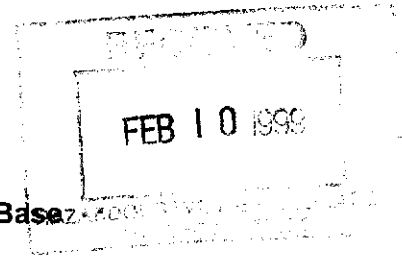


February 9, 1999

Mr. Girish V. Desai
Project Manager
Division of Hazardous Waste Remediation
New York Department of Environmental Conservation
SUNY Building 40
Stony Brook, New York 11790-2356

Agfa Corporation
100 Challenger Road
Ridgefield Park, NJ 07660-2199
Phone: 201 440-0111



**Re: Work Plan for Limited Investigation in APC-10, Tesla Tower Base,
Peerless Photo Products Site (I.D. No.: 1-52-031)
Shoreham, New York**

Dear Mr. Desai:

Agfa is pleased to present this Work Plan to perform limited investigation activities at the Peerless Photo Products Site in APC-10, the Tesla Tower Base, revised based on our telephone conversations of January 13, 1999 and February 1, 1999. This Work Plan is based on the activities agreed upon by NYSDEC, the New York State Department of Health (NYSDOH), and the Suffolk County Department of Health Services (SCDHS) on September 29, 1998, and incorporates Agfa's responses to comments provided by NYSDEC in letters dated November 16, 1998 and February 1, 1999.

This investigation is limited in scope and does not include the majority of Areas of Potential Concern, sampling methods, media to be sampled, and chemical analytes presented in either the NYSDEC-approved RI/FS Work Plan dated September 30, 1993 or Addendum #1 to the RI/FS Work Plan dated January 4, 1994. Only specific sections of these documents are applicable to this investigation. As such, this investigation will be performed in accordance with the procedures specified below and specific sections of the Work Plan referenced below.

The remainder of this Work Plan consists of the following sections:

- 1.0 Methods of Sample Collection and Analysis
- 2.0 Field Sampling Activities
- 3.0 Quality Assurance/Quality Control

1.0 METHODS OF SAMPLE COLLECTION AND ANALYSIS

As you know, a total of three soil borings will be installed in the Tesla Tower Base as part of this investigation. Analytes of interest in this investigation are limited to total silver, cadmium, and mercury. Sampling will be conducted in accordance with a site-specific health and safety plan that considers hazards associated with these metals, to be prepared by the consultant performing the sampling. A copy of the site-specific health and safety plan to be used is enclosed with this Work Plan as Annex 1. Methods of sample collection, equipment decontamination, and sample analysis are discussed below.

1.1 Sample Collection

The borings will be advanced using a hollow-stem auger, and split-spoon samplers will be used to collect soil samples. Soils generated during installation of the borings will be drummed and then characterized to determine their proper disposal. The drums of soils will be kept separate from other materials at the site prior to their proper disposal. Work steps to be followed in performing this sampling will consist of the following:

- 1) Clear underground utilities.
- 2) Determine appropriate level of health and safety protection.
- 3) Obtain decontaminated standard split spoon.
- 4) Obtain samples by driving the split spoon sampler through the center and ahead of the cutting teeth of the auger. These samples will be collected from the appropriate depths as presented in Section 2.0.
- 5) Put on disposable latex sampling gloves.
- 6) Upon retrieval of each split spoon, open and scoop sample into appropriate sample container using decontaminated stainless steel spatula or scoop.
- 7) Label the sample container with the following information using waterproof ink:
 - a) Sample ID number;
 - b) Site name;
 - c) Date and time of collection;
 - d) Type of analysis requested; and
 - e) Initials of sampler.
- 8) Wrap completed label with clear tape.
- 9) Complete chain of custody form.
- 10) Store collected samples in a cooler located in an area known to be free of contamination.
- 11) Enter into bound field log book the following information, at a minimum:
 - a) Sample location;
 - b) Sample ID number;
 - c) Date and time of collection;
 - d) Sample depth;
 - e) Soil characteristics; and
 - f) Remarks concerning drilling rates.

- 12) When sampling is completed, transport iced samples to analytical laboratory, maintaining standard chain of custody procedures. Preservation is not required for the selected analytes.

1.2 Decontamination Procedures

Decontamination of sampling equipment will be performed in accordance with procedures presented in Section 1.2.4 of the Field Sampling and Analysis Plan for the Phase 1 Remedial Investigation (Phase 1 FSAP) prepared by Groundwater Technology, Inc. (GTI) on September 30, 1993, with the following exceptions:

- 1) Plastic sand traps will be decontaminated in the manner applied to split spoons, rather than replaced, between samples.
- 2) A sampling truck will not be used. Due to the close proximity of the borings to each other, sampling will be performed on a sheet of plastic located in the parking lot adjacent to the Tesla Tower Base.

1.3 Sample Analysis

At the request of NYSDEC, Agfa investigated the potential for use of field analysis kits for cadmium, silver, and mercury. Field test kits are available for mercury. However, an Internet search and discussions with vendors (Hazco, Forestry Suppliers) revealed that field test kits are not available for cadmium and silver. As such, standard laboratory analyses will be used.

Total silver and cadmium concentrations in each sample selected for analysis will be determined using EPA Method 6010B; total mercury concentrations will be determined using EPA Method 7471. One field blank will be collected and analyzed for total cadmium, total silver, and total mercury, and one duplicate soil sample will analyzed for every 20 samples analyzed.

2.0 FIELD SAMPLING ACTIVITIES

Based on our discussions, the intent of this investigation is to vertically profile the elevated cadmium concentrations in soil boring SB-6F, the elevated silver concentrations in soil boring SB-6A, and the elevated concentrations of both silver and cadmium in soil boring SB-6B. In addition, it was agreed during our September 29 meeting that mercury would be included as a target parameter for all sample locations, since it was detected at concentrations above concentrations specified in NYSDEC's TAGM 4046.

This limited investigation will consist of three soil borings, as proposed below. It may be necessary to modify these sampling depths slightly due to field conditions. If adjustment to this proposal becomes necessary in the field, agreement will be obtained from the on-site NYSDEC representative at that time.

LOCATION	MINIMUM DEPTH	SAMPLING DEPTHS (ft. bgs.)	ANALYSES
SB-6A	14 feet	4 ft., 9 ft., 14 ft., and 5-foot intervals thereafter, as required.	Total Silver, Cadmium, Mercury
SB-6B	14 feet	4 ft., 9 ft., 14 ft., and 5-foot intervals thereafter, as required.	Total Silver, Cadmium, Mercury
SB-6F	33 feet	8 ft., 13 ft., 18 ft., 23 ft., 28 ft., 33 ft., and 5-foot intervals thereafter, as required.	Total Silver, Cadmium, Mercury

The borings will be advanced using a hollow-stem auger, and split-spoon samplers will be used to collect soil samples. Sampling at the locations of borings SB-6A and SB-6B will require removal of one or more large trees to allow access to drilling equipment.

As indicated in the table presented above, initial samples at each location will be collected from the lowermost depth in the Phase 1/Phase 2 RI boring where contaminants of concern were detected at concentrations exceeding Site Cleanup Goals (SCGs). This will have the dual benefit of confirming the correct location of the boring through comparison with historical results, and providing a point of comparison for the deeper samples. Subsequent samples will be collected from each boring at a rate of one every five vertical feet. Initial sample depths will be 4 feet bgs at locations SB-6A and SB-6B and 8 feet bgs at location SB-6F. The minimum depths listed above are based on our discussions during the September 29 meeting.

Initial analysis of samples from SB-6A and SB-6B will include those samples collected from intervals 4 feet bgs, 9 feet bgs, and 14 feet bgs. Initial analysis of samples from SB-6F will include those samples collected from intervals 8 feet bgs, 13 feet bgs, 18 feet bgs, 23 feet bgs, 28 feet bgs, and 33 feet bgs. Identification of the vertical extent of contamination in each boring will be considered to be complete when analysis indicates that two consecutive samples contain contaminants of concern below SCGs.

At Agfa's discretion and based on observations made during installation, the borings may be advanced beyond the minimum depths specified above. Any samples collected from depths below the specified minimum depths will be archived in a laboratory. These samples may be used for later analysis if such analysis is needed to identify the vertical extent of contamination in each boring as defined above. Once the vertical extent of contamination is established in a boring, all remaining archived samples will be properly discarded.

Because investigative work has not been performed at the site in several years, Agfa recommends that a flyer that briefly describes the sampling activities be sent to immediate neighbors and other relevant stakeholders approximately one week before commencement of sampling. We will provide a draft copy of the flyer for your review prior to mailing.

3.0 QUALITY ASSURANCE/QUALITY CONTROL

The samples will be analyzed by a NYSDOH-approved, ELAP/CLP-certified laboratory. Quality Assurance/Quality Control (QA/QC) procedures will be followed in accordance with the EPA method for analysis of Total Analyte List (TAL) Metals.

Laboratory analytical data for samples collected as part of this limited RI will be reported in the NYSDEC ASP Category B deliverable format. The data will be validated in accordance with NYSDEC's Guidance for the Development of Data Usability Summary Reports (DUSRs), which requires the following be reviewed:

1. Use of appropriate data deliverable format (must be NYSDEC ASP Category B or USEPA CLP); for this project, data will be reported in NYSDEC ASP Category B format
2. Compliance with holding times;
3. Compliance of QC data (blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls, and sample data) with protocol-required limits and specifications;
4. Use of established and agreed upon analytical protocols;
5. Confirmation of results presented in data summary sheets and quality control verification forms by raw data; and
6. Use of correct data qualifiers.

Data validation will be performed by Eric Malarek, ICF Kaiser's Quality Assurance Officer for the project. Mr. Malarek is a chemist with more than twelve years of experience performing data validation, quality assurance, and project chemical management. Mr. Malarek's qualifications are presented as Annex 2.

Based on the contaminants of concern, no field monitoring equipment will be required for the investigation. As such, field calibration of equipment will not be required. Field and laboratory sample custody procedures employed during this investigation will be in accordance with those presented in Sections 2.1 and 2.2 of the site Field Sampling and Analysis Plan (FSAP) prepared by Groundwater Technology, Inc. in September 1993, with one exception. The role of the Site Manager for the investigation will be assumed, for purposes of sample custody, by the designated field team leader.

Because investigative work has not been performed at the site in several years, Agfa recommends that a flyer that briefly describes the sampling activities be sent to immediate neighbors and other relevant stakeholders approximately one week before commencement of sampling. We will provide a draft copy of the flyer for your review prior to mailing.

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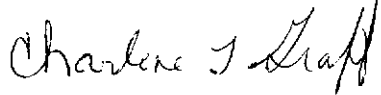
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Agfa intends to proceed with this limited investigation at the earliest opportunity. As such, we request your approval of this Work Plan as soon as possible. Agfa will provide a draft copy of the notice flyer upon your approval of this scope. If you have any questions, please call me at (201) 440-2500, extension 4613.

Sincerely,

Agfa Corporation

A handwritten signature in cursive script that reads "Charlene T. Graff".

Charlene T. Graff
Environmental Specialist

cc: S. Davis; Huber, Lawrence & Abell
C. Kerlish; ICF Kaiser

ANNEX 1

SITE HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN

PREPARED FOR:

**Peerless Photo Products Site
Randall Road
Shoreham, NY**

PREPARED BY: ICF KAISER ENGINEERS

DATE PREPARED: February 5, 1999

ICF KAISER PROJECT NUMBER: 70173-001-00

NOTICE

This Health and Safety Plan (Plan) was prepared to be used by ICF Kaiser Engineers employees, performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known, or suspected, to be present on the project site(s). It is not possible in advance, to discover, evaluate, and protect against all possible hazards which may be encountered during the completion of this project. Adherence to the requirements of this Plan will significantly reduce, but not eliminate, the potential for occupational injury and illness at the project site(s). The guidelines contained in this Plan were developed specifically for the project site(s) and scope of work described herein, and should not be used at any other site(s) without the review and approval of a qualified health and safety professional.

SITE HEALTH AND SAFETY PLAN SIGNATURE FORM

Prior to the initiation of field activities, I have read, and have been given an opportunity to question the contents of this Site Health and Safety Plan. By my signature, I certify that I understand, and agree to comply with the information and directions set forth in this Plan. I further certify that I am in full compliance with OSHA 29 CFR 1910.120 in regards to training and medical monitoring requirements.

SITE PERSONNEL:

Printed Name

Signature

Date

_____	_____	_____
_____	_____	_____
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_____	_____	_____

Harold Hornung

Harold Hornung
Office Health & Safety Officer

Harold Hornung

Signature

2/5/99

Date

GENERAL SITE INFORMATION

SITE NAME: **Peerless Photo Products Site**

SITE ADDRESS: **Randall Road
Shoreham, New York**

SITE CONTACT AND PHONE NUMBER: **Peerless Photo Products Site is an unmanned site. Site
Contact is:
Ms. Charlene Graff
Agfa Corporation
(201) 440-2500 ext. 4613**

ICF PROJECT NUMBER: **80425**

PROPOSED DURATION OF SITE WORK: **START DATE: To Be Determined
END DATE: To Be Determined**

SITE HISTORY (CURRENT STATUS, PAST USES / PROCESSES)

The site is a former photographic chemical manufacturing facility. Previous on-site chemicals have included acetic acid, cadmium salts, and silver salts. Several areas of the site are historically significant, including a laboratory formerly used by Nikola Tesla, and the concrete base of a radio tower. The site is currently inactive. Previous sampling has detected cadmium and silver in soils, and cadmium in groundwater beneath the site.

ICF KE has been contracted by the Agfa Corporation to conduct additional soil sampling in APC-10, Tesla Tower Base and APC-11, LILCO Right-of-Way. This information will be used to support remedial technology selection for the site.

CONTAMINANTS OF CONCERN (PROVIDE SPECIFICS IN TABLE 1)

Chlorinated Solvents	_____	Gasoline/Diesel/Mineral Oil	_____
Heavy Metals	<u> X </u> (Cd & Silver)	Asbestos	_____
Pesticides	_____	Non-Chlorinated Solvents	_____
Corrosives	_____	Oxidizers	_____

NOTE: Appendix A contains the Niosh chemical data sheets for cadmium and silver.

SCOPE OF WORK

Task 1 - Soil sampling will be conducted in the Tesla Tower Base and the Lilco Right of Way (APC-11). ICF KE will attempt to reproduce and extend the depth of historical borings SB-6A, SB-6B, and SB-6F in the Tesla Tower Base, and submit the samples for analysis of TCLP cadmium and total cadmium. ICF KE personnel will collect up to two samples from borings in the Lilco (APC-11) Right of Way area and the samples will be analyzed for TCLP silver and total silver.

TABLE 1 — SITE CHEMICAL HAZARDS SUMMARY

CHEMICAL NAME / CAS NUMBER	PRINCIPAL HAZARD	ACUTE EXPOSURE SYMPTOMS	CONTAMINATED MEDIA	HIGHEST CONCENTRATION	EXPOSURE LIMIT
cadmium	Inhalation (known human carcinogenic)	Skin and eye irritation, nausea, vomiting, headache, chills, diarrhea, and tight chest.	Soil and groundwater	260 ppb	0.005 mg/m ³
silver	Inhalation & contact	Skin and eye irritation, nasal septum, and GI disorders.	Soil and groundwater	unknown	0.01 mg/m ³

ASSIGNMENT OF RESPONSIBILITIES

- A. The project manager (and field operations leader, if different) is responsible for ensuring that all provisions specified in this plan are appropriately implemented on the project.

The project manager shall identify and communicate anticipated health and safety requirements to any subcontractor(s) as early as possible; and shall complete the appropriate ICF International Subcontractor Health and Safety Agreement documents.

- B. The site safety officer (SSO) is responsible for the field coordination of the project health and safety plan and other aspects of the ICF Kaiser health and safety program. Among the specific duties of the SSO are: hazard assessment, air monitoring, evaluation of the personal protective equipment program, and consulting with the health and safety director on matters related to the project. The SSO reports to the project manager, and has authority to stop work when necessary to guarantee employee well being.
- C. Project team members will be familiar with the contents of this health & safety plan, the project work plan, and the project quality assurance plan; and will observe all specifications set forth within those plans, and with further direction they may receive from time to time. No employee may, for any reason, perform an act, or create a condition that may cause harm to themselves, co-workers, or third parties. All employees shall immediately report unsafe conditions to the site safety officer.

MEDICAL SURVEILLANCE

- A. All ICF Kaiser personnel who may be required to enter the exclusion zone or decontamination zone shall have successfully completed a preplacement or periodic/update physical examination in accordance with 29 CFR 1910.120.
- B. All subcontractor personnel who, because of their job assignments, may incur exposures to the hazardous materials present at the jobsite, must have successfully completed a physical examination similar in content to the ICF Kaiser preplacement physical exam, unless this requirement is waived by the ICF Kaiser Environment Group health and safety director.

EMPLOYEE TRAINING AND INDOCTRINATION

- A. All ICF Kaiser personnel assigned to this project shall have completed, at a minimum, the appropriate mandatory formal training courses. 29 CFR 1910.120 requires 40, or 24 hours of initial training, and 8 hours annual refresher training; plus three days supervised on-site training for hazardous waste workers. An additional 8 hours training is required for supervisors. State regulations shall be consulted to identify alternate or additional requirements.
- B. All subcontractor personnel shall have completed minimum training in compliance with 1910.120, as appropriate, or requirements as specified by other regulations, or this plan.

- C. Daily safety meetings, detailing specific hazards of the work to be performed and safety precautions and procedures for each task, shall be conducted by a qualified person at the beginning of each shift and shall be documented in writing in the field log.
- D. Material safety data sheets (MSDS) will be obtained for all hazardous materials introduced for use on site. A copy of each MSDS shall be available on the site. General chemical information in the form of MSDSs for residual or waste materials encountered on site is available through a database located in the ICF Kaiser Pittsburgh office.

HAZARD EVALUATION (EVALUATE EACH TASK FOR HAZARDS FROM THE FOLLOWING SOURCES)

<u>PHYSICAL</u>	Slip & Fall	Elevated Work Locations
	Thermal Stress	Vehicular Traffic
	Fire	Manual Lifting
	Noise	Moving Machinery
<u>BIOLOGICAL</u>	Poisonous Plants	Insects/Spiders
	Snakes	Other Animals
<u>CHEMICAL</u>	Corrosives	Systemic Poisons
	Irritants	Sensitizers

WILL THE PLANNED SITE OPERATIONS INCREASE EXISTING HAZARDS, OR INTRODUCE ADDITIONAL HAZARDS TO THE SITE? NO _____ YES XXX

IF YES, DESCRIBE THE INCREASED/ADDITIONAL HAZARDS; AND IDENTIFY CONTROL MEASURES:

Drilling with truck-mounted hollow-stem auger and split spoon samplers increases physical hazards including moving machinery and vehicular traffic. Also increased hazard from exposure to cadmium and silver impacted soil from soil cuttings generated during boring operations.

NOTE: Drilling Safety Guide is attached as Appendix B.

OVERALL HAZARD RATING: LOW XXX MODERATE _____

DISCUSSION OF COMMON PHYSICAL HAZARDS

HEAT STRESS

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, to serious illness or death.

Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment puts a worker at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at sites, regular monitoring and other preventive measures are vital.

Note: Chemical protective clothing is defined as, but not limited to:

- Clothing constructed of Tyvek, or coated-Tyvek
- PVC rainsuits or coveralls, and
- CPF Series Coveralls.

Heat stress manifests in progressive stages, increasing in severity. The initial stage is commonly termed heat fatigue, which is usually transient, and subsides with rest and replenishment of fluids. Heat fatigue is characterized by discomfort, and reduced mental awareness, with a greater effect in unacclimated workers. Medical treatment is usually not needed.

Heat exhaustion results from sustained exertion in heat, combined with failure to replace water and salts lost in sweat. Symptoms include fatigue, nausea, headache, and clammy, moist skin, which may be flushed or pale. Replacement of water and salts is required to recover, victims may faint upon standing. Electrolyte replacement fluids should be taken until urine volume increases.

Heat syncope results in fainting, and is caused by standing immobile in heat. It is caused by pooling of venous blood in the dilated vessels of the skin and lower body. Recovery is complete and rapid following rest in a recumbent position at a cool location.

The most serious heat illness is heat stroke. Heat stroke is a **medical emergency**, treatment must be immediate, and professional medical attention must be obtained. Heat stroke is caused by a combination of factors including heavy exertion in heat, inadequate replacement of fluids, poor physical condition, and individual susceptibility. Failure of the sweat response occurs, leading to a rapidly accelerated increase in core temperature. The victim usually has hot, dry red skin, and if conscious, is confused; convulsions may be present. The victim must be cooled immediately, heat stroke is fatal if treatment is incomplete or delayed.

As with any illness, the best cure is prevention. Heat stress is most likely early in the summer, prior to acclimatization. Full acclimatization takes from 5 to 7 consecutive days of controlled exertion in heat. Individual physical conditioning, pre-existing illnesses, and use of alcohol contribute significantly to the potential for heat stress. Elevated core temperatures are associated with fetal developmental abnormalities.

Operational Guidance

Determine a baseline heart rate and oral temperature for each employee prior to on-site activities by counting the radial pulse and using a clinical thermometer to measure oral temperature. A work/rest schedule should be developed prior to initiating field activities, whenever ambient temperatures are greater than 70°F and chemical protective clothing is used; and when temperatures are greater than 85°F without chemical protective garments. The schedule must be constantly assessed to ensure effectiveness, and may need to be modified during the work day. Note that subcontractors performing physically more demanding work may need to establish a more restrictive schedule.

Increasing Work Rate

- (1) If a worker's heart rate and oral temperature do not increase, or only increase slightly (10% or less for the heart rate and 0.5° or less for the oral temperature) from the baseline readings after the first work cycle, the work period (according to the established work-rest regimen) can be increased by 20%.
- (2) The worker shall be monitored closely after the next work cycle period and if there are still no significant increases in heart rate and oral temperature, the work period can be increased by an additional 10% and the rest period remains the same.
- (3) Increases in the work period can be made throughout the shift if there are no significant increases in the physiological monitoring indices.
- (4) Note that the increases to the work period are made based on the work-rest regimen established prior to initiation of work activities.

Decreasing Work Rate

- (1) Count the radial pulse as early as possible in the rest period.
- (2) If a worker's heart rate exceeds 110 beats per minute immediately after a work period, shorten the next work cycle by 30% and keep the rest period the same.
- (3) If the heart rate still exceeds the 110 beats per minute after the next work period, shorten the following work cycle by 30%.
- (4) Continue to shorten the employee's work cycle until the heart beat is below 110 beats per minute.

Adequate liquids must be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

Replacement fluids can be a 0.1% salt water solution, a commercial mix, such as Gatorade or Quik Kick, or a combination of these with fresh water. Employees should be encouraged to salt their foods more heavily. Salt pills are prohibited.

The replacement fluid temperature should be kept cool.

Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.

All breaks are to be taken in a cool, shaded rest area (<80°F).

Employees shall remove chemical protective garments during rest periods.

Employees shall not be assigned other tasks during rest periods.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

Employees shall be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

Training

Those personnel (including workers, supervisors, and contractor employees) potentially exposed to heat stress conditions shall have been trained in the following:

1. Sources of heat stress, influence of protective clothing, and importance of acclimatization;
2. How the body handles heat;
3. Heat related illnesses;
4. Preventative/Corrective measures; and
5. First Aid procedures.

COLD STRESS

As with high temperatures, outdoor work in low temperatures can result in risks to the health of employees exposed without adequate preparation. To minimize impacts from cold stress, the information and precautions given below shall be observed.

Cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. Most hypothermia cases develop in air temperatures between 30 - 50°F. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body.

Employees shall be protected from exposure to cold so that the deep core temperature does not fall below 38° centigrade (C) (100.4°F). Lower body temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling,

causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible.

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

- Frost nip or initial frostbite: characterized by sudden blanching or whitening of skin.
- Superficial frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: tissues are cold, pale, and solid; extremely serious injury.
- Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: 1) shivering, 2) apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95°F, 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate, 4) freezing of the extremities, and finally 5) death.

Operational Guidance

Proper dress is critical to the prevention of hypothermia. The following information provides a useful starting point:

If the clothing of an employee might become wet on a job site, the outer layer of the clothing must be impermeable to water.

Employees should layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.

Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could lead to heat stress problems.

Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.

Employees handling evaporative liquids (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

Work shall be arranged in such a way that sitting still or standing for long periods is minimized.

Thermal socks, long cotton or thermal underwear, hardhat liners and other cold weather gear can aid in the prevention of hypothermia.

Blankets, warm drinks (other than caffeinated coffee) and warm break areas are essential.

An overall goal is to keep from getting wet. If one does get wet, dry off and change clothes.

All eyewash/shower units shall be winterized for flow in cold weather.

Because of temperature and wind, operations may be suspended by the field operations leader as advised by the health and safety officer.

Training

All employees who may work in cold areas shall be trained in:

1. Proper first aid treatment,
2. Proper clothing practices,
3. Proper eating and drinking habits,
4. Recognition of impending adverse health effects, and
5. Safe work practices.

Clothing for warmth, which is worn under chemical protective clothing, can be laundered in normal fashion, without the wash water being collected as contaminated water. If there is a rip or tear in the chemical protective clothing in a contaminated area, the clothing for warmth must be handled as potentially contaminated, and the water in which it is washed must be collected as potentially contaminated water. More rigorous steps may be required if materials handled are extremely toxic (dioxin, etc.).

MANUAL LIFTING

Manual lifting is common to site investigation activities; and is a potential source of serious injury. The common concern about lifting is causing an injury to the back; but improper lifting techniques can also injure the neck, shoulder, knee, and hands. Site conditions (poor footing, inadequate lighting, and weather) can compound the hazards associated with lifting. To minimize potential hazards from manual lifting, follow the guidance presented below:

Prior to lifting, size up the job; look at the weight, size, shape, and condition of the object to be lifted, and decide if you can lift it unassisted.

Obtain help if the lift will exceed your abilities. When lifting/carrying an object with another person, the weight should be evenly distributed, and movements coordinated.

If you are lifting an object on your own, place your feet close to the object, get a good grip (palm of the hand is stronger than fingers, watch for sharp edges, nails, splinters), and straighten your back.

Keeping your back straight, keep the object close to your body, and use the muscles in your legs to lift the object. Complete the lift before turning, and turn by repositioning your feet, never twist while lifting or carrying an object.

Reverse the procedure when setting the object down, and keep your fingers clear of pinch points.

If you do injure yourself lifting, or suspect you may have, report the injury immediately, do not attempt self treatment, or ignore the problem.

HAZARD CONTROL MEASURES

Control of hazards through application of engineering controls is the most desirable course of action. The transitory nature of field projects, and the uncontrolled conditions prevalent at sites make the use of engineering controls infeasible much of the time. As a result, administrative controls and personal protective equipment are the most effective options to reduce hazards to workers.

At the beginning of the project, each work shift, and as often as necessary to ensure safety, a competent person shall conduct an area survey to locate work place hazards and determine appropriate safety control measures.

EMPLOYEE HEALTH AND SAFETY RULES

The following general safety rules are to be observed at all project sites.

- At least one copy of this plan shall be available at each work site.
- Horseplay, practical joking, or any other actions that jeopardize safety will not be tolerated.
- Running is not permitted.
- Alcoholic beverages and non-medicinal drugs are not permitted at the project site. Employees suspected of being under the influence of alcohol or drugs will be removed from the site.
- Radios (excepting two-way radios), tape players or other forms of entertainment devices are prohibited in the authorized zone.
- All activities will be performed in such a manner to minimize or prevent the disbursement or release of contaminants.
- Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the regulated area until it has been cleaned, or properly packaged and labeled.
- Legible and understandable precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.
- Removal of contaminated soil from protective clothing or equipment by blowing, shaking or any other means which disperse contaminants into the air is prohibited.
- Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the generator, transporter and disposer.

- Contaminated materials shall be stored in tightly closed containers in well-ventilated areas.
- Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.
- Emergency equipment shall be located in readily accessible locations.
- All trenching, shoring, and excavation work must comply with all federal OSHA rules.
- No food or beverages shall be present or consumed in the regulated area. No tobacco products shall be present or used and cosmetics shall not be applied in the regulated area.
- Employees shall be required to wash their hands and face before eating, drinking, smoking, or applying cosmetics.
- Portable or fixed emergency shower/eyewash stations shall be located outside the regulated area near work activities.
- All personnel shall avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, or leaning against drums shall be avoided.
- Monitoring equipment shall not be placed on potentially contaminated surfaces.
- Field personnel must observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:
 - changes in complexion and skin discoloration
 - changes in coordination
 - changed in demeanor
 - excessive salivation and pupillary response
 - changes in speech pattern
- Field personnel shall be cautioned to inform each other of non-visual effects of toxic exposure such as:
 - headaches or dizziness
 - nausea
 - blurred vision
 - cramps
 - irritation of eyes, skin, or respiratory tract
- Prompt remedial action shall be taken whenever an inadvertent release of a hazardous material occurs.
- Appropriate action to provide secure footing shall be taken at all locations where personnel will be working.

- Provision must be made for cleaning gross contamination from boots and suits in the decontamination zone.
- Whenever solvents, cleaners, or other chemical substances are used for decontamination, a properly completed Material Safety Data Sheet for the chemicals shall be available at the work site.
- Whenever flammable or combustible solvents are used for decontamination, specific procedures for the control of flammable gases and vapors may be necessary. When concentrations of flammable vapors cannot be controlled by ventilation, this would include, but is not limited to, the following:
 - Tests shall be made by a qualified person to ensure that concentrations of flammable vapors in the work area do not exceed 20% of the lower explosive limit.
 - As appropriate, equipment on site shall be bonded and grounded, spark proof, and explosion resistant.
 - An adequate supply of fire extinguishes with a minimum rating of 10 B:C, shall be strategically located throughout the work area so as to limit the travel distance required by any worker to reach the extinguisher to less than 75 linear feet.
- A qualified person shall take positive steps to ensure that employees are protected from physical hazards which would include, but are not limited to, the following:
 - Discharge of steam, high pressure air, water or oil;
 - Tools or other objects dropping from overhead;
 - Falls from scaffolds, stairs, or ladders;
 - Tripping over hoses, pipes, tools or equipment;
 - Slipping on wet, oily surfaces;
 - Insufficient or faulty personal protective equipment;
 - Insufficient or faulty operations equipment and tools; and
 - Noise in excess of acceptable levels.

SITE CONTROL

ACCESS

Access to the site shall be restricted to authorized personnel. All personnel shall enter and exit the regulated area through the decontamination zone.

BUDDY SYSTEM/SITE COMMUNICATIONS

If the size, or topography of the site is such that operations will be conducted out of continuous visual contact with support zone personnel, a buddy system, or means of immediate voice communication (two way radio) shall be instituted.

POSTING

The site should be posted to warn the public of potential hazards. Also, notices regarding the use of protective equipment (hardhats, safety glasses, etc.) should be placed at the access points to the sites. Additional notices of specific hazardous areas should be posted where needed.

VISITORS

All visitors to the site shall notify the field operations leader or SSO of their presence upon arrival. Visitors shall be escorted at all times.

PERSONAL PROTECTIVE EQUIPMENT

LEVELS OF PROTECTION

Level A

Level A protection will not be utilized on this project.

Level B

Level B protection will not be utilized on this project.

Level C

Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.

Level D

Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

The standard level of protection for work on this project is Level D, consisting of:

Hardhat,
Safety shoes,
Safety glasses,
Long pants and long-sleeve shirt*, and
Canvas or leather work gloves.

*T-shirts may be substituted during general oversight activities when ambient air temperatures exceed 80°F

RESPIRATORY PROTECTION (GENERAL)

- Only properly cleaned and maintained, NIOSH/MSHA approved respirators shall be used on site.
- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection will be made by the regional health and safety officer.
- Air purifying cartridges shall be replaced at the beginning of each shift or when load-up or breakthrough occur.
- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determined that the employee will be unable to function normally wearing a respirator or that the safety or health of the employee or other employees will be impaired by use of a respirator. This shall be so stated on the medical certificate.
- Only employees who have had pre-issue qualitative fit tests and annual fit tests thereafter shall be allowed to work in atmospheres where respirators are required.
- If an employee has demonstrated difficulty in breathing during the fitting test or during use, he or she shall have a supplemental physical examination to determine the cause of the difficulty.
- Where practical, respirators will be assigned to individuals for their exclusive use.
- Respiratory devices will be cleaned, sanitized, and inspected at the completion of each shift activities.
- Contact lenses are not to be worn while using any type of respiratory protection.
- Excessive facial hair (beards) prohibits proper face fit and effectiveness of respirators. persons required to wear respirators must not have excessive growth of beard. All personnel wearing respirators will be required to be clean shaven prior to each day's shift.
- Regular eyeglasses cannot be worn with full-face respirators (breaks the facepiece seal). Inserts must be used.
- The respiratory protection utilized on site will be in compliance with 29 CFR 1910.134.

- Where respirators are designated for protection against particulate contaminants, the employee shall be permitted to change canisters or cartridges whenever an increase in breathing resistance (load-up) is detected.

TASK/PROTECTION MATRIX

<u>ACTIVITY</u>	<u>LEVEL OF PROTECTION</u>
Boring installation	D
Soil Sampling	D
_____	---
_____	---
_____	---
_____	---
_____	---

Definition of Protection Levels

Level D Hardhat;
 Safety glasses or goggles;
 Steel toe/shank shoes;
 Long pants, long-sleeve shirt*.
 Uncoated Tyvek for soil sampling (poly-coated tyvek for groundwater sampling)

* When using chemical protective coveralls, shorts and/or t-shirts may be worn to reduce heat stress. T-shirts may be substituted during general oversight activities when ambient air temperatures exceed 80°F.

Level C Hardhat;
 Full Face Air Purifying Respirator;
 GMC-H Cartridges;

ACTION LEVELS

The following breathing zone action levels shall be used in conjunction with air monitoring. The breathing zone is defined as the area from the workers' waist up, forward of the shoulders. Miniram readings should be stable and continuous for at least 1 minute.

Inorganics

Background to 2.5 mg/m³
2.5 - 5.0 mg/m³

Continue work/monitor
Use Level C respiratory protection and administer dust suppression methods
Evacuate site

>5.0 mg/m³

* Contact the Site Safety Officer if readings continue to exceed Background +5 mg/m³.

DECONTAMINATION

PERSONNEL DECONTAMINATION

Personnel decontamination facilities will be established on site to ensure that personnel maintain a high degree of personal hygiene and minimize the possibility of exposure to chemical hazards.

A personnel decontamination area will be established to facilitate controlled removal of contamination and protective clothing. All personnel exiting the exclusion zone will pass through the decontamination area to remove gross contamination. This will be accomplished via two-stage washing of outer gloves and boots, the first stage using soap and water, and the second stage being a clean water rinse. An emergency eyewash will be located in the immediate area for employees who may come in contact with contaminated materials.

Personnel are required to wash hands, face, and other exposed skin areas prior to leaving for breaks or lunch. Boots, gloves and respirators will be decontaminated following standard procedures prior to entering the support zone.

INSTRUMENT DECONTAMINATION

Instruments used in potentially contaminated areas should be protected from contamination by plastic wrap to the extent feasible (take care not to cover air inlets or exhaust ports). Decontamination of instruments is to be conducted using appropriate solvents (alcohol, distilled water, etc.) so that the instruments are visually clean.

EQUIPMENT DECONTAMINATION

Equipment used in potentially contaminated areas (bucket augers, trowels, etc.) will be decontaminated prior to entering the site. Upon completion of the project, or prior to leaving the site, the equipment will be cleaned with a sequential wash/rinse procedure to remove potentially contaminated media.

DECONTAMINATION WASTE DISPOSAL

Wastes generated during personnel and instrument decontamination (water, solvents, rags, paper towels, etc.) shall be collected, filtered if necessary, and containerized if necessary, according to hazard class. Decon wastes shall be disposed in accordance with applicable regulations.

EMERGENCY PROCEDURES

NOTIFICATIONS

In the event of an emergency requiring notification of off-site personnel, the field operations leader is responsible for immediately contacting the appropriate agencies. If the field operations leader is unavailable, the site safety officer will perform this function. A list of phone numbers for emergency agencies and utilities will be posted near each phone in the field office.

Each day, or as often as necessary, the field operation leader shall designate an assembly point in case of emergency. Whenever an employee reports, or becomes aware of an emergency conditions, the employee shall immediately proceed to the assembly point. The field operation leader shall account for all personnel on site, and shall provide instructions on further actions to be taken, including declaration of "all clear".

EMERGENCY NUMBERS

The emergency phone numbers shall be identified, and posted at the project site (Table 2). The nearest source of emergency medical care shall be identified, and the information provided to site workers (Table 3).

TABLE 2— EMERGENCY CONTACTS

EMERGENCY PHONE NUMBERS	
FIRE/RESCUE	(516) 744-4102
AMBULANCE	911
POLICE/SHERIFF	(516)854-8600
POISON CONTROL CENTER	Call Emergency Number 800-962-1253
SPILL REPORTING	NJDEP Hotline 800-424-8802
ELECTRIC UTILITY	(718) 225-1177
WATER UTILITY	(718)225-1177
GAS UTILITY	(718)225-1177

TABLE 3 — EMERGENCY MEDICAL INFORMATION

HOSPITAL/EMERGENCY MEDICAL SOURCE	
NAME	Central Suffolk Hospital
PHONE	(516)548-6000
ADDRESS	1300 Roanoke
	Riverhead, Long Island

DIRECTIONS	Take Rt. 25A west into Riverhaed and make a right onto Roanoke. The hospital will be on a few miles down on the left.

EMERGENCY EQUIPMENT ON-SITE

The following emergency equipment will be available at each site:

- First aid kits
- Fire extinguishers
- Emergency eyewash stations/showers

FIRST AID PROCEDURES

Physical Injury

- For minor injuries, routine first aid procedures shall be applied. If required, the injured employee shall then be transported to the hospital.
- For major injuries, an ambulance shall immediately be called, the emergency medical responders shall assess the nature and extent of the injury. In cases of severe injury occurring along with chemical contamination of the victim, and if injuries permit, the victim shall be decontaminated or have the contaminated garments removed prior to being transported in the ambulance, but only if these actions will not pose risk to the victim's health. Ambulance and hospital personnel shall be advised if decontamination was not performed.
- In the event of bleeding, broken bones; shock, burns, heat exhaustion, heat stroke, seizure, insect stings, etc., the trained personnel shall use Red Cross approved measures for treatment.

Chemical Injury

- Appropriate safety gear shall be worn when treating the victim.
- The victim shall be removed to fresh air
- The victim's vital signs shall be assessed, and resuscitation shall be initiated if necessary.
- If clothing is chemically contaminated and injuries permit, clothing shall be removed and the skin flooded with copious amounts of water.

- If the eyes are contaminated, they shall be irrigated immediately with copious amount of water for 15 minutes minimum. Medical attention shall be obtained immediately for any injury involving the eyes.
- Call the nearest Poison Control Center for technical advice and assistance.

FIRES

Small Fires

A small fire is defined as a fire that can be extinguished with a single 10 pound dry chemical fire extinguisher. In the event of a small fire, site personnel will take the following actions:

- Evacuate all unnecessary personnel from the area, if possible to an upwind location.
- Attempt to extinguish fire using portable fire extinguishes or by smothering with soil.
- Request emergency response assistance (ambulance, fire, hospital, poison control center) as needed for any injuries or exposure to hazardous chemicals.

Large Fires

In the event of a large fire or a small fire which cannot be extinguished, the following actions will be taken:

- Evacuate all unnecessary personnel from the site, preferably to an upwind location.
- Notify the fire department and other emergency response services (police, ambulance, hospital, poison control center) as needed.

NEVER RISK A LIFE TO SAVE EQUIPMENT.

SPILLS

If a spill of hazardous material occurs, the following actions will be taken:

- Notify the field operations leader immediately.
- Take immediate measures to control and contain the spill within site boundaries.
- Keep unnecessary personnel away, isolate the hazardous area and deny entry.

- Stay upwind and keep out of low-lying areas.
- Allow no flares, smoking, or flames in hazard area.
- For liquids, keep combustibles away from the spilled materials.

Small Dry Spills

Shovel contaminated materials into dry containers and cover. Use care not to make material airborne. Label the containers as to contents and remove to a secure area.

Small Liquid Spills

Absorb the liquid with sand, clean fill, or other noncombustible absorbent material. Place contaminated material in a container, cover and label it, and remove it to a secure area.

SEVERE WEATHER

In the event of severe weather, as determined by observation of lightning, high winds, or heavy rain, site work shall be suspended until the weather has passed. If the area of the project is under a severe weather warning issued by the National Weather Service, the site safety officer shall maintain continuous observation of approaching weather.

Following a severe weather episode (including earthquakes), site work shall not resume until the site area has been inspected and a qualified person has determined that the site is secure.

LOGS, REPORTS AND RECORDKEEPING

ACCIDENT REPORTS

Following any accident, near-miss, or declared emergency, the field manager shall prepare a report describing the incident using the Supervisor's Injury/Incident Report form.

This report will be submitted to the Group health and safety director within one working day of the event.

AIR MONITORING RECORDS

Real time monitoring (Miniram) records shall be maintained in a project log book. Instrument field calibration and maintenance records shall be maintained in the same log.

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ACCIDENT REPORTS

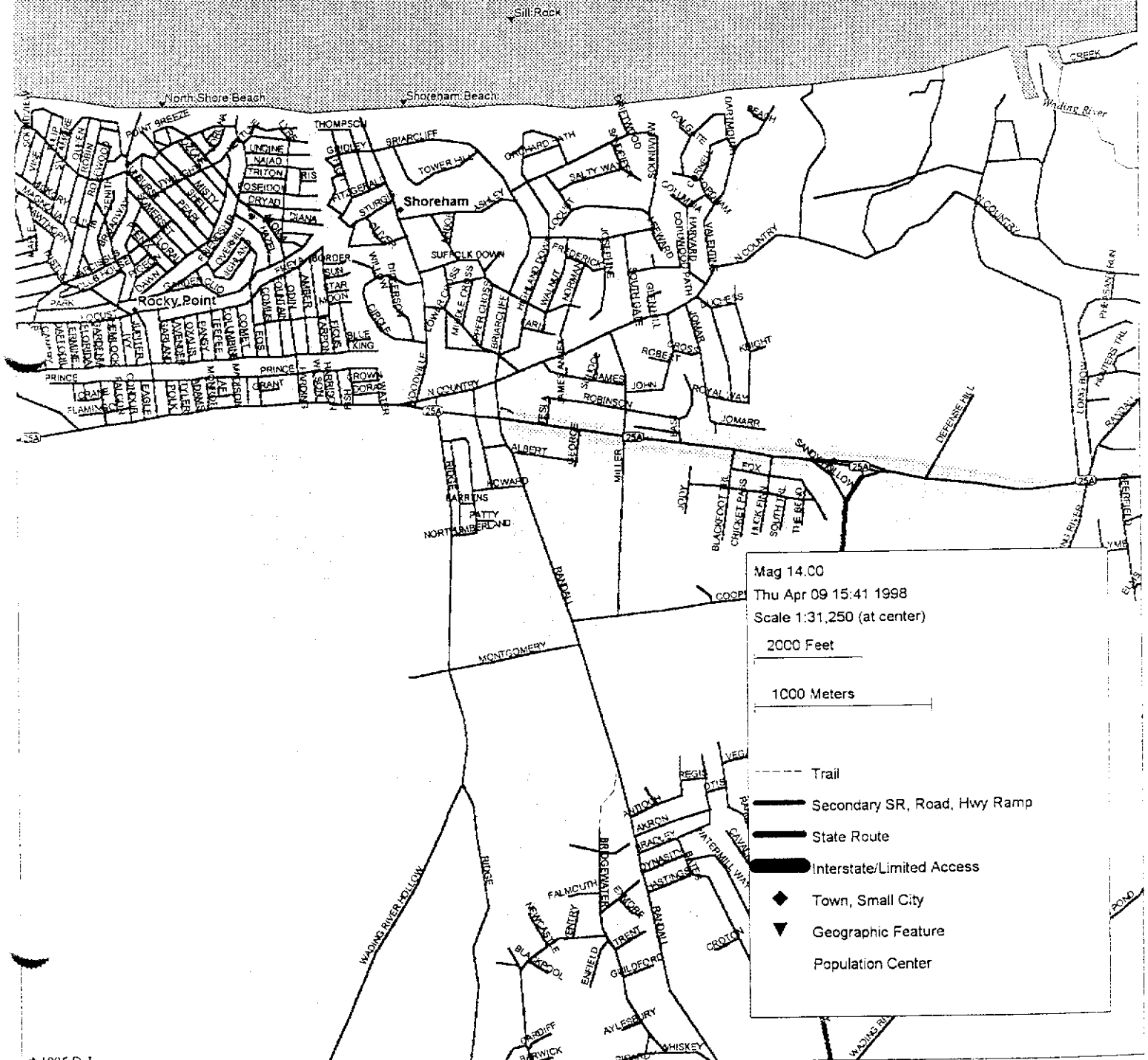
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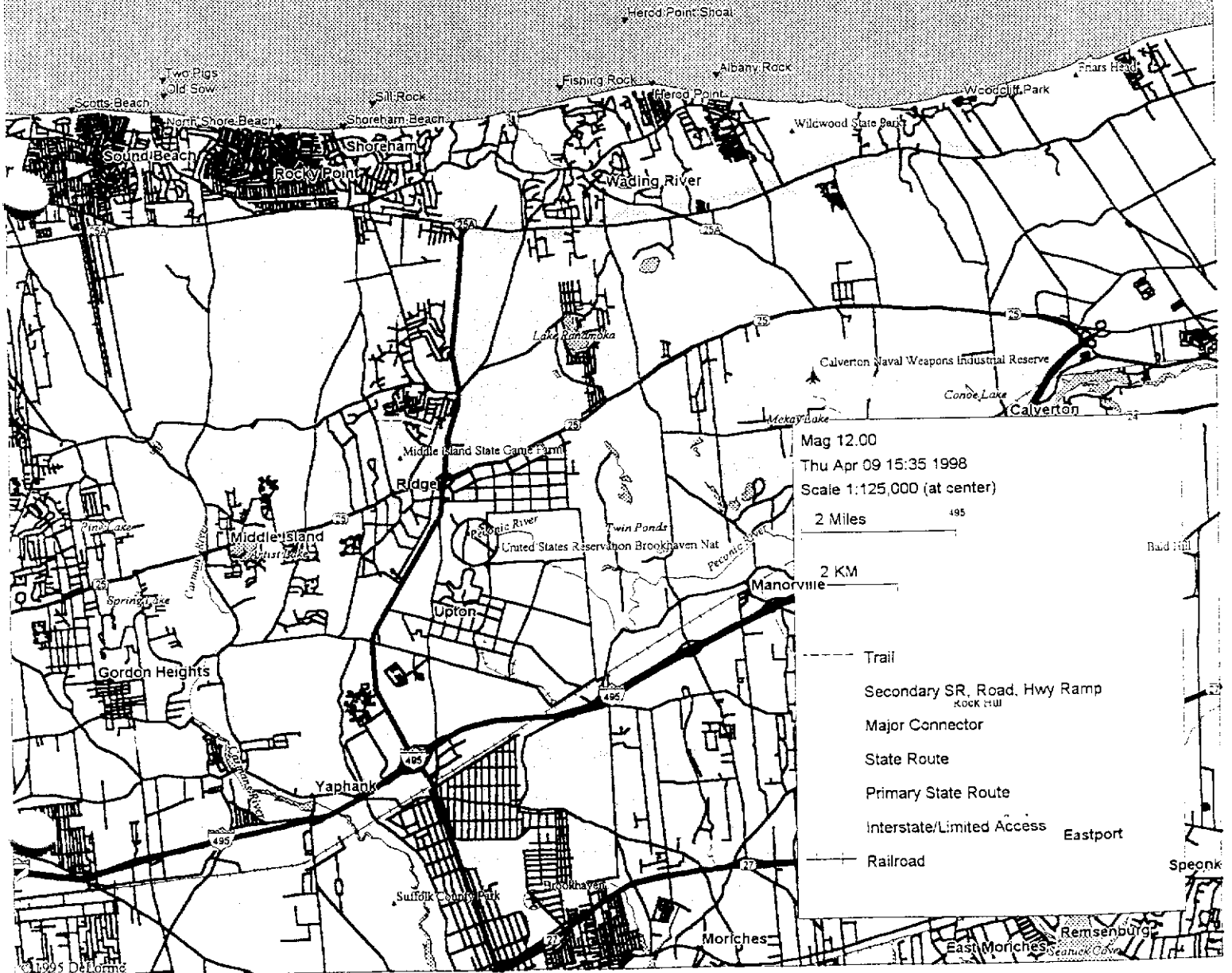
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Route To Hospital Map

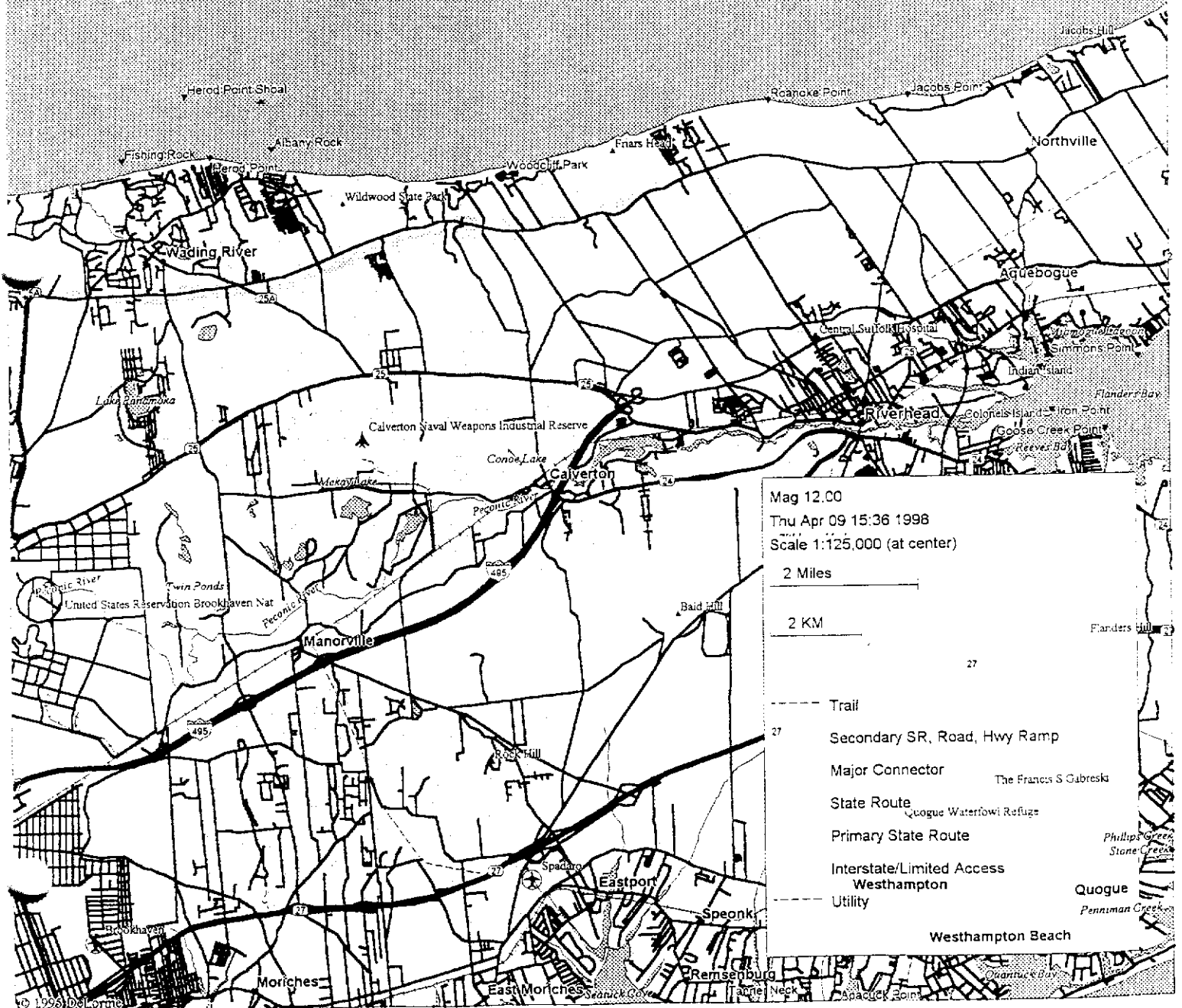


Mag 14.00
 Thu Apr 09 15:41 1998
 Scale 1:31,250 (at center)
 2000 Feet
 1000 Meters

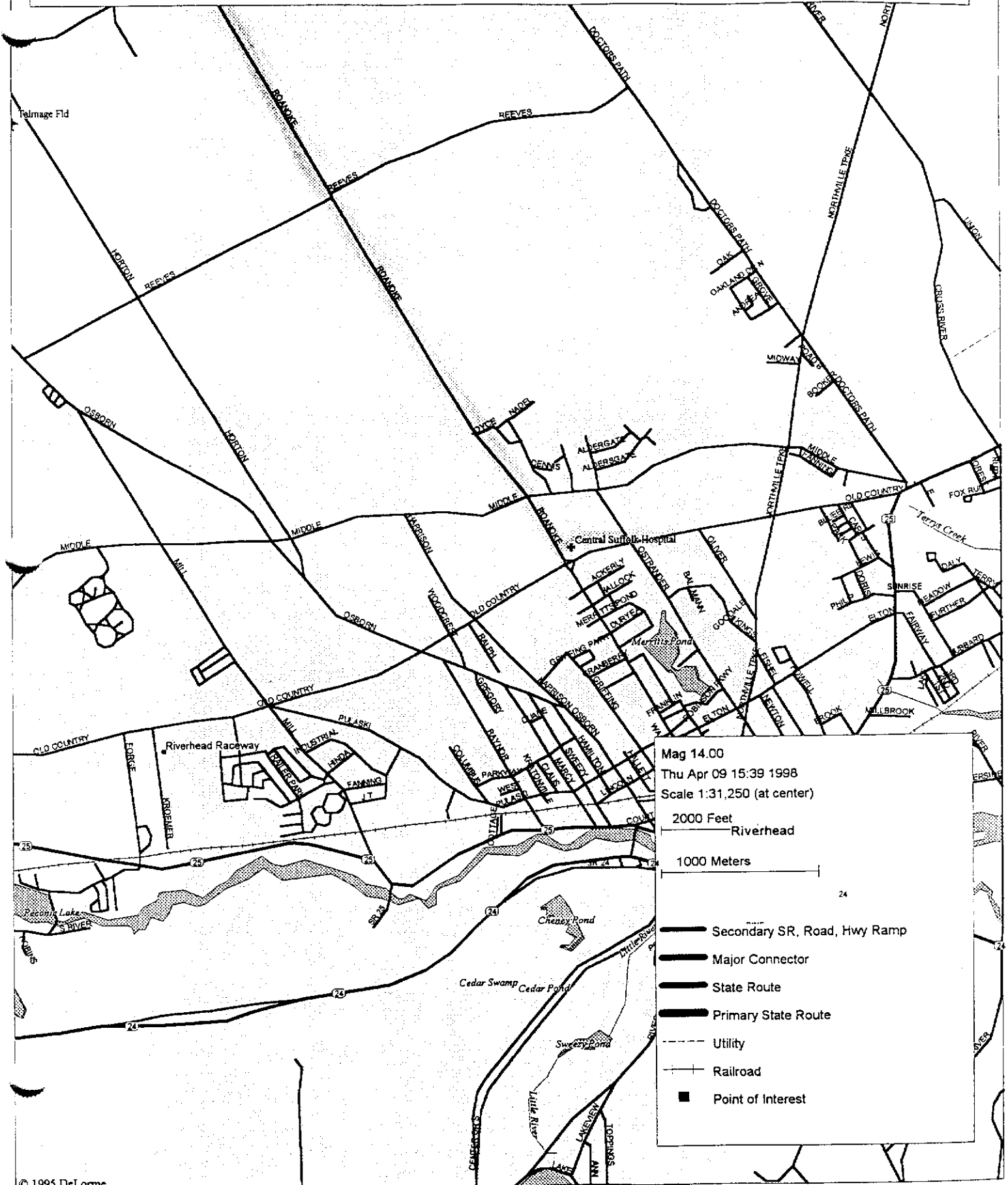
Route To Hospital Map



Route To Hospital Map



Route To Hospital Map



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2000 Feet
 Riverhead

1000 Meters

- Secondary SR, Road, Hwy Ramp
- Major Connector
- State Route
- Primary State Route
- Utility
- Railroad
- Point of Interest

APPENDIX A
Chemical Data Sheets

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL, Fl.P., IP, Sp. Gr., flammability	VP, FRZ, UEL, LEL		
Silver (metal dust and soluble compounds, as Ag) Ag (Metal) 7440-22-4 (Metal) VV3500000 (Metal)	Silver metal; Argentum Synonyms of soluble silver compounds such as Silver nitrate (AgNO ₃) vary depending upon the specific compound.	NIOSH/OSHA 0.01 mg/m ³	10 mg/m ³ (as Ag)	Metal; White, lustrous solid.	MW: 107.9 BP: 3632°F Sol: Insoluble Fl.P: NA IP: NA	VP: 0 mm (approx) MLT: 1761°F UEL: NA LEL: NA	Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethylenimine oxalic acid, tartaric acid	Filter: Acid: ICP: III [#7300, Elements]
Soapstone (containing less than 1% quartz) 3MgO-4SiO ₂ -H ₂ O VV8780000	Massive talc, Soapstone silicate, Steatite	NIOSH 6 mg/m ³ (total) 3 mg/m ³ (resp) OSHA† 20 mppcf	3000 mg/m ³	Odorless, white-gray powder.	MW: 379.3 BP: ? Sol: Insoluble Fl.P: NA IP: NA	VP: 0 mm (approx) MLT: ? UEL: NA LEL: NA	None reported	Filter: none; Grav: III [#0500, Nuisance Dust (total)]
Sodium aluminum fluoride (as F) Na ₂ AlF ₆ 15096-52-3 WA9625000	Cryocide, Crycodust, Cryocite, Sodium hexafluoroaluminat	NIOSH*/OSHA* 2.5 mg/m ³ [*Note: The REL and PEL also apply to other inorganic, solid fluorides (as F).]	250 mg/m ³ (as F)	Colorless to dark, odorless solid. [pesticide] [Note: Loses color on heating.]	MW: 209.9 BP: Decomposes Sol: 0.04% Fl.P: NA IP: NA	VP: 0 mm (approx) MLT: 1832°F UEL: NA LEL: NA	Strong oxidizers	Pad*/pre-Filter; Reagents; ISE; II [#7902, Fluorides]
Sodium azide NaN ₃ 26628-22-8 VY8050000 1687 58	Azide, Azium, Sodium salt of hydrazoic acid	NIOSH C 0.1 ppm (as HN ₃) (skin) C 0.3 mg/m ³ (as NaN ₃) (skin) OSHA† none	N.D.	Colorless to white, odorless, crystalline solid. [pesticide] [Note: Forms hydrazoic acid (HN ₃) in water.]	MW: 65.0 BP: Decomposes Sol(53°F): 42% Fl.P: 7 IP: 11.70 eV	VP: ? MLT: 527°F (Decomposes) UEL: ? LEL: ?	Acids, metals, water [Note: Over a period of time, sodium azide may react with copper, lead, brass, or solder in plumbing systems to form an accumulation of the HIGHLY EXPLOSIVE compounds of lead azide & copper azide.]	None available
					Sp. Gr: 2.90 Noncombustible Solid			
					Sp. Gr: 10.49 (Metal) Metal: Noncombustible Solid, but flammable in form of dust or powder.			

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection—maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam (AgNO ₃) Change: Daily Provide: Eyewash		NIOSH/OSHA 0.25 mg/m ³ : SA, CF/PAPR/HE ¹ 0.5 mg/m ³ : HIEF/SCBAF/SAF 10 mg/m ³ : SAF, PD, PP §: SCBAF, PD, PP/SAF, PD, PP, ASCBA Escape: HIEF/SCBAE	Inh Ing Con	Blue-gray eyes, nasal septum, throat, skin; irrit, ulceration skin; GI dist	Eye: Skin: Breath: Swallow:	Irrimed Water flush Resp support Medical attention irimed	Nasal septum, skin, eyes
[Silver (metal dust and soluble compounds, as Ag)]							
Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		NIOSH 30 mg/m ³ : DM 60 mg/m ³ : DMXSQ/SA 150 mg/m ³ : PAPRDM 300 mg/m ³ : HIEF/SAT, CF*/PAPR/HE ¹ SCBAF/SAF 3000 mg/m ³ : SAF, PD, PP §: SCBAF, PD, PP/SAF, PD, PP, ASCBA Escape: HIEF/SCBAE	Inh Con	Pneumoconiosis: cough, dysp; digital clubbing; cyan; basal crackles, cor pulmonale	Eye: Breath:	Irrimed Resp support	Respsys, CVS
[Soapstone (containing less than 1% quartz)]							
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		NIOSH/OSHA 12.5 mg/m ³ : DM 25 mg/m ³ : OMXSQ*/SA* 62.5 mg/m ³ : SA, CF*/PAPRDM*+ 125 mg/m ³ : HIEF+SCBAF/SAF 250 mg/m ³ : SAF, PD, PP §: SCBAF, PD, PP/SAF, PD, PP, ASCBA Escape: HIEF+SCBAE	Inh Ing Con	Irrit eyes, resp sys; nau, abdom pain, diarr; saliv, thirst, sweat; stiff spine; derm; calcification of ligaments of nbs, pelvis	Eye: Skin: Breath: Swallow:	Irrimed Soap wash prompt Fresh air Medical attention irimed	Eyes, skin, resp sys, CNS, skeleton, kidneys
[Sodium aluminum fluoride (as F)]							
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash, Quick drench		+Note: May need acid gas sorbent TBAL	Inh Abs Ing Con	Irrit eyes, skin; head, dizz, weak, blurred vision; dysp; low BP, bradycardia; kidney changes	Eye: Skin: Breath: Swallow:	Irrimed Water flush irimed Resp support Medical attention irimed	Eyes, skin, CNS, CVS, kidneys
[Sodium azide]							

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					MW, BP, SOL, Fl.P, IP, Sp, Gr, Flammability	VP, FRZ, UEL, LEL		
p-tert-Butyltoluene (CH ₃) ₂ CC ₆ H ₄ CH ₃ 38-51-1 XSB400000	4-tert-Butyltoluene, 1-Methyl-4-tert-butylbenzene	NIOSH 10 ppm (60 mg/m ³) ST 20 ppm (120 mg/m ³) OSHA† 10 ppm (60 mg/m ³)	100 ppm	Colorless liquid with a distinct aromatic odor, somewhat like gasoline.	MW: 148.3 BP: 379°F Sol: Insoluble Fl.P: 155°F IP: 8.28 eV	VP(77°F): 0.7 mm FRZ: -62°F UEL: ? LEL: ?	Oxidizers	Char; CS; GC/FID; II #1501, Aromatic Hydro- carbons]
2667 27	1 ppm = 6.16 mg/m ³				Sp.Gr: 0.86 Class IIIA Combustible Liquid			
n-Butyronitrile CH ₃ CH ₂ CH ₂ CN 109-74-0 ET8750000	Butanenitrile, Butyronitrile, 1-Cyanopropane, Propyl cyanide, n-Propyl cyanide	NIOSH 8 ppm (22 mg/m ³) OSHA none	N.D.	Colorless liquid with a sharp, suffocating odor. [Note: Forms cyanide in the body.]	MW: 69.1 BP: 244°F Sol(77°F): 3% Fl.P: 62°F IP: 11.67 eV	VP: 14 mm FRZ: -170°F UEL: ? LEL: 1.65%	Strong oxidizers & reducing agents, strong acids & bases	Char; Benzene; GC/FID; II [Adapt #1606]
2411 28	1 ppm = 2.87 mg/m ³				Sp.Gr: 0.81 Class IB Flammable Liquid			
Cadmium dust (as Cd) Cd (Metal) 7440-43-9 (Metal) EU9800000 (Metal)	Cadmium metal; Cadmium Other synonyms vary depending upon the specific cadmium compound.	NIOSH* Ca See Appendix A OSHA* [1910.1027] 0.005 mg/m ³	Ca [9 mg/m ³ (as Cd)]	Metal: Silver-white, blue-tinged, lustrous, odorless solid.	MW: 112.4 BP: 1409°F Sol: Insoluble Fl.P: NA IP: NA	VP: 0 mm (approx) MLT: 610°F UEL: NA LEL: NA	Strong oxidizers; elemental sulfur, selenium & tellurium	Filter; Acid; AAS; II [#7048]
2570 53 (compound)		[*Note: The REL and PEL apply to all Cadmium compounds (as Cd).]			Sp.Gr: 8.65 (Metal) Metal: Noncombustible Solid in bulk form, but will burn in powder form.			
Cadmium fume (as Cd) CdO/Cd 1306-19-3 (CdO) EV1930000 (CdO)	CdO: Cadmium monoxide, Cadmium oxide fume Cd: Cadmium	NIOSH* Ca See Appendix A OSHA* [1910.1027] 0.005 mg/m ³	Ca [9 mg/m ³ (as Cd)]	Odorless, yellow-brown, finely divided particulate dispersed in air.	MW: 128.4 BP: Decomposes Sol: Insoluble Fl.P: NA IP: NA	VP: 0 mm (approx) MLT: 2599°F UEL: NA LEL: NA	Not applicable	Filter; Acid; AAS; II [#7048]
		[*Note: The REL and PEL apply to all Cadmium compounds (as Cd).]			Sp.Gr: 8.15 (crystalline form)/6.95 (amorphous form) Noncombustible Solid			

Personal protection and sanitation (See Table 3)	Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Route	Symptoms (See Table 5)	Health hazards		
				First aid (See Table 6)	Target organs (See Table 5)	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH/OSHA 100 ppm: SA:CF/PAPROV/CCRFOV/ GMFOV/SCBAF/SAF S: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh In Con	Irrit eyes, skin; dry nose, throat; head; low BP, tach, abnor CVS stress; CNS, hemato depres; metallic taste; liver, kidney in]	Eye: Skin: Breath: Swallow:	Irrigated Water flush prompt Resp support Medical attention immed	Eyes, skin, resp sys, CVS, CNS, bone marrow, liver, kidneys
[p-tert-Butyltoluene]	NIOSH 80 ppm: CCROW/SA 200 ppm: SA:CF/PAPROV 400 ppm: CCRFOV/GMFOV/PAPRTOW/ SCBAF/SAF 1000 ppm: SAF:PD,PP S: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Aba In Con	Irrit eyes, skin, resp sys; head, dizz, weak, gidd, conf, convuls; dysp; abdom pain, nau, vomit	Eye: Skin: Breath: Swallow:	Irrigated Soap wash immed Resp support Medical attention immed	Eyes, skin, resp sys, CNS, CVS
[n-Butyronitrile]	NIOSH X: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HIEF/SCBAE	Inh In	Pulm edema, dysp, cough, chest tight, subs pain; head, chills, musc aches; nau, vomit, diarr; anos, emphy, prot, mild anemia; [carc]	Eye: Skin: Breath: Swallow:	Irrigated Soap wash Resp support Medical attention immed	Resp sys, kidneys, prostate, blood [prostatic & lung cancer]
[Cadmium dust (as Cd)]	NIOSH X: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HIEF/SCBAE	Inh	Pulm edema, dysp, cough, tight chest, subs pain; head, chills, musc aches; nau, vomit, diarr; emphy, prot, anos, mild anemia; [carc]	Breath:	Resp support	Resp sys, blood [prostatic & lung cancer]
[Cadmium fume (as Cd)]						

APPENDIX B

DRILLING SAFETY GUIDE

DRILLING SAFETY GUIDE

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DRILLING SAFETY GUIDE

1. An Introduction To Drilling Safety

The organization for which you work is interested in your safety. Your employer cares about your safety not only when you are working on or around a drill rig, but also when you are traveling to and from a drilling site, moving the drill rig and tools from location to location on a site, or providing maintenance on a drill rig or drilling tools. This safety guide is for your benefit. Failure to heed the safety procedures contained in this manual could result in serious injury or death.

Every drill crew should have a designated safety supervisor who has the authority to enforce safety on the drilling site. A rig worker's first safety responsibility is to obey the directions of the safety supervisor.

2. Governmental Regulations

All local, state, and federal regulations or restrictions, currently in effect or effected in the future, take precedence over the recommendations and suggestions which follow. Government regulations will vary from country to country and from state to state.

3. The Safety Supervisor

The safety supervisor for the drill crew will, in most cases, be the drill rig operator. The safety supervisor must:

- Consider the "responsibility" for safety and the "authority" to enforce safety to be a matter of first importance.
- Be the leader in using proper personal safety gear and set an example in following the rules that are being enforced on others.
- Enforce the use of proper personal protective safety equipment and take appropriate corrective action when proper personal protective safety equipment is not being used.
- Understand that proper maintenance of tools and equipment and general "housekeeping" on the drill rig will provide an environment that will promote and enforce safety.
- Before drilling is started with a particular drill, ensure that anyone who operates the drill has had adequate training and is thoroughly familiar with the drill rig, its controls, and its capabilities.
- Inspect the drill rig at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, and/or damaged pressure gauges and pressure relief valves.

Check and test all safety devices, such as emergency shutdown switches, at least daily and preferably at the start of a drilling shift. Drilling must not be permitted until all emergency shutdown and warning systems are working correctly. Do not allow any emergency device to be bypassed or removed.

Check that all gauges, warning lights, and control levers are functioning properly and listen for unusual sounds each time an engine is started.

Ensure that every drill rig worker is informed of safety operating practices on and around the drill rig. Provide every drill rig worker with a copy of the organization's drilling operations safety manual, and when appropriate, the drill rig manufacturer's operations and maintenance manual. Ensure that every employee reads and understands the safety manual.

Carefully instruct a new worker in drilling safety and observe the new worker's progress towards understanding safe operating practices.

Assess the mental, emotional, and physical capability of each worker to perform the assigned work in a proper and safety manner. Remove any worker from the drill site whose mental and physical capabilities might cause injury to the worker or coworkers.

Ensure that a first-aid kit and a fire extinguisher, which are properly maintained, are on each drill rig and each additional vehicle.

Be well trained in and capable of using first-aid kits, fire extinguishers, and all other safety devices and equipment. Train crew members.

Maintain a list of addresses and telephone numbers of emergency assistance units (ambulance services, police, hospitals, etc.) and inform other members of the drill crew of the existence and location of the list.

4. Individual Protective Equipment

For most geotechnical, mineral, and/or groundwater drilling projects, individual protective equipment must include a safety hat, safety shoes, safety glasses, and close-fitting gloves and clothing. The clothing of the individual drill rig worker is not generally considered protective equipment; however, the worker's clothing should be comfortable but must be close fitting, without loose ends, straps, draw strings, belts or otherwise unfastened parts that might catch on some rotating or translating component of the drill rig. Rings and jewelry must not be worn during a work shift.

Safety Head Gear. Safety hats (hard hats) must be worn by everyone working or visiting at or near a drilling site. All safety hats must meet the requirements of ANSI Z89.1. All safety hats must be kept clean and in good repair with the headband and crown straps properly adjusted for the individual drill rig worker or visitor.

Safety Shoes or Boots. Safety shoes or boots must be worn by all drilling personnel and all visitors to the drill site that observe drilling operations within close proximity of the drill rig. All safety shoes or boots must meet the requirements of ANSI.Z411.

Gloves. All drilling personnel must wear gloves for protection against cuts and abrasions that could occur while handling wire rope or cable and from contact with sharp edges and burrs on drill rods and other drilling or sampling tools. All gloves must be close fitting and not have large cuffs or loose ties that can catch on rotating or translating components of the drill rig.

Safety Glasses. All drilling personnel must wear safety glasses. All safety glasses must meet the requirements of ANSI.Z87.1.

Other Protective Equipment. For some drilling operations, the environment or regulations may dictate that other protective equipment be used. The requirement for such equipment must be determined jointly by the management of the drilling organization and the safety supervisor. Such equipment might include face or ear protection or reflective clothing. Each drill rig worker must wear noise-reducing ear protectors when appropriate.

When drilling is performed in chemically or radiologically contaminated ground, special protective equipment and clothing may, and probably will, be required. The design and composition of the protective equipment and clothing must be determined jointly by the management and the client who requests the drilling services, and under some circumstances, with the concurrence of a health and safety professional.

5. Housekeeping On and Around the Drill Rig

The first requirement for safe field operations is that the safety supervisor understand and fulfill the responsibility for maintenance and "housekeeping" on and around the drill rig. The safety supervisor must:

Provide suitable storage locations for all tools, materials, and supplies so that these items can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.

Avoid storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig, unless designed for this purpose.

Stack pipe, drill rods, casing, augers, and similar drilling tools in orderly fashion on racks or sills to prevent spreading, rolling, or sliding.

Place penetration or other driving hammers at a safe location on the ground or secure them to prevent movement when not in use.

- Keep work areas, platforms, walkways, scaffolding, and other accessways free of materials, debris, obstructions, and substances such as ice, grease or oil that could cause a surface to become slick or otherwise hazardous.
- Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease, and/or ice.
- Store gasoline only in a non-sparkling, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

6. Maintenance

Good maintenance will make drilling operations safer. Also, maintenance must be performed safely. The following points are essential to safety:

- Wear safety glasses when performing maintenance on a drill rig or on drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running). Take precautions to prevent accidental starting of an engine during maintenance by removing or tagging the ignition key.
- Block the wheels or lower the leveling jacks or both and set hand brakes before working under a drill rig.
- Release all pressure on the hydraulic systems, the drilling fluid system and the air pressure systems of the drill rig -- when possible and appropriate -- prior to performing maintenance. In other words, reduce the drill rig and operating systems to a "zero energy state" before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have had adequate time to cool.
- Never climb the mast (derrick) to do maintenance or make repairs. Lower mast, stop engine and deenergize rig before starting maintenance or repair on mast.
- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Follow the manufacturer's recommendations for applying the proper quantity and quality of lubricants, hydraulic oils and/or coolants.

- Replace all caps, filter plugs, protective guards or panels, and high pressure hose clamps and chains or cables that have been removed for maintenance before returning the drill rig to service.

7. Hand Tools

Since there are almost an infinite number of hand tools that can be used on or around a drill rig and in repair shops, there are an equal number of instructions for proper use. "Use the tool for its intended purpose" is the most important rule. The following suggestions apply to safe use of several hand tools that frequently are used on and around drill rigs:

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- When using any kind of chisel or punch, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored appropriately when not in use.
- Use wrenches -- not pliers -- on nuts.
- Use screwdrivers with blades that fit the screw.
- When using a wrench on a tight nut, first use some penetrating oil and then use the largest wrench available that fits the nut. When possible pull on the wrench handle rather than push on it; apply force to the wrench with both hands when possible and with both feet firmly placed. Always assume that you may lose your footing; check the place that you may fall for sharp objects.
- Keep all pipe wrenches clean and in good repair. Use a wire brush frequently to clean the jaws of pipe wrenches. An accumulation of dirt and grease can cause wrenches to slip.
- Never use pipe wrenches in place of a rod-holding device.
- Replace hook and heel jaws when they become visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform if the wrench should slip or the tool joint suddenly let go.

8. Clearing the Work Area

Prior to drilling, adequately clear and level the site to accommodate the drill rig and supplies and provide a safe working area. Do not begin drilling if tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.

9. Start-Up

Instruct all drill rig personnel and visitors to "stand clear" of the drill rig immediately prior to starting the engine.

- Make sure all brakes are set, all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers or air controls are in the correct positions, and the cathead rope is not on the cathead before starting a drill rig engine.
- Start all engines according to the manufacturer's manual.

10. Drilling Operations

Safety requires the attention and cooperation of every worker and site visitor.

- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions. (Refer to Section 11 on Overhead and Buried Utilities).
- Before raising the mast (derrick), clear all drill rig personnel (with exception of the operator) and visitors from the areas immediately to the rear and the sides of the mast. Inform all drill rig personnel and visitors that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is begun, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. Relevel the drill rig if it settles after initial set up. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- Before starting drilling operations, secure, and/or lock the mast (derrick) if required, according to the drill manufacturer's recommendations.
- Do not stand on the elevated deck of a truck-mounted or all-terrain-mounted drill rig while the drill rig is in operation unless necessary for special tasks and the operator has been notified.
- Only operate a drill rig from the position of the controls. Before leaving the area of the controls, shift the transmission controlling the rotary drive into neutral and place the feed lever in neutral. Before leaving the vicinity of the drill, shut down the drill engine.

- Throwing or dropping tools must not be permitted. Carefully pass tools by hand between personnel or use a hoist line.
- Do not consume alcoholic beverages, other depressants, or chemical stimulants prior to starting work on a drill rig or while on the job.
- If it is necessary to drill within an enclosed area, make certain that exhaust fumes are conducted out of the area. Exhaust fumes are toxic and some cannot be detected by smell.
- Clean mud and grease from boots before stepping on a drill platform and use hand holds and railings. Watch for slippery ground when stepping down from the platform.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- Drain all air and water lines and pumps when not in use if freezing weather is expected.
- Adequately cover or protect all unattended boreholes to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. Cover, protect or backfill all open boreholes according to local or state regulations on completion of the drilling project.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas -- even when the drill rig is shut down.
- When using a ladder on a drill rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.
- Terminate drilling operations during an electrical storm and move the complete crew away from the drill rig.

An elevated derrick platform should be used with the following precautions:

- When working on a derrick platform, use a safety belt and a lifeline. The safety belt must be at least 4 in. (100 mm) wide and should fit snugly but comfortably. The lifeline, when attached to the derrick, must be less than 6 ft. (2 m) long. The safety belt and lifeline must be strong enough to withstand the dynamic force of a 250 lb. (115 kg) weight (contained within the belt) falling 6 ft. (2 m).
- Use a safety device when climbing to a derrick platform that is higher than 20 ft. (6 m).

- When on a derrick platform, fasten the lifeline to the derrick just above the derrick platform and to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- When first arriving at a derrick platform, immediately inspect for broken members, loose connections, loose tools, or other loose materials.
- Securely attach tools to the platform with safety lines. Do not attach a tool to a line attached to one's wrist or any other part of the body.
- When working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Do not leave loose tools and similar items on the derrick platform or on structural members of the derrick.
- A derrick platform over 4 ft. (1.2 m) above ground surface must have toe boards and safety railing that are in good condition.
- Avoid being under rig workers on elevated platforms whenever possible.

If heavy objects must be manually lifted, exercise care to avoid injury.

- Before lifting an object without using a hoist, make sure that the load is within your personal lifting capacity. If it is too heavy, ask for assistance.
- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping the back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping the back vertical and unarched. In other words, perform the lifting with the muscles in the legs, not with the muscles in the lower back.
- If a heavy object must be moved some distance without the aid of machinery, keep the back straight and unarched. Change directions by moving the feet, not by twisting the body.
- Move heavy objects with the aid of hand carts whenever possible.

11. Overhead and Buried Utilities

Both supervisors and members of the exploration crew must take special precautions when a drill rig will be used on a site or project within the vicinity of electrical power lines and other utilities. Electricity can shock, it can burn, and it can cause death.

- Locate, note, and emphasize overhead and buried utilities on all boring location plans and boring assignment sheets.
- When overhead electrical power lines exist at or near a drilling site or project, consider all wires to be alive and dangerous.

- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the utility and ask them to lift or raise the lines or deenergized (turn off) the power.
- Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine the minimum horizontal distance from any point on the drill rig to the nearest power line when the mast is raised and/or being raised. If this horizontal distance is less than 100 ft. (30 m), first consult the local utility company and refer to OSHA REG 29 CFM 1910.180 before commencing operations.
- Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.
- In order to avoid contact with power lines, only move the drill rig with the mast (derrick) down.
- If there are any questions concerning the safety of drilling on sites in the vicinity of overhead power lines, call the power company. The power company will provide expert advice at the drilling site as a public service and at no cost.

Electricity is as dangerous underground as overhead. Be aware of and always suspect the existence of underground utilities such as electrical power, gas, petroleum, telephone, sewer and water.

- If a sign warning of underground utilities is located on a site boundary, do not assume that underground utilities are located on or near the boundary or property line under the sign. Call the utility and check it out. The underground utilities may be a considerable distance away from the warning sign.
- Always contact the owners of utility lines or the nearest underground utility location service before drilling. Determine jointly with utility personnel the precise location of underground utility lines, mark and flag the locations, and determine jointly with utility personnel what specific precautions must be taken to ensure safety.

12. Supplying Power to the Job Site

Drilling projects sometimes require around-the-clock operations and, therefore, require temporary electrical lighting. In general, all wiring and fixtures used to provide electricity for drilling operations should be installed by qualified personnel in accordance with the National Electrical Code (NFPA70-1984) with consideration of the American Petroleum Institute's recommended practices for electrical installations for production facilities (API-RP-500B). Lights should be installed and positioned so that the work area and operating positions are well lighted without shadows or blind spots. The following are specific recommendations for land-based drilling operations:

- Before working on an electrical power or lighting system, lock-out the main panel box with your own lock and keep the key on your person at all times.
- Install all wiring using high quality connections, fixtures and wire. Be sure that the wiring is insulated and protected with consideration for the drilling environment. Do not use makeshift wiring and equipment.
- Place all lights positioned directly above working areas in cages or similar enclosures to prevent loose or detached lamps or vaportight enclosures from falling on workers.
- Install lights so as to eliminate glare or "blind spots" on tools, ladders, walkways, platforms, and the complete working area.
- Locate and guard electrical cables to prevent damage by drilling operations or by the movement of personnel, tools, or supplies.
- Use only three-prong, U-blade, grounded type plug receptacles and have adequate current carrying capacity for the electrical tools that may be used.
- Use only electrical tools that have three-prong, U-blade, ground wire plugs and cords.
- Do not use electrical tools with lock-on devices.
- Provide adequate grounding for all electrical welders, generators, control panels, and similar devices.
- Provide secure protective enclosures on control panels, fuse boxes, transformers, and similar equipment.
- Avoid attaching electrical lighting cables to the derrick or other components of the drill rig. If this must be done, use only approved fasteners. Do not "string" wire through the derrick.
- Do not use poles used to hold wiring and lights for any other purpose.
- Turn power off before changing fuses or light bulbs.
- Require all workers in a drilling area illuminated with electrical lighting to wear safety head gear that protects the worker's head, not only against falling or flying objects, but also against limited electrical shock and burns according to ANSI.Z89.1 and Z89.2.
- Allow only trained, designated personnel to operate electrical equipment.
- Do not permit unqualified field personnel to work on or near electrical lines or devices.

13. Contact with Electricity

If a drill rig makes contact with electrical wires, it may or may not be insulated from the ground by the tires of the carrier. Under either circumstance, if the human body simultaneously comes in contact with the drill rig and the ground, electrocution can result, causing death or serious injury. If a drill rig or a drill rig carrier makes contact with overhead or underground electrical lines:

- Under most circumstances the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. They should not move or touch any part, particularly a metallic part, of the vehicle or the drill rig.
- If it is determined that the drill rig should be vacated, all personnel must jump clear and as far as possible from the drill. Personnel must not step off -- but must jump off. Do not hang on to the vehicle or any part of the drill when jumping clear.
- If you are on the ground, stay away from the vehicle and the drill rig; do not allow others to get near the vehicle and the drill rig. Seek assistance immediately from local emergency personnel such as the police or a fire department.
- When an individual is injured and in contact with the drill rig or with power lines, attempt rescue with extreme caution. If a rescue is attempted, use a long, dry, unpainted piece of wood or a long, dry, clean rope. Keep as far away from the victim as possible and do not touch the victim until the victim is completely clear of the drill rig or electrical lines.
- Do not attempt to administer first aid unless the victim is completely clear of the electrical source. Begin cardiopulmonary resuscitation (CPR) immediately if a heart beat (pulse) cannot be detected.

14. Wire Line Hoists, Wire Rope, and Hoisting Hardware

Use wire line hoists, wire rope, and hoisting hardware only as stimulated by the American Iron and Steel Institute *Wire Rope Users Manual*.

- Visually inspect all wire ropes and fittings during use and thoroughly inspect them at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weaving, jamming, crushing, bird caging, kinking, core protrusion, and/or damage to lifting hardware. Replace wire ropes when inspection indicates excessive damage, as described in the *Wire Rope Users Manual*.
- Thoroughly inspect all wire ropes that have not been used for a period of a month or more.

- Install all connections and end fittings, which consists of spliced eyes and various manufactured devices, according to the manufacturer's specifications. Do not exceed ratings specified by manufacturer.
- If a ball-bearing type hoisting swivel is used to hoist drill rods, inspect and lubricate swivel bearings daily to assure that the swivel freely rotates under load.
- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device; do not hoist more than 1 ft. (0.3 m) of the drill rod column above the top of the mast (derrick); do not hoist a rod column with loose tool joints; and do not make, tighten, or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to break the fall of the rods by hand or by tensioning the slipping device.
- Most sheaves on exploration drill rigs are stationary with a single part line. Never increase the number of parts of line without first consulting with the manufacturer of the drill rig.
- Wire ropes must be properly matched with each sheave. If the rope is too large, the sheave will pinch the wire rope. If the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger-sized wire ropes.

The following procedures and precautions must be understood and implemented for use of wire ropes and rigging hardware:

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however, drills may be moved using the main hoist of the drill if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.
- When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or to the feed mechanism of the drill.
- When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.
- Apply loads smoothly and steadily to minimize shock loading of a wire rope.
- Avoid sudden loading in cold weather.
- Never use frozen ropes.

- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Replace damaged latches on hooks before using.
- Know the working load of the equipment and tackle being used. Never exceed this limit.
- Periodically inspect and test hoist clutches and brakes.
- Know and do not exceed the rated capacity of mast hooks, rings, links, swivels, shackles, and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not use hands to guide wire rope on hoist drums.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never conduct any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep hands away from hoists, wire rope, hoisting hooks, sheaves, and pinch points while slack is being taken up or when the load is being hoisted.
- Never hoist the load over the head, body, or feet of any personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Use replacement wire ropes that conform to the drill rig manufacturer's specifications.

15. Cathead and Rope Hoists

Follow these procedures when using a cathead hoist:

- Keep the cathead clean and free of rust, oil and grease. Rust should be removed from the cathead with a wire brush having a handle.
- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 in. (3 mm), replace the cathead.

- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.
- Should the rope "grab" the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel, including the operator, to rapidly back away and stay clear. If the rope "grabs" the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. Keep careful watch on the suspended tools and quickly back away after turning off the engine.
- Always protect the rope from contact with chemicals. Chemicals can cause deterioration of the rope that may not be detected visibly.
- Never wrap the rope from the cathead (or any other rope, wire rope, or cable on the drill rig) around a hand, wrist, arm, foot, ankle, legs, or any other part of the body.
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing, or other tools with the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.
- Never operate a cathead (or perform any other task around a drill rig) with loose, unbuttoned, or otherwise unfastened clothing or when wearing gloves with large cuffs or loose straps or lacings.
- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.
- Only operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

16. Augers

Follow these general procedures when starting a boring with continuous flight or hollow-stem augers:

- Start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or on the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.

Establish a system of responsibility for the operator and tool handler to follow during the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must ensure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation. In addition:

- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not use an over-length pin or bolt. Do not touch the coupling or the auger with hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- Use a long-handed shovel to move auger cuttings away from the auger. Never use hands or feet to move cuttings away from the auger.

- Do not attempt to remove earth from rotating augers. Clean augers only when the drill rig is in neutral and the augers are stopped from rotating.

17. Rotary and Core Drilling

Check rotary drilling tools prior to drilling:

- Lubricate and check for frozen bearings before using water/air swivels and hoisting plugs. Water/air swivel bearings must be free before using, and stay clear of water/air swivel hose when rotating.
- Check drill rod chuck jaws periodically and replace when necessary.
- Check the capacities of hoists and sheaves against the anticipated weight to the drill rod string plus other expected hoisting loads.

During rotary or core drilling, follow these special precautions that involve chucking, joint break, hoisting, and lowering of drill rods:

- Only the operator of the drill rig should be allowed to brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Do not lower drill rods into the hole with pipe wrenches.
- If a string of drill rods is accidentally or inadvertently released into the hole, do not attempt to grab the falling rods by hand or with a wrench.
- In the event of a plugged bit or other circulation blockage, relieve the high pressure in the piping and hose between the pump and the obstruction before breaking the first tool joint.
- When drill rods are hoisted from the hole, clean them only with a wiper made of rubber or other suitable material. Do not use hands to clean drilling fluid from drill rods.
- If work must progress above a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. Equip the mud pit with rough surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Do not lift or lean unsecured drill rods against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

18. Transporting a Drill Rig

When transporting a drill rig on and off a drilling site:

- Allow only licensed individuals to operate the vehicle. Comply with all federal, state, and local regulations.
- Know the traveling height (overhead clearance), width, length, and weight of the drill rig with carrier and know the highway and bridge load, width, and overhead limits. Allow adequate margins and make sure that they are not exceeded.
- Never move a drill rig unless the vehicle brakes are in sound working order.
- Allow for mast overhang when cornering or approaching other vehicles or structures.
- Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.
- Watch for low hanging electrical lines, particularly at the entrances to drilling sites, restaurants, motels, or other commercial sites.
- Never travel on a street, road, or highway with the mast (derrick) of the drill rig in the raised or partially raised position.
- Remove all ignition keys when a drill rig is left unattended.

19. Loading and Unloading

When loading or unloading a drill rig on a trailer or a truck:

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the drill rig with carrier -- including tooling.
- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the drill rig carrier before approaching loading ramps.
- Distribute the weight on the drill rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the hitch of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
- Secure the drill rig and tools to the hauling vehicle with ties, chains, and/or load binders of adequate capacity.

20. Off-Road Movement

Follow these procedures during off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gulleys, ruts, and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling side-hill. Conservatively evacuate side-hill capability of drill rigs because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely rather than at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- Set all brakes and/or locks after the drill has been moved to a new drilling site. When grades are present, block the wheels.
- Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

21. Tires, Batteries, and Fuel

Check tires on the drill daily for safety and, during extended travel, for loss of air. Maintain air pressures for travel on streets, roads, and highways according to the manufacturer's recommendations. Only repair truck and off-highway tires with the required special tools and follow the recommendations of a tire manufacturer's repair manual.

If tires on all-terrain drills are deflated to reduce ground pressure for movement on soft ground, reinflate the tires to normal pressures before movement on firm or hilly ground or on streets, roads, and highways. Underinflated tires are not stable on firm ground.

During air pressure checks, inspect for:

- Missing or loose wheel lugs.
- Objects wedged between duals or embedded in the tire casing.

- Damaged or poorly fitting rims or rim flanges.
- Abnormal or uneven wear and cuts, breaks, or tears in the casing.

Batteries contain strong acid. Use extreme caution when servicing batteries.

- Service batteries only in a ventilated area and while wearing safety glasses.
- When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.
- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Loosen cell caps before charging to permit the escape of gas.
- Spilled battery acid can burn skin and should be immediately flushed with lots of water. If battery acid gets into someone's eyes, flush immediately with large amounts of water and see a medical physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted or smoking materials and flames away from batteries.

Take special precautions for handling fuel and refueling the drill rig or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.
- Refuel in a well-ventilated area.
- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.
- Do not spill fuel on hot surfaces. Clean any spills before starting an engine.
- Wipe up spilled fuel with cotton rags or cloths; do not use wool or metallic cloth.
- Keep open lights, lighted smoking materials, flames, or sparking equipment well away from the fueling area.
- Turn off heaters in carrier cabs when refueling the carrier or the drill rig.
- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.
- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.

- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- During travel store fuel containers and hoses so they are in contact with a metal surface. This should prevent the buildup of static charge.

22. First Aid

Train at least one member of the drill crew, and if only one, preferably the drilling and safety supervisor, to perform first aid. First aid must be taught on a person-to-person basis, not by providing or reading a manual. Manuals should only provide continuing reminders and be used for reference. Courses provided or sponsored by the American Red Cross or a similar organization best satisfy the requirements of first aid training for drill crews.

For drilling operations it is particularly important that those responsible for first aid should be able to recognize the symptoms of and be able to provide first aid for electrical shock, heart attack, stroke, broken bones, eye injury, snake bite, and cuts or abrasions to the skin. Again, first aid for these situations is best taught to drill crew members by instructors qualified by an agency such as the American Red Cross.

Keep first aid kit available and well maintained on each drill site.

23. Drill Rig Utilization

Do not attempt to exceed manufacturers' ratings of speed, force, torque, pressure, flow, etc. Only use the drill rig and tools for the purposes for which they are intended and designed.

24. Drill Rig Alterations

Alterations to a drill rig drilling tools must only be made by qualified personnel and only after consultation with the manufacturer.

ANNEX 2

RESUME FOR ERIC MALAREK

PROPOSED QUALITY ASSURNACE OFFICER

Corporate Resume Form

Employee Name: Eric Malarek

Title: Senior Chemist III

Date Last Updated: February 5, 1999

I. Education:

- May 1997, MBA, University of Central Florida, Orlando, FL.
(Accredited by the American Assembly of Collegiate Schools of Business)
- January 1987, BA in Chemistry, Rutgers College, Rutgers University, New Brunswick, NJ.
(Concentration in biological studies, minor in economics)
(Accredited by the American Chemical Society)

II. Professional Registrations and Certifications:

- 40 hour OSHA 29CFR 1910.120 (e)(8) certified with hazardous waste training and annual 8 hour refresher, ICF Kaiser Engineers, Inc., Edgewood, MD, April 30, 1998.
- Adult CPR Certified, American Red Cross, December 6, 1998.
- Standard First Aid, American Red Cross, December 4, 1997.

III. Experience:

Eric Malarek, is a Chemist for ICF Kaiser Engineers at the Edgewood, Maryland office. His primary responsibility includes project chemical management, consulting, and technical support for a variety of public and private environmental projects. He has over 10 years of professional experience in the environmental testing field including laboratory management, quality assurance and quality control, data management, field sampling, and methods development. This included three years of managing a laboratory and seven years as Quality Assurance Officer. His experience with the laboratory covers environmental analysis for sample matrices including groundwater, surface water, drinking water, soils, sediments, sludge, and waste. His familiarity with laboratory methods includes CLP Statements of Work, USEPA 500 and 600 series organic methods, SW-846 Test Methods for Evaluating Solid Waste, Standard Methods for the Examination of Water and Wastes, and Methods for Chemical Analysis of Water and Waste. As QA Officer, he has written and implemented laboratory quality assurance plans in accordance with Florida Department of Environmental Protection, as well as site specific Quality Assurance Project Plans. He has served as the Laboratory CLP Coordinator for inorganics under the USEPA CLP program. Mr. Malarek has performed various systems and performance audits and implemented corrective action procedures. In addition, he was involved in data reduction, review and validation to ensure the data integrity to meet the data quality objectives. He also was employed by the USEPA to perform inorganic analysis on environmental samples.

IV. Description of Project Experience:

Remedial Investigation/Feasibility Study

- US Army Corps of Engineers (USACE), Canal Creek G-Street, Aberdeen Proving Ground, Edgewood, Maryland (11/97 to 3/98, 4/98, 9/98 to 1/99, 2/99). Mr. Malarek participated in writing the quality assurance project plan addenda (QAPA), laboratory solicitation statement of work (SOW), field sampling, data management, and data validation for the Canal Creek

G-Street site as project chemist. Site plans and activities were reviewed and approved by the US Corps of Engineers and the local USEPA branch. The site activities under QAPA2 (ICF KE, December 1997) initially included sampling and analysis for approximately 137 aqueous and soil samples for an ongoing remedial investigation and feasibility study. Both an on-site and off-site laboratories were used to provide analytical results. Specific project scope for the Canal Creek site investigations is to determine if natural degradation of the chlorinated solvents is occurring and whatever water quality of groundwater is amending to natural attenuation as well as the continuing monitoring of groundwater for the extent of contamination. The addendum provides site-specific QA/QC requirements for ensuring the integrity of activities associated with the data quality objectives. The implementation of the QAPA helped to ensure the validity of the data collected, and established a firm foundation for decisions regarding the RI/FS.

QAPA Addendum 3 (ICF KE, September 1998) addressed a feasibility study to address the chlorinated VOCs in groundwater and inorganic and organic compounds in soil, as well as additional site characterization data. This included the collection of approximately 42 solid samples and approximately 36 aqueous groundwater samples at G-Street. The objectives of the field investigation are to define the physical characteristics that comprise the site and to completely define the nature and extent of contamination at the site to determine the geologic/hydrogeologic characteristics of the site; the aquifer characteristics of the site; the extent of groundwater contamination; and, to confirm that no contaminant source areas exist in the unsaturated zone.

QAPA Addