.50
n-butyl acetate	10.01	tri-n-propyl amine	7.23
isobutyl acetate	9.97	formamide	10.25
sec-butyl acetate	9.91	acetamide	9.77
methyl propionate	10.15	N-methyl acetamide	8.90
ethyl propionate	10.00	N,N-dimethyl formamide	9.12
methyl n-butyrate	10.07	N,N-dimethyl acetamide	8.81
methyl isobutyrate	9.98	N,N-diethyl formamide	8.89
		N,N-diethyl acetamide	8.60

TABLE A-6 (Page 5 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

OTHER ALIPHATIC MOLECULES WITH N ATOM		OLEFINS, CYCLO-OLEFINS, ACETYLENES	
Molecule	IP(eV)	Molecule	IP(eV)
nitromethane	11.08	ethylene	10.515
nitroethane	10.88	propylene	9.73
1-nitropropane	10.81	1-butene	9.58
2-nitropropane	10.71	2-methylpropene	9.23
HCN	13.91	trans-2-butene	9.13
acetonitrile	12.22	cis-2-butene	9.13
propionitrile	11.84	1-pentene	9.50
n-butyronitrile	11.67	2-methyl-1-butene	9.12
acrylonitrile	10.91	3-methyl-1-butene	9.51
3-butene-nitrile	10.39	3-methyl-2-butene	8.67
ethyl nitrate	11.22	1-hexene	9.46
n-propyl nitrate		1,3-butadiene	9.07
methyl thiocyanate	10.065	isoprene	8.845
ethyl thiocyanate	9.89	cyclopentene	9.01
methyl isothiocyanate	9.25	cyclohexene	8.945
ethyl isothiocyanate	9.14	4-methylcyclohexene	8.91
		4-cinylcyclohexene	8.93
		cyclo-octatetraene	7.99
		acetylene	11.41
		propyne	10.36
		1-butyne	10.18

TABLE A-6 (Page 6 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

SOME DERIVATIONS OF OLEFINS		HETEROCYCLIC MOLECULES	
Molecule	IP(eV)	Molecule	IP(eV)
vinyl chloride	9.995	furan	8.89
cis-dichloroethylene	9.65	2-methyl furan	8.39
trans-dichloroethylene	9.66	2-furaldehyde	9.21
trichloroethylene	9.45	tetrahydrofuran	9.54
tetrachloroethylene	9.32	dihydropyran	8.34
vinyl bromide	9.80	tetrachydropyran	9.26
1,2-dibromoethylene	9.45	thiophene	8.860
tribromoethylene	9.27	2-chlorothiophene	8.68
3-chloropropene	10.04	2-bromothiophene	8.63
2,3-dichloropropene	9.82	pyrrole	8.20
1-bromopropene	9.30	pyridine	9.32
3-bromopropene	9.7	2-picoline	9.02
CF ₃ CCl = CCICF ₃	10.36	3-picoline	9.04
n-C ₅ F ₁₁ CF = CF ₃	10.48	4-picoline	9.04
acrolein	10.10	2,3-lutidine	8.85
crotonaldehyde	9.73	2,4-lutidine	8.85
mesityl oxide	9.08	2,6-lutidine	8.85
vinyl methyl ether	8.93		
allyl alcohol	9.67		
vinyl acetate	9.19		

TABLE A-6 (Page 7 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

AROMATIC COMPOUNDS			
Molecule	IP(eV)	Molecule	IP(eV)
benzene	9.245	nitrobenzene	9.92
toluene	8.82	aniline	7.70
ethyl benzene	8.76	fluoro-benzene	9.195
n-propyl benzene	8.72	chloro-benzene	8.98
i-propyl benzene	8.69	bromo-benzene	8.73
n-butyl benzene	8.69	iodo-benzene	9.07
s-butyl benzene	8.68	o-dichlorobenzene	9.12
t-butyl benzene	8.68	m-dichlorobenzene	8.94
o-xylene	8.56	p-dichlorobenzene	9.155
m-xylene	8.56	1-chloro-2-fluoro-	9.21
p-xylene	8.445	benzene	
mesitylene	8.40	1-chloro-3-fluoro-	8.99
durene	8.025	benzene	
styrene	8.47	1-chloro-4-fluoro-	8.915
-methyl styrene	8.35	benzene	
ethylbenzene	8.815	o-fluorotoluene	8.915
naphthalene	8.12	m-fluorotoluene	8.915
1-methylnaphthalene	7.69	p-fluorotoluene	8.785
2-methylnaphthalene	7.955	o-chlorotoluene	8.83
biphenyl	8.27	m-chlorotoluene	8.83
phenol	8.50	p-chlorotoluene	8.70
anisole	8.22	o-bromotoluene	8.79
phenetole	8.13	m-bromotoluene	8.81
benzaldehyde	9.53	p-bromotoluene	8.67
acetophenone	9.27	o-iodotoluene	8.62
benzenethiol	8.33	m-iodotoluene	8.61
phenyl isocyanate	8.77	p-iodotoluene	8.50
phenyl isothiocyanate	8.520	benzotrifluoride	9.68
benzonitrile	9.705	o-fluorophenol	8.66

TABLE A-6 (Page 8 of 8)
IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

MISCELLANEOUS MOLECULES	
Molecule	IP(eV)
ethylene oxide	10.565
propylene oxide	10.22
p-dioxane	9.13
dimethoxymethane	10.00
diethoxymethane	9.70
1,1-dimethoxyethane	9.65
propiolactone	9.70
methyl disulfide	8.46
ethyl disulfide	8.27
diethyl sulfide	9.68
thiolacetic acid	10.00
acetyl chloride	11.02
acetyl bromide	10.55
cyclo-C ₆ H ₁₁ CF ₃	10.46
(n-C ₃ F ₇)(CH ₃)C=O	10.58
trichlorovinylsilane	10.79
(C ₂ F ₅) ₃ N	11.7
isoprene	9.08
phosgene	11.77

APPENDIX B

MSHA/NIOSH

APPROVALS FOR RESPIRATORS AND CARTRIDGES

Ultra-Twin[®] respirator

combination cartridge, GMA-F type

NIOSH and MSHA Approved for
respiratory protection against organic vapors,
and dusts and mists

(See approval plate, opposite page, for specific limitations)

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMA-F Respirator Assembly
consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMA-F Cartridge	464023 (10/PKG.)	2

GMA-F
NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS AND
DUSTS AND MISTS

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH



APPROVAL NO.
TC-23C-151



ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, and dusts and mists having a time weighted average not less than 0.05 milligram per cubic meter or 2 million particles per cubic foot.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow the manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-151

Issued to Mine Safety Appliances Company - August 31, 1984

The approved full facepiece respirator assembly for organic vapors, dust and mists consists of the following MSA parts: 7-204-1, 7-204-2 or 7-204-3 facepiece and 460964 (TC-23C-151) cartridges.

Ultra-TwinTM respirator

combination cartridge, GMA-H type

NIOSH and MSHA Approved for respiratory protection against organic vapors; pesticides; paint, lacquer and enamel mists and dust, fumes, mists, asbestos-containing dusts and mists and radionuclides

(See approval plate, opposite page, for specific limitations)

WARNING: Do not use for urethane paints or other paints containing diisocyanates because of their poor warning properties. Use against such contaminants could result in severe or permanent damage to the respiratory system. Use Air Supplied Respirators.

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMA-H Respirator Assembly consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMA-H Cartridge	464029 (6/PKG.)	2

GMA-H
NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR FOR
ORGANIC VAPORS; PESTICIDES; PAINT,
LACQUER AND ENAMEL MISTS AND
DUSTS, FUMES, MISTS
AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH



APPROVAL NO.
TC-23C-155



ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U.S.A.

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 parts per million organic vapors by volume; (2) pesticides; (3) mists of paints, lacquers and enamels and (4) dusts, fumes, and mists having a time weighted average less than 0.05 milligram per cubic meter, asbestos-containing dusts and mists and radionuclides. Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigants. Not for use in atmospheres containing less than 19.5 percent oxygen. Not for use in atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained. Follow the manufacturer's instructions for changing cartridges. This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-155
Issued to Mine Safety Appliances Company — May 10, 1985

The approved full facepiece respirator assembly for organic vapors; pesticides; paint, lacquer and enamel mists and dusts, fumes, mists and radionuclides consists of the following MSA parts: 7-204-1, 7-204-2 or 7-204-3 facepiece and 460842 (TC-23C-155) cartridges.

Ultra-Twin[®] respirator

combination cartridge, GMC-H type

NIOSH and MSHA Approved for
respiratory protection against acid gases
and/or organic and formaldehyde vapors
and dusts, fumes, mists, asbestos-containing
dusts and mists and radionuclides

See approval plate, opposite page, for specific limitations

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMC-H Respirator Assembly consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMC-H Cartridge	464027 (6/PKG.)	2

GMC-H
NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR FOR
ORGANIC AND FORMALDEHYDE VAPORS,
CHLORINE, HYDROGEN CHLORIDE,
SULFUR DIOXIDE, AND DUSTS, FUMES,
MISTS, AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH



APPROVAL NO.
TC-23C-153



ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors, 30 parts per million formaldehyde vapor; 10 parts per million chlorine; 50 parts per million hydrogen chloride; 50 parts per million sulfur dioxide; dusts, fumes, and mists having a time weighted average less than 0.05 milligram per cubic meter, asbestos-containing dusts and mists and radionuclides.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-153

Issued to Mine Safety Appliances Company - March 10, 1983

The approved full facepiece respirator assembly for organic and formaldehyde vapors, chlorine, hydrogen chloride, sulfur dioxide, dust, fumes, mists, and radionuclides consists of the following MSA parts: 7-204-1, 7-204-2 or 7-204-3 facepiece and 460844 (TC-23C-153) cartridges.

**NIOSH Approval Label
For Full Facepiece Respirator Using R53HE
Combination Filter Cartridges
(R7753HE, S7753HE)**

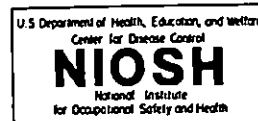
Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE,
CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND
MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-23C-418



**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigants.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418

ISSUED TO

**AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

**NIOSH Approval Label
For Full Facepiece Respirator Using R53HE
Combination Filter Cartridges
(R7753HE, S7753HE)**

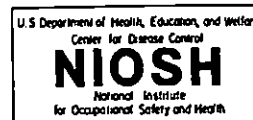
Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE,
CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND
MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-23C-418



**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418

ISSUED TO

**AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

**NIOSH Approval Label
For Full Facepiece Respirator Using R53HE
Combination Filter Cartridges
(R7753HE, S7753HE)**

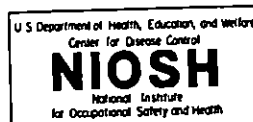
Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE,
CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND
MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-23C-418



**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418

ISSUED TO

**AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



U. S. Department of Health and Human Services
Centers for Disease Control

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MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen. Not for use in atmospheres immediately dangerous to life or health. Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained. Follow manufacturer's instructions for changing cartridges. This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

**NIOSH Approval Label
For Full Facepiece Respirator Using R53HE
Combination Filter Cartridges
(R7753HE, S7753HE)**

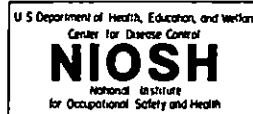
Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE,
CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND
MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-23C-418



**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418

ISSUED TO

**AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



U. S. Department of Health and Human Services
Centers for Disease Control

NIOSH
National Institute
for Occupational Safety and Health

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH**

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

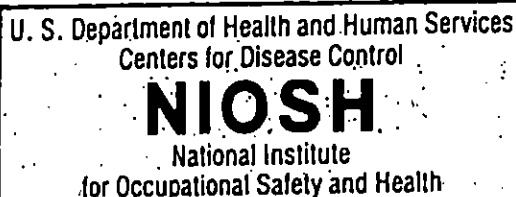
MSHA-NIOSH APPROVAL TC-23C-212

Issued to North Safety Equipment

March 29, 1988

**THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.**

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH**

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen. Not for use in atmospheres immediately dangerous to life or health.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212

Issued to North Safety Equipment

March 29, 1988

**THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.**

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



U. S. Department of Health and Human Services
Centers for Disease Control

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MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212

Issued to North Safety Equipment

March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



U. S. Department of Health and Human Services
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**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH**

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS.

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212

Issued to North Safety Equipment

March 29, 1988

**THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.**

**NIOSH Approval Label
For Full Facepiece Respirator Using R53HE
Combination Filter Cartridges
(R7753HE, S7753HE)**

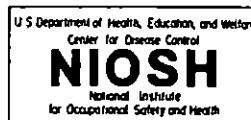
Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE,
CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND
MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-23C-418



**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418

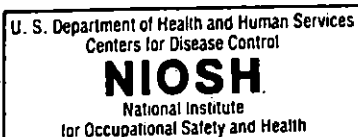
ISSUED TO

**AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

**MODEL 7683
PERMISSIBLE
CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN
CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS,
FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS**



**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH**

APPROVAL NO. TC-23C-212

ISSUED TO

**NORTH SAFETY EQUIPMENT
Cranston, Rhode Island, U.S.A.**

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists. Not for use in atmospheres containing less than 19.5 percent oxygen. Not for use in atmospheres immediately dangerous to life or health. Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained. Follow manufacturer's instructions for changing cartridges. This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

**MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988**

**THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.**

APPENDIX C

OSHA PELs AND NIOSH RELs

TABLE C-1 (Page 1 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Acetaldehyde	75-07-0	200	360	-
Acetic acid	64-19-7	10	25	-
Acetic anhydride	108-24-7	5	20	-
Acetone	67-64-1	1000	2400	-
Acetonitrile	75-05-8	40	70	-
2-Acetylaminofluorine; see 1910.1014	53-96-3			
Acetylene dichloride; see 1,2-Dichloroethylene				
Acetylene tetrabromide	79-27-6	1	14	-
Acrolein	107-02-8	0.1	0.25	-
Acrylamide	79-06-1	-	0.3	X
Acrylic acid	79-10-7	-	-	X
Acrylonitrile; see 1910.1045	107-13-1	2		
Aldrin	309-00-2	-	0.25	-
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	X
Allylglycidyl ether (AGE)	106-92-3	C 10	C 45	-
Allyl propyl disulfide	2179-59-1	2	12	-
alpha-Alumina:	1344-28-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Aluminum (as Al):	7429-90-5			
Metal:				
Total dust		-	15	-
Respirable fraction		-	5	-
2-Aminodiphenyl; see 1910.1011	92-67-1			
2-Aminoethanol; see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 2 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Ammonia	7664-41-7	50	35	-
Ammonium chloride fume	12125-02-9	-	-	-
Ammonia sulfamate:	7773-06-0			
Total dust		-	15	-
Respirable fraction		-	5	-
n-Amyl acetate	628-63-7	100	525	-
sec-Amyl acetate	626-38-0	125	650	-
Aniline and homologs	62-53-3	5	19	X
Anisidine (o,p-isomers) - skin	29191-52-4	-	0.5	X
Antimony and compounds (as Sb)	7440-36-0	-	0.5	-
Alpha naphthyl thiourea (ANTU)	86-88-4	-	0.3	-
Arsenic organic compounds (as As)	7440-38-2	-	0.5	-
Arsenic, inorganic compounds (as As); see 1910.1018	7440-38-2	-	0.01	-
Arsine	7784-42-1	0.05	0.2	-
Asbestos; see 1910.1001	Varies			
Azinphos-methyl	86-50-0	-	0.1 fibers/cc	X
Barium (soluble compounds) (as Ba)	7440-39-3	-	0.5	-
Barium sulfate:	7727-43-7			
Total dust		-	15	-
Respirable fraction		-	5	-
Benomyl:	17804-35-2			
Total dust		-	15	-
Respirable fraction		-	5	-
Benzene; see 1910.1028	71-43-2	1	3.25	
Benzidine; see 1910.1010	92-87-5			
p-Benzoquinone; see Quinone				
Benzo(a)pyrene; see coal tar pitch volatiles				

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 3 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Benzoyl peroxide	94-36-0	-	5	-
Benzyl chloride	100-44-7	1	5	-
Beryllium and beryllium compounds (as Be)	7440-41-7	-	0.002	-
Biphenyl; see Diphenyl				
Bismuth telluride, undoped:	1304-82-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Boron oxide:	1303-86-2			
Total dust		-	15	-
Boron trifluoride	7637-07-2	C 1	C 3	-
Bromine	7726-95-6	0.1	0.7	-
Bromoform	75-25-2	0.5	5	X
Butadiene (1,3-butadiene)	106-99-0	1.0	2.2	
Butanethiol; see Butyl mercaptan				
2-Butanone (methyl ethyl ketone)	79-93-3	200	590	-
2-Butoxyethanol	111-76-2	50	240	-
n-Butyl acetate	123-86-4	150	710	-
sec-Butyl acetate	105-46-4	200	950	-
tert-Butyl acetate	540-88-5	200	950	-
n-Butyl alcohol	71-36-3	100	300	X
sec-Butyl alcohol	78-92-2	150	450	-
tert-Butyl alcohol	75-65-0	100	300	-
Butylamine	109-73-9	C 5	C 15	X
tert-Butyl chromate (as CrO ₃)	1189-85-1	-	C 0.1	X
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	-
Butyl mercaptan	109-79-5	10	35	-
p-tert-Butyltoluene	98-51-1	10	60	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 4 of 23)
OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Cadmium (as Cd); see 1910.1027	7440-43-9	-	0.005 ^d	
Calcium carbonate:	1317-65-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Calcium hydroxide:	1305-62-0			-
Total dust		-	15	
Respirable fraction		-	5	
Calcium oxide	1305-78-8	-	5	-
Calcium silicate:	1344-95-2			
Total dust		-	15	-
Respirable fraction		-	5	-
Calcium sulfate:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Camphor, synthetic	76-22-2	-	2	-
Carbaryl (Sevin [®])	63-25-2	-	5	-
Carbon black	1333-86-4	-	3.5	-
Carbon dioxide	124-38-9	5000	9000	-
Carbon disulfide	75-15-0	20	63.2 ^d	X
Carbon monoxide	630-08-0	50	55	-
Carbon tetrachloride	56-23-5	10	63.9 ^d	-
Cellulose:	9004-34-6			
Total dust		-	15	-
Respirable fraction		-	5	-
Chlordane	57-74-9	-	0.5	X
Chlorinated camphene	8001-35-2	-	0.5	X
Chlorinated diphenyl oxide	55720-99-5	-	0.5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 5 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Chlorine	7782-50-5	C 1	C 3	-
Chlorine dioxide	10049-04-4	0.1	0.3	-
Chlorine trifluoride	7790-91-2	C 0.1	C 0.4	-
Chloroacetaldehyde	107-20-0	C 1	C 3	-
a-Chloroacetophenone (phenacyl chloride)	532-27-4	0.05	0.3	-
Chlorobenzene	108-90-7	75	350	-
o-Chlorobenzylidene malononitrile	2698-41-1	0.05	0.4	X
Chlorobromomethane	74-97-5	200	1050	-
2-Chloro-1,3-butadiene; see b-Chloroprene				
Chlorodifluoromethane	75-45-6	1000	3500	-
Chlorodiphenyl (42% Chlorine) (PCB)	53469-21-9	-	1	X
Chlorodiphenyl (54% Chlorine) (PCB)	11097-69-1	-	0.5	X
1-Chloro, 2,3-epoxypropane; see Epichlorohydrin				
2-Chloroethanol; see Ethylene chlorohydrin				
Chloroethylene; see Vinyl chloride				
Chloroform (Trichloromethane)	67-66-3	C 50	C 240	-
bis(Chloromethyl)ether; see 1910.1008	542-88-1			
Chloromethyl methyl ether; see 1910.1006	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	-
Chloropicrin	76-06-2	0.1	0.7	-
beta-Chloroprene	126-99-8	25	90	X
o-Chlorostyrene	2039-87-4	-	-	-
o-Chlorotoluene	95-49-8	-	-	-
2-Chloro-6-trichloromethyl pyridine:	1929-82-4			
Total dust		-	15	-
Respirable fraction		-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 6 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Chromic acid and chromates (as CrO ₃)	Varies with compound	-	C 0.1 ^d	
Chromium (II) compounds (as Cr)	7440-47-3	-	0.5	-
Chromium (III) compounds (as Cr)	7440-47-3	-	0.5	-
Chromium metal and insoluble salts (as Cr)	7440-47-3	-	1	-
Chrysene; see Coal tar pitch volatiles	218-01-9			
Clopidol:	2971-90-6			
Total dust		-	15	-
Respirable fraction		-	5	-
Coal dust (less than 5% SiO ₂), respirable quartz fraction		-	e	-
Coal dust (greater than or equal to 5% SiO ₂), respirable quartz fraction		-	e	-
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene	65966-93-2	-	0.2	-
Cobalt metal, dust, and fume (as Co)	7440-48-4	-	0.1	-
Coke oven emissions; see 1910.1043	--			
Copper:	7440-50-8			
Fume (as Cu)		-	0.1	-
Dusts and mists (as Cu)		-	1	-
Cotton dust; see 1910.1043	--	-	0.002	-
Crag herbicide (Sesone):	136-78-7			
Total dust		-	15	-
Respirable fraction		-	5	-
Cresol, all isomers	1319-77-3	5	22	X
Crotonaldehyde	123-73-9; 4170-30-3	2	6	-
Cumene	98-82-8	50	245	X
Cyanides (as CN)	Varies with compound	-	5	-
Cyclohexane	110-82-7	300	1050	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 7 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Cyclohexanol	108-93-0	50	200	X
Cyclohexanone	108-94-1	50	200	X
Cyclohexene	110-83-8	300	1015	-
Cyclopentadiene	542-92-7	75	200	-
2,4-D(Dichlorophenoxy-acetic acid)	94-75-7	-	10	-
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox ^R)	8065-48-3	-	0.1	X
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	-
1,2-Diaminoethane; see Ethylenediamine				
Diazinon	333-41-5	-	-	-
Diazomethane	334-88-3	0.2	0.4	-
Diborane	19287-45-7	0.1	0.1	-
1,2-Dibromo-3-chloropropane; see 1910.1044	96-12-8	0.001	0.0098	
1,2-dibromoethane; see Ethylene dibromide				
Dibutyl phosphate	107-66-4	1	5	-
Dibutyl phthalate	84-74-2	-	5	-
o-Dichlorobenzene	95-50-1	C 50	C 200	-
p-Dichlorobenzene	106-46-7	75	450	-
3,3'-Dichlorobenzidine; see 1910.1007	91-94-1	-	-	
Dichlorodifluoromethane	75-71-8	1000	4950	-
1,3-Dichloro-5,5-dimethyl hydantoin	118-52-5	-	0.2	-
1,1-Dichloroethane	75-34-3	100	400	-
1,2-Dichloroethane; see Ethylene dichloride				
1,2-Dichloroethylene	540-59-0	200	790	-
Dichloroethyl ether	111-44-4	C 15	C 90	X
Dichloromethane; see Methylene chloride				
Dichloromonofluoromethane	75-43-4	1000	4200	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 8 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ^{3b}	
1,1-Dichloro-1-nitroethane	594-72-9	C 10	C 60	-
1,2-Dichloropropane; see Propylene dichloride				
Dichlorotetrafluoroethane	76-14-2	1000	7000	-
Dicrotophos (DDUP)	141-66-2	-	1	X
Dicyclopentadienyl iron:	102-54-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Dieldrin	60-57-1	-	0.25	X
Diethylamine	109-89-7	25	75	-
2-Diethylaminoethanol	100-37-8	10	50	X
Diethyl ether; see Ethyl ether				
Difluorodibromomethane	75-61-6	100	860	-
Diglycidyl ether (DGE)	2238-07-5	C 0.5	C 2.8	-
Dihydroxybenzene; see Hydroquinone				
Diisobutyl ketone	108-83-8	50	290	-
Diisopropylamine	108-18-9	5	20	X
4-Dimethylaminoazobenzene; see 1910.1015	60-11-7			
Dimethoxymethane; see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	-
Dimethylaminobenzene; see Xylidene				
Dimethylaniline (N,N-Dimethyl aniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene				
Dimethyl-1,2-dibromo-2,2-dichloroethyl phosphate	300-76-5	-	3	X
Dimethylformamide	68-12-2	10	30	X
2,6-Dimethyl-4-heptanone; see Diisobutyl ketone				
1,1-Dimethylhydrazine	57-14-7	0.5	1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 9 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Dimethylphthalate	131-11-3	-	5	-
Dimethyl sulfate	77-78-1	1	5	X
Dinitrobenzene (all isomers)	528-29-0	-	1	X
	99-65-0			
	100-25-4			
Dinitro-o-cresol	534-52-1	-	0.2	X
Dinitrotoluene	121-14-2	-	1.5	X
Dioxane (Diethylene dioxide)	123-91-1	100	360	X
Diphenyl (Biphenyl)	92-52-4	0.2	1	-
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate				
Dipropylene glycol methyl ether	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-2-[ethylhexyl]phthalate)	117-81-7	-	5	-
	112-62-9			
Emery:				
Total dust		-	15	-
Respirable fraction		-	5	-
Endosulfan	115-29-7	-	0.1	X
Endrin	72-20-8	-	0.1	X
Epichlorohydrin	106-89-8	5	19	X
EPN	2104-64-5	-	0.5	X
1,2-Epoxypropane; see Propyleneoxide				
2,3-Epoxy-1-propanol; see Glycidol				
Ethanethiol; see Ethylmercaptan				
Ethanolamine	141-43-5	3	8	-
Ethion	563-12-2	-	-	X
2-Ethoxyethanol	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100	540	X
Ethyl acetate	141-78-6	400	1400	-
Ethyl acrylate	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 10 of 23)
OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Ethylamine	75-04-7	10	18	-
Ethyl amyl ketone (5-methyl-3-heptanone)	106-68-3	25	130	-
Ethyl benzene	100-41-4	100	435	-
Ethyl bromide	74-96-4	200	890	-
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	-
Ethyl chloride	75-00-3	1000	2600	-
Ethyl ether	60-29-7	400	1200	-
Ethyl formate	109-94-4	100	300	-
Ethyl mercaptan	75-08-1	C 10	C 25	-
Ethyl silicate	78-10-4	100	850	-
Ethylene chlorohydrin	107-07-3	5	16	X
Ethylenediamine	107-15-3	10	25	-
Ethylene dibromide	106-93-4	20	156.2 ^d	-
Ethylene dichloride	107-06-2	50	205.5 ^d	-
Ethylene glycol dinitrate	628-96-6	C 0.2	C 1	X
Ethylene glycol methyl acetate; see Methyl cellosolve acetate				
Ethyleneimine; see 1910.1012	151-56-4			
Ethylene oxide; see 1910.1047	75-21-8			
Ethylidene chloride; see 1,1-Dichloroethane				
N-ethylmorpholine	100-74-3	20	94	X
Ferbam:	14484-64-1			
Total dust		-	15	-
Ferrovandium dust	12604-58-9	-	1	-
Fluorides (as F)	Varies with compound	-	2.5 ^d	-
Fluorine	7782-41-4	0.1	0.2	-
Fluorotrichloromethane (Trichlorofluoromethane)	75-69-4	1000	5800	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 11 of 23)
OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Formaldehyde; see 1910.1048	50-00-0	0.75	0.94 ^d	
Formic acid	64-18-6	5	9	-
Furfural	98-01-1	5	20	X
Furfuryl alcohol	98-00-0	50	200	X
Glycerin (mist):	56-81-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Glycidol	556-52-5	50	150	-
Glycol monoethyl ether; see 2-Ethoxyethanol				
Grain dust (oat, wheat, barley)	-	-	10	-
Graphite, natural respirable dust	7782-42-5	-	15 mppcf ^e	-
Graphite, synthetic:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Guthion ^R ; see Azinphos methyl				
Gypsum:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Hafnium	7440-58-6	-	0.5	-
Heptachlor	76-44-8	-	0.5	X
Heptane (n-heptane)	142-82-5	500	2000	-
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	13335-87-1	-	0.2	X
n-Hexane	110-54-3	500	1800	-
2-Hexanone (methyl n-butyl ketone)	591-78-6	100	410	-
Hexone (methyl isobutyl ketone)	108-10-1	100	410	-
sec-Hexyl acetate	108-84-9	50	300	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 12 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Hydrazine	302-01-2	1	1.3	X
Hydrogen bromide	10035-10-6	3	10	-
Hydrogen chloride	7647-01-0	C 5	C 7	-
Hydrogen cyanide	74-90-8	10	11	X
Hydrogen fluoride (as F)	7664-39-3	3	2.4 ^d	-
Hydrogen peroxide	7722-84-1	1	1.4	-
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	-
Hydrogen sulfide	7783-06-4	C20	C28.4 ^d	-
Hydroquinone	123-31-9	-	2	-
Iodine	7553-56-2	C 0.1	C 1	-
Iron oxide fume	1309-37-1	-	10	-
Isoamyl acetate	123-92-2	100	525	-
Isoamyl alcohol (primary and secondary)	123-51-3	100	360	-
Isobutyl acetate	110-19-0	150	700	-
Isobutyl alcohol	78-83-1	100	300	-
Isophorone	78-59-1	25	140	-
Isopropyl acetate	108-21-4	250	950	-
Isopropyl alcohol	67-63-0	400	980	-
Isopropylamine	75-31-0	5	12	-
Isopropyl ether	108-20-3	500	2100	-
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	-
Kaolin:	-	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-
Ketene	463-51-4	0.5	0.9	-
Lead inorganic (as Pb); see 1910.1025	7439-92-1	-	0.05	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 13 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ^{3 b}	
Limestone:	1317-67-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Lindane	58-89-9	-	0.5	X
Lithium hydride	7580-67-8	-	0.025	-
Liquified petroleum gas (LPG)	68476-85-7	1000	1800	-
Magnesite:	546-93-0			
Total dust		-	15	-
Respirable fraction		-	5	-
Magnesium oxide fume:	1309-48-4			
Total particulate		-	15	-
Malathion:	121-75-5			
Total dust		-	15	X
Maleic anhydride	108-31-6	0.25	1	-
Manganese compounds (as Mn)	7439-96-5	-	C 5	-
Manganese fume (as Mn)	7439-96-5	-	C 5	-
Marble:	1317-65-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Mercury (aryl and inorganic) (as Hg)	7439-97-6	-	C0.1 ^d	X
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	-	0.01 ^d	X
Mesityl oxide	141-79-7	25	100	-
Methanethiol; see Methyl mercaptan				
Methomyl (Lannate)	16752-77-5	-	-	-
Methoxychlor:	72-43-5			
Total dust		-	15	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 14 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
2-Methoxyethanol; Methyl cellosolve	109-86-4	25	80	
2-Methoxyethyl acetate (methyl cellosolve acetate)	110-49-6	25	120	
4-Methoxyphenol	150-76-5	-	-	-
Methyl acetate	79-20-9	200	610	-
Methyl acetylene (propyne)	74-99-7	1000	1650	-
Methyl acetylene-propadiene mixture (MAPP)		1000	1800	-
Methyl acrylate	96-33-3	10	35	X
Methylal (dimethoxymethane)	109-87-5	1000	3100	-
Methyl alcohol	67-56-1	200	260	X
Methylamine	74-89-5	10	12	-
Methyl amyl alcohol; see Methyl isobutyl carbinol				
Methyl (n-amyl) ketone	110-43-0	100	465	-
Methyl bromide	74-83-9	C 20	C 80	X
Methyl butyl ketone; see 2-Hexanone				
Methyl chloride	74-87-3	100	210 ^d	-
Methyl chloroform (1,1,1-trichloroethane)	71-55-6	350	1900	-
Methylcyclohexane	108-87-2	500	2000	-
Methylcyclohexanol	25639-42-3	100	470	-
o-Methylcyclohexanone	583-60-8	100	460	X
Methylene chloride	75-09-2	25	88.25 ^d	
Methyl ethyl ketone (MEK); see 2-Butanone				
Methyl formate	107-31-3	100	250	-
Methyl hydrazine (monomethyl hydrazine)	60-34-4	C 0.2	C 0.35	X
Methyl iodide	74-88-4	5	26	X
Methyl isoamyl ketone	110-12-3	100	475	-
Methyl isobutyl carbinol	108-11-2	25	100	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 15 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Methyl isobutyl ketone; see Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
Methyl mercaptan	74-93-1	C 10	C 20	-
Methyl methacrylate	80-62-6	100	410	-
Methyl propyl ketone; see 2-Pentanone				
alpha-Methyl styrene	98-83-9	C 100	C 480	-
Methylene bisphenyl isocyanate (MBI)	101-68-8	C 0.02	C 0.2	-
Mica; see Silicates				
Molybdenum (as Mo):	7439-98-7			
Soluble compounds		-	5	-
Insoluble compounds:				
Total dust			15	-
Monomethyl aniline	100-61-8	2	9	X
Morpholine	110-91-8	20	70	X
Naphtha (coal tar)	8030-30-6	100	400	-
Naphthalene	91-20-3	10	50	-
alpha-Naphthylamine; see 1910.1004	134-32-7			
beta-Naphthylamine; see 1910.1009	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	-
Nickel, metal, and insoluble compounds (as Ni)	7440-02-0	-	1	-
Nicotine	54-11-5	-	0.5	X
Nitric acid	7697-37-2	2	5	-
Nitric oxide	10102-43-9	25	30	-
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-95-3	1	5	X
p-Nitrochlorobenzene	100-00-5	-	1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 16 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
4-Nitrodiphenyl; see 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	-
Nitrogen dioxide	10102-44-0	C 5	C 9	-
Nitrogen trifluoride	7783-54-2	10	29	-
Nitroglycerin	55-63-0	C 0.2	C 2	X
Nitromethane	75-52-5	100	250	-
1-Nitropropane	108-03-2	25	90	-
2-Nitropropane	79-46-9	25	90	-
N-Nitrosodimethylamine; see 1910.1016	63-5-6			
Nitrotoluene (all isomers):		5	30	
o-Isomer	88-72-2;			X
m-Isomer	99-08-1;			X
p-Isomer	99-99-0			X
Nitrotrichloromethane; see Chloropicrin				
Octachloronaphthalene	2234-13-1	-	0.1	X
Octane	111-65-9	500	2350	-
Oil mist, mineral	8012-95-1	-	5	-
Osmium tetroxide (as Os)	20816-12-0	-	0.002	-
Oxalic acid	144-62-7	-	1	-
Oxygen difluoride	7783-41-7	0.05	0.1	-
Ozone	10028-15-6	0.1	0.2	-
Paraffin wax fume	8002-74-2	-	-	-
Paraquat, respirable dust	4685-14-7	-	0.5	X
	1910-42-5			
	2074-50-2			
Parathion	56-38-2	-	0.1	X
Particulates not otherwise regulated (PNOR):	-			
Total dust	-	-	15	-
Respirable fraction	-	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 17 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
PCB; see chlorodiphenyl (42% and 54% chlorine)				
Pentaborane	19624-22-7	0.005	0.01	-
Pentachloronaphthalene	1321-64-8	-	0.5	X
Pentachlorophenol	87-86-5	-	0.5	X
Pentaerythritol:	115-77-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Pentane	109-66-0	1000	2950	-
2-Pentanone (methyl propyl ketone)	107-87-9	200	700	-
Perchloroethylene (tetrachloroethylene)	127-18-4	100	689 ^d	-
Perchloromethyl mercaptan	594-42-3	0.1	0.8	-
Perchloryl fluoride	7616-94-6	3	13.5	-
Perlite:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Petroleum distillates (naphtha) (rubber solvent)	8002-05-9	500	2000	X
Phenol	108-95-2	5	19	X
p-Phenylene diamine	106-50-3	-	0.1	X
Phenyl ether, vapor	101-84-8	1	7	-
Phenyl ether-biphenyl mixture, vapor	-	1	7	-
Phenylethylene; see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	-
Phenylhydrazine	100-63-0	5	22	X
Phosdrin (Mevinphos ^R)	7786-34-7	-	0.1	X
Phosgene (carbonyl chloride)	74-44-5	0.1	0.4	-
Phosphine	7803-51-2	0.3	0.4	-
Phosphoric acid	7664-38-2	-	1	-
Phosphorus (yellow)	7723-14-0	-	0.1	-
Phosphorus pentachloride	10026-13-8	-	1	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 18 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Phosphorus pentasulfide	1314-80-3	-	1	-
Phosphorus trichloride	7719-12-2	0.5	3	-
Phthalic anhydride	85-44-9	2	12	-
Picloram:	1918-02-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Picric acid	88-89-1	-	0.1	X
Pindone (2-pivalyl-1,3-indandione)	83-26-1	-	0.1	-
Plaster of paris:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Platinum (as Pt):	7440-06-4			
Metal		-	-	-
Soluble salts		-	0.002	-
Portland cement:	65997-15-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Propane	74-98-6	1000	1800	-
beta-Propiolactone; see 1910.1013	57-57-8			
n-Propyl acetate	109-60-4	200	840	-
n-Propyl alcohol	71-23-8	200	500	-
n-Propyl nitrate	627-13-4	25	110	-
Propylene dichloride	78-87-5	75	350	-
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	-
Propyne; see Methylacetylene				
Pyrethrum	8003-34-7	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 19 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Pyridine	110-86-1	5	15	-
Quinone	106-51-4	0.1	0.4	-
Rhodium (as Rh), metal fume and insoluble compounds	7440-16-6	-	0.1	-
Rhodium (as Rh), soluble compounds	7440-16-6	-	0.001	-
Ronnel	299-84-3	-	15	-
Rotenone	83-79-4	-	5	-
Rouge:	-	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-
Selenium compounds (as Se)	7782-49-2	-	0.2	-
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	-
Silica, amorphous, precipitated and gel	-	-	f	-
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	68855-54-9	-	f	-
Silica, crystalline cristobalite, respirable dust	14464-46-1	-	f	-
Silica, crystalline quartz, respirable dust	14808-60-7	-	f	-
Silica, crystalline tripoli, respirable dust	1317-95-9	-	f	-
Silica, crystalline tridymite, respirable dust	15468-32-3	-	f	-
Silica, fused, respirable dust	60676-86-0	-	f	-
Silicates (less than 1% crystalline silica):	-	-	-	-
Mica (respirable dust)	12001-26-2	-	f	-
Soapstone, total dust	-	-	f	-
Soapstone, respirable dust	-	-	f	-
Talc (containing asbestos); use asbestos limit; see 29 CFR 1910.1001	-	-	-	-
Talc (containing no asbestos); respirable dust	14807-96-6	-	f	-
Tremolite, asbestiform; see 1910.1001	-	-	-	-
Silicon:	7440-21-3	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 20 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ^{3b}	
Silicon carbide:	409-21-2			
Total dust		-	15	-
Respirable fraction			5	-
Silver, metal and soluble compounds (as Ag)	7440-22-4	-	0.01	-
Soapstone; see Silicates				
Sodium fluoroacetate	62-74-8	-	0.05	X
Sodium hydroxide	1310-73-2	-	2	-
Starch:	9005-25-8			
Total dust		-	15	-
Respirable fraction		-	5	-
Stibine	7803-52-3	0.1	0.5	-
Stoddard solvent	8052-41-3	500	2900	-
Strychnine	57-24-9	-	0.15	-
Styrene	100-42-5	100-	433 ^d	-
Sucrose:	57-50-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Sulfur dioxide	7446-09-5	5	13	-
Sulfur hexafluoride	2551-62-4	1000	6000	-
Sulfuric acid	7664-93-9	-	1	-
Sulfur monochloride	10025-67-9	1	6	-
Sulfur pentafluoride	5714-22-7	0.025	0.25	-
Sulfuryl fluoride	2699-79-8	5	20	-
Systox ^R ; see Demeton				
2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	93-76-5	-	10	-
Talc; see Silicates				
Tantalum, metal and oxide dust	7440-25-7	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 21 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
TEDP (Sulfotep)	3689-24-5	-	0.2	X
Tellurium and compounds (as Te)	13494-80-9	200	766 ^d	-
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2	-
Temephos:	3383-96-8			
Total dust		-	15	-
Respirable fraction		-	5	-
TEPP	107-49-3	-	0.05	X
Terphenyls	26140-60-3	C 1	C 9	-
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	500	4170	-
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	500	4170	-
1,1,2,2-Tetrachloroethane	79-34-5	5	35	X
Tetrachloroethylene; see Perchloroethylene				
Tetrachloromethane; see Carbon tetrachloride				
Tetrachloronaphthalene	1335-88-2	-	2	X
Tetraethyl lead (as Pb)	78-00-2	-	0.075	X
Tetrahydrofuran	109-99-9	200	590	-
Tetramethyl lead (as Pb)	75-74-1	-	0.075	X
Tetramethyl succinonitrile	3333-52-6	0.5	3	X
Tetranitromethane	509-14-8	1	8	-
Tetryl (2,4,6-trinitrophenyl-methyl-nitramine)	479-45-8	-	1.5	X
Thallium, soluble compounds (as Ti)	7440-28-0	-	0.1	X
4,4-Thiobis(6-tert, Butyl-M-cresol):	96-69-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Thiram	137-26-8	-	5	-
Tin, inorganic compounds (except oxides) (as Sn)	7440-31-5	-	2	-
Tin, organic compounds (as Sn)	7440-31-5	-	0.1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 22 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Titanium dioxide:	13463-67-6			
Total dust		-	15	-
Toluene	108-88-3	200	766 ^d	-
Toluene-2,4-diisocyanate (TDI)	584-84-9	C 0.02	C 0.14	-
o-Toluidine	95-53-4	5	22	X
Toxaphene; see Chlorinated camphene				
Tremolite; see Silicates				
Tributyl phosphate	126-73-8	-	5	-
1,1,1-Trichloroethane; see Methyl chloroform				
1,1,2-Trichloroethane	79-00-5	10	45	X
Trichloroethylene	79-01-6	100	546 ^d	-
Trichloromethane; see Chloroform				
Trichloronaphthalene	1321-65-9	-	5	X
1,2,3-Trichloropropane	96-18-4	50	300	-
1,1,2-Trichloro 1,2,2-trifluoroethane	76-13-1	1000	7600	-
Triethylamine	121-44-8	25	100	-
Trifluorobromomethane	75-63-8	1000	6100	-
2,4,6-Trinitrophenyl; see Picric acid				
2,4,6-Trinitrophenyl methyl nitramine; see Tetryl				
2,4,6-Trinitrotoluene (TNT)	118-96-7	-	1.5	X
Triorthocresyl phosphate	78-30-8	-	0.1	X
Turpentine	8006-64-2	100	560	-
Uranium (as U):	7440-61-1			
Insoluble compounds		-	0.025	-
Soluble compounds		-	0.05	-
Vanadium:	1314-62-1			
Respirable dust (as V ₂ O ₅)		-	C 0.5	-
Fume (as V ₂ O ₅)		-	C 0.1	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 23 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm ^a	mg/m ³ ^b	
Vegetable oil mist:	-	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-
Vinyl benzene; see Styrene	-	-	-	-
Vinyl bromide	593-60-2	-	-	-
Vinyl chloride; see 1910.1017	75-01-4	1	2.60	-
Vinylcyanide; see Acrylonitrile	-	-	-	-
Vinyl toluene	25013-15-4	100	480	-
Warfarin	81-81-2	-	0.1	-
Xylenes (o-, m-, p-isomers)	1330-20-7	100	435	-
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-5	-	1	-
Zinc chloride fume	7646-85-7	-	1	-
Zinc oxide fume	1314-13-2	-	5	-
Zinc oxide:	1314-13-2	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-
Zinc stearate:	557-05-1	-	-	-
Total dust	-	-	15	-
Respirable fraction	-	-	5	-
Zirconium compounds (as Zr)	7440-6	-	5	-

Note: The PELs are 8-hr TWAs unless otherwise noted. There are as determined from breathing-zone air samples.

^a Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 torr.

^b Approximate milligrams of substance per cubic meter of air.

^c The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances, i.e., the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table C-2 apply.

^d See Table C-2.

^e Millions of particles per cubic ft of air, based on impinged samples counted by light field techniques.

^f See Table C-3.

C = Ceiling limit.

TABLE C-2

OSHA PELs

MATERIAL	8-HR TIME-WEIGHTED	ACCEPTABLE	ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE CEILING CONCENTRATION FOR AN 8-HR SHIFT	
	AVERAGE	CEILING CONCENTRATION	CONCENTRATION	MAXIMUM DURATION
Benzene (Z37.40-1969) ¹	10 ppm	25 ppm	50 ppmv	10 minutes
Beryllium and Beryllium compounds (Z37.29-1970)	2 µg/m ³	5 ug/m ³	25 ug/m ³	30 minutes
Cadmium fume (Z37.5-1970)	0.1 mg/m ³	0.3 mg/m ³		
Cadmium dust (Z37.5-1970)	0.2 mg/m ³	0.6 mg/m ³		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 minutes
Carbon Tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 minutes in any 4 hours
Chromic acid and Chromates (Z37.7-1971)		1 mg/10 m ³		
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 minutes
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 minutes in any 3 hours
Formaldehyde (Z37.16-1967) ²	3 ppm	5 ppm	10 ppm	30 minutes
Hydrogen fluoride (Z37.28-1969)	3 ppm			
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 minutes once only if no other measurable exposure occurs
Fluoride as dust (Z37.38-1969)	2.5 mg/m ³			
Mercury (Z37.8-1971)		1 mg/10 m ³		
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 minutes in any 3 hours
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg/m ³	0.04 mg/m ³		
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 minutes in any 3 hours
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 minutes in any 3 hours
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 minutes
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 minutes in any 2 hours

¹This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028. This standard also applies to any industry for which 1910.1028 is stayed or otherwise not in effect.

²This standard applies to any industry for which 1910.1048 is stayed or otherwise not in effect.

TABLE C-3

OSHA PELs

SUBSTANCE	mppcf ^a	mg/m ³
SILICA:		
CRYSTALLINE		
QUARTZ (Respirable)	$\frac{250^b}{\% \text{ SiO}_2 + 5}$	$\frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$
QUARTZ (Total Dust)		$\frac{30 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$
CRISTOBALITE: Use 1/2 the value calculated from the count or mass formulae for quartz		
TRIDYMIT: Use 1/2 the value calculated from the formulae for quartz		
AMORPHOUS, including natural diatomaceous earth	20	$\frac{80 \text{ mg/m}^3}{\% \text{ SiO}_2}$
SILICATES (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20 ^d	
Talc (containing asbestos). Use asbestos limit		
Tremolite (see 29 CFR 1910.1101)		
Portland cement	50	
GRAPHITE (NATURAL)	15	
COAL DUST (respirable fraction less than 5% SiO ₂)		$\frac{2.4 \text{ mg/m}^3}{\text{or}}$
For more than 5% SiO ₂		$\frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$
INERT OR NUISANCE DUST:		
Respirable fraction	15	5 mg/m ³
Total dust	50	15 mg/m ³

Note - Conversion factors - mppcf x 35.3 = million particles per cubic meter = particles per c.c.

^aMillions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

^bThe percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

^cBoth concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic Diameter (unit density sphere)	Percent Passing Selector	Aerodynamic Diameter (unit density sphere)	Percent Passing Selector
2	90	3.5	50
2.5	75	5.0	25
		10	0

^dContaining less than 1% quartz; if 1% quartz, use-quartz limit.

TABLE C-4 (Page 1 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)^a

COMPOUND	RELs		NOTES
	ppm	mg/m ³	
Acetone	250	590	10-hr TWA
Acetonitrile	20	34	10-hr TWA
Acrylamide	-	0.03 CA	10-hr TWA
Acrylonitrile	1 CA	-	10-hr TWA
	10	-	15-min ceiling
Aldrin	-	0.25	
Allyl chloride-skin	1	3	10-hr TWA
	2	6	15-min ST
Allyl glycidyl ether	5	22	10-hr TWA
	10	44	15-min ST
Ammonia	25	18	10-hr TWA
	35	27	15-min ST
Antimony	-	0.5	10-hr TWA
Arsenic	-	0.002 CA	15-min ceiling
Arsine	-	0.002 CA	15-min ceiling
Benzene	0.1	-	10-hr TWA
	1	-	15-min ST
Benzoyl peroxide	-	5	10-hr TWA
Benzyl chloride	1	5	15-min ceiling
Beryllium	-	0.0005	Not to exceed
Boron trifluoride	1	3	ceiling limit
Butadiene		Reduce to lowest feasible limit CA	
2-Butanone	200	590	10-hr TWA
	300	885	15-min ST
tert-Butyl chromate	-	0.001 as Cr + 6 CA	10-hr TWA
N-Butyl glycidyl ether	5.6	30	15-min ceiling
Butyl mercaptan	0.5	1.8	15-min ceiling
Cadmium dust		Reduce to lowest feasible limit CA	
Cadmium fume		Reduce to lowest feasible limit CA	
Calcium arsenate	-	0.002 CA	15-min ceiling
Carbaryl (sevin)	-	5	10-hr TWA
Carbon black	-	3.5 CA	10-hr TWA
Carbon dioxide	5000	9000	10-hr TWA
	30000	54000	15-min ST
Carbon disulfide	1	3	10-hr TWA
	10	30	15-min ST
Carbon monoxide	35	40	10-hr TWA
	200	229	ceiling limit
Carbon tetrachloride	0.1	1.4	10 hr TWA
	<0.3	<4	15-min ST

TABLE C-4 (Page 2 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)^a

COMPOUND	RELs		NOTES
	ppm	mg/m ³	
Chlorine	1	3	15-min ST
Chlorodiphenyl (42%)	-	0.001 CA	10-hr TWA
Chlorodiphenyl (54%)	-	0.001 CA	10-hr TWA
Chloroform	2	9.78 CA	60-min ST
Chloroprene	1	3.6 CA	15-min ceiling
Cresol	2.3	10	10-hr TWA
Cyclohexanone	25	100	10-hr TWA
DDT	-	0.5 CA	10-hr TWA
Diacetone alcohol	50	240	10-hr TWA
Dieldrin-skin	-	0.25 CA	10-hr TWA
Diglycidyl ether	0.1	0.5 CA	10-hr TWA
Diisobutyl ketone	25	150	10-hr TWA
1,1-Dimethylhydrazine	0.06	0.15 CA	120-min ceiling
Dinitro-o-cresol-skin	-	0.2	10-hr TWA
Dinitrotoluene-skin	-	1.5 CA	10-hr TWA
di-sec-Octylphthlate	-	5 CA	10-hr TWA
	-	10	15-min ST
Dioxane	1	3.6 CA	30-min ceiling
2-Ethoxy ethylacetate - skin	0.5	2.7	
Ethylene dibromide	0.045 CA		10-hr TWA
	0.13 CA		15-min ceiling
Ethylene dichloride	1	4 CA	10-hr TWA
	2	8 CA	15-min ST
Ethylene glycol dinitrate	-	0.1	15-min ST
Ethylene oxide	<0.1	<0.18 CA	10-hr TWA
	5	9 CA	10-min/day
Ethyl mercaptan	0.5	1.3	15-min ceiling
Ferro vanadium dust	-	1	10-hr TWA
	-	3	15-min ST
Formaldehyde	0.016 CA	-	10-hr TWA
	0.1 CA	-	15-min ceiling
Furfuryl alcohol - skin	10	40	10-hr TWA
	15	60	15-min ST
Heptane	85	350	10-hr TWA
	440	1800	15-min ceiling
Hexachloroethane - skin	1	10 CA	10-hr TWA
Hexane	50	180	10-hr TWA
2-Hexanone	1	4	10-hr TWA
Hexone	50	205	10-hr TWA
Hexone	75	300	15-min ST

TABLE C-4 (Page 3 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)^a

COMPOUND	RELs		NOTES
	ppm	mg/m ³	
Hydrazine	0.03	0.04 CA	120-min ceiling
Hydrogen cyanide - skin	4.7	5	15-min ST
Hydrogen fluoride	3	2.5	10-hr TWA
	6	5	15-min ceiling
Hydrogen sulfide	10	15	10-min ceiling
Hydroquinone	-	2	15-min ceiling
Isophorone	4	25	10-hr TWA
Isopropyl alcohol	400	980	10-hr TWA
	500	1225	15-min ST
Isopropyl glyceride ether	50	240	15-min ceiling
Lead	-	0.1	10-hr TWA
Malathion - skin	-	10	10-hr TWA
Mesityl oxide	10	40	10-hr TWA
Methyl alcohol - skin	200	260	10-hr TWA
	250	325	15-min ST
Methyl (n-amyl) ketone	100	465	10-hr TWA
Methyl bromide	Reduce exposure to lowest feasible limit CA		
Methyl cellosolve - skin	0.1	0.3	10-hr TWA
Methyl chloride	Reduce exposure to lowest feasible limit CA		
Methyl chloroform	350	1900	15-min ceiling
Methylene bisphenyl isocyanate	0.005	0.05	10-hr TWA
	0.02	0.2	10-min ceiling
Methylene chloride	Reduce exposure to lowest feasible limit CA		
Methyl iodide	2	10 CA	10-hr TWA
Methyl mercaptan	0.5	1	15-min ceiling
Nickel	-	0.015 CA	10-hr TWA
Nitric acid	2	5	10-hr TWA
	4	10	15-min ST
Nitric oxide	25	30	10-hr TWA
Nitrogen dioxide	1	1.8	15-min ST
2-Nitro propane	Reduce exposure to lowest feasible limit CA		
Octane	75	350	10-hr TWA
	385	1800	15-min ceiling
Parathion - skin	-	0.05	10-hr TWA
Pentane	120	350	10-hr TWA
	610	1800	15-min ST
2-Pentanone	150	530	10-hr TWA
Petroleum distillates	-	350	10-hr TWA
	-	1800	15-min ceiling

TABLE C-4 (Page 4 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)^a

COMPOUND	RELs		NOTES
	ppm	mg/m ³	
Phenol - skin	5	19	10-hr TWA
	15.6	60	15-min ceiling
Phenyl glycidyl ether	1	6 CA	15-min ceiling
Phenyl hydrazine	0.14	0.6	120-min ceiling
Phosgene	0.1	0.4	10-hr TWA
	0.2	0.8	15-min ceiling
Silica, crystalline	-	0.05 CA	10-hr TWA
Sodium hydroxide	-	2	15-min ceiling
Stoddard solvent	-	350	10-hr TWA
	-	1800	15-min ceiling
Styrene	50	215	10-hr TWA
	100	425	15-min ST
Sulfur dioxide	2	5	10-hr TWA
	5	10	15-min ST
Sulfuric acid	-	1	10-hr TWA
1,1,2,2-Tetrachloroethane - skin	1	7 CA	10-hr TWA
Tetrachloroethylene	Minimize workplace exposure concentration CA		
Tetra methyl succinonitrile - skin	0.5	3	10-hr TWA
Tin, organic - skin	-	0.1	10-hr TWA
Toluene	100	375	10-hr TWA
	150	560	15-min ST
Toluene-2,4-diisocyanate	-	- CA	
Trichloroethylene	-	- CA	
Vanadium pentoxide	-	0.05	15-min ceiling
Vinyl chloride	Lowest reliably detectable concentration CA		
Xylene	100	435	10-hr TWA
	150	655	15-min ST
Zinc oxide fume	-	5	10-hr TWA
	-	10	15-min ST

TWA - time weighted average.

ST - Short-term exposure limit.

CA - potential occupational carcinogen.

^a1994 values.

APPENDIX D

QUALITATIVE RESPIRATOR FIT-TESTING PROTOCOL

I. QUALITATIVE RESPIRATOR FIT TESTING:
PROTOCOL FOR ISOAMYL ACETATE AS OUTLINED IN
OSHA STANDARD 29 CFR 1910.1025 APPENDIX D

Isoamyl Acetate Protocol

A. Odor threshold screening.

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.

2. Odor-free water (e.g. distilled or spring water) at approximately 25° C shall be used for the solutions.

3. The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but may not be connected to the same recirculating ventilation system.

5. The odor test solution is prepared in a second jar by placing .4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

6. A test blank is prepared in a third jar by adding 500 cc of odor free water.

7. The odor test and test blank jars shall be labelled 1 and 2 for jar identification. If the labels are put on the lids, they can be periodically dried off and switched to avoid people thinking the same jar always has the IAA.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2):

"The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA QLFT may not be used.

11. If the test subject correctly identifies the jar containing the odor test solution, he may proceed to respirator selection and fit testing.

B. Respirator selection.

1. The test subject shall be allowed to select the most comfortable respirator from a large array of various sizes and manufacturers that includes at least three sizes of elastomeric half-facepieces and units of at least two manufacturers.

2. The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to assess a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This may not constitute his formal training on respirator use, only a review.

3. The test subject should understand that he is being asked to select the respirator which provides the most comfortable fit for him. Each respirator represents a different size and shape and, if fit properly, will provide adequate protection.

4. The test subject holds each facepiece up to his face and eliminates those which are obviously not giving a comfortable fit. Normally, selection will begin with a half-mask and if a fit cannot be found here, the subject will be asked to go to the full facepiece respirators. (A small percentage of users will not be able to wear any half-mask.)

5. The more comfortable facepieces are recorded; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in #6 below. If the test subject is not familiar with using a particular respirator, he shall be directed to don the mask several times and to adjust the straps each time, so that he becomes adept at setting proper tension on the straps.

6. Assessment of comfort shall include reviewing the following points with the test subject:

- Chin properly placed.
- Positioning of mask on nose.
- Strap tension.
- Fit across nose bridge.
- Room for safety glasses.
- Distance from nose to chin.
- Room to talk.
- Tendency to slip.
- Cheeks filled out.
- Self-observation in mirror.
- Adequate time for assessment.

7. The test subject shall conduct the conventional negative- and positive-pressure fit checks (e.g. see ANSI Z88.2-1980). Before conducting the negative- or positive-pressure checks, the subject shall be told to "seat" his mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.

8. The test subject is now ready for fit testing.

9. After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

10. The employee shall be given the opportunity to select a different facepiece and be retested if during the first two weeks of on-the-job wear the chosen facepiece becomes unacceptably uncomfortable.

C. Fit test.

1. The fit test chamber shall be substantially similar to a clear 55-gallon drum liner suspended inverted over a 2 foot diameter frame, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

3. After selecting, donning, and properly adjusting a respirator himself, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

4. A copy of the following exercises and rainbow (or equally effective) passage shall be taped to the inside of the test chamber.

Test Exercises

i. Normal breathing.

ii. Deep breathing. Be certain breaths are deep and regular.

iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have the test subject inhale when his head is at either side.

iv. Nodding head up-and-down. Be certain motions are complete and made about every second. Alert the test subject not bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will

result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

vi. Normal breathing.

5. Each test subject shall wear his respirator for at least 10 minutes before starting the fit test.

6. Upon entering the test chamber, the test subject shall be given a 6 inch by 5 inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of his cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. Each exercise described in No. 4 above shall be performed for at least one minute.

9. If at any time during the test, the subject detects the banana-like odor of IAA, he shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

10. Upon returning to the selection room, the subject shall remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

11. If a person cannot be fitted with the selection of half-mask respirators, include full facepiece models in the selection process. When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having him break the face seal and take a breath before exiting the chamber.

12. When the test subject leaves the chamber, he shall remove the saturated towel, returning it to the test conductor. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag. There is no significant IAA concentration buildup in the test chamber from subsequent tests.

13. Persons who have successfully passed this fit test may be assigned the use of the tested respirator in atmospheres with up to 10 times the PEL of airborne lead. In other words, this IAA protocol may be used to assign a protection factor no higher than 10.

II. QUALITATIVE RESPIRATOR FIT TESTING:
PROTOCOL FOR IRRITANT SMOKE AS OUTLINED IN
OSHA STANDARD 29 CFR 1910.1025 APPENDIX D

Irritant Fume Protocol

A. Respirator selection.

Respirators shall be selected as described in section IB above, except that each respirator shall be equipped with high efficiency cartridges.

B. Fit test.

1. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize him with its characteristic odor.

2. The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the fit test.

3. The test conductor shall review this protocol with the test subject before testing.

4. The test subject shall perform the conventional positive pressure and negative pressure fit checks. Failure of either check shall be cause to select an alternate respirator.

5. Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a low pressure air pump set to deliver 200 milliliters per minute.

6. Advise the test subject that the smoke can be irritating to the eyes and instruct him to keep his eyes closed while the test is performed.

7. The test conductor shall direct the stream of irritant smoke from the tube towards the face seal area of the test subject. He shall begin at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

8. The following exercises shall be performed while the respirator seal is being challenged by the smoke. Each shall be performed for one minute.

i. Normal breathing.

ii. Deep breathing. Be certain breaths are deep and regular.

iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have test subject inhale when his head is at either side.

iv. Nodding head up-and-down. Be certain motions are complete. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

v. Talking--slowly and distinctly, count backwards from 100.

vi. Normal breathing.

9. If the irritant smoke produces an involuntary reaction (cough) by the test subject, the test conductor shall stop the test. In this case the tested respirator is rejected and another respirator shall be selected.

10. Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube to determine whether he reacts to the smoke. Failure to evoke a response shall void the fit test.

11. Steps B4, B7, B8 of this protocol shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test irritant smoke.

12. Respirators successfully tested by the protocol may be used in contaminated atmospheres up to ten times the PEL. In other words this protocol may be used to assign protection factors not exceeding ten.

LAWLER, MATUSKY & SKELLY ENGINEERS
QUALITATIVE FIT TEST FOR RESPIRATORS

1. DATE Yr. Mo. Day EMPLOYEE NAME Last First M.I. EMPLOYEE No.

AGE SEX (M/F) 1) Experience (years) 2) Frequency 3) Mask Now Using 4) Unusual Conditions

5) Mask(s) Selected 6) Qualitative Tests 7) IAA Sensitivity Test - Pass or Fail

PP NP IAA IS 8) Smoke Sensitivity Test - Pass or Fail

9) Respirator Selection

1 = Passed 1st Choice - Pass Fail
2 = Failed 2nd Choice - Pass Fail
3 = Did Not Run 3rd Choice - Pass Fail
Final Selection

COMMENTS:

manufacturer size

Facial Conditions (X)

Wrinkles Wide-bridge
Broken Nose Shallow-bridge
Deep Nostrils

10) Test Instructor Name:

11) Odor Sensitivity Odor Description

Jar No. Odor

1 Y N
2 Y N
3 Y N
4 Y N

2. FREQUENCY - How many times respirator used during week

1) Less than 1/week
2) 2-5 times/week
3) 5-10 times/week
4) 1-4 times/day

3. MASKS (Block 37) - (Manufacturer)

1 = Mike Safety Appliances
2 = American Optical
3 = Scott Aviation
4 = North
5 = Wilson
6 = Survivor

4. UNUSUAL CONDITIONS

1 = Beard/Heavy
2 = Beard/Light
3 = Scarce
4 = Wrinkles
5 = Glasses
6 = Other
7 = Several Days Beard Growth

5. QUALITATIVE TESTS

PP = Positive Pressure
NP = Negative Pressure
IA = Isoamyl Acetate
IS = Irritant Smoke

Size (Block 38)

1 = Small
2 = Medium (if only 1 size, record 2)
3 = Large
4 = Full Face

APPENDIX E

**LAWLER, MATUSKY & SKELLY ENGINEERS LLP
SITE-SPECIFIC HEALTH AND SAFETY PLAN FORM**

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: _____ HASP Preparer: _____

Address: _____ City/State: _____

Job No.: _____

APPROVALS

Project Manager: _____

Safety Officer: _____

PROJECT PERSONNEL:

On-Site Coordinator: _____

On-Site Health and
Safety Officer: _____

Phone: (914) 735-8300 _____

DATE OF PLAN PREPARATION: _____

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

SITE ACCESS: (describe procedures to control site access)

MONITORING PROCEDURES (If required by the Safety Officer)

Monitoring the site for identity and concentration of contamination in all media:

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

Personnel monitoring procedures:

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

EMERGENCY PROCEDURES

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

In the event of personnel injury:

In event of potential or actual fire or explosion:

In event of potential or actual ionizing radiation exposure:

In event of environmental accident (spread of contamination outside sites):

EMERGENCY SERVICES (complete here or have separate list available on-site)

Emergency Medical Facility (include map or written description of route to hospital)

Location

Telephone

Ambulance Service

Fire Department

Police Department

Poison Control Center

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)

Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

1. _____
2. _____
3. _____
4. _____

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

TRAINING

(Provide description of minimum training, reference OSHA Sections).

AFFADAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name)
have read the Health and Safety Plan (HASP) for the _____
(site description and project description). I have also read the LMS generic HASP. I agree to
conduct all on site work in conformity with the requirements of both HASPs. In addition, I
acknowledge that failure to comply with the designated procedures in the Health and Safety Plans
may lead to my removal from the site.

Signed _____

Date _____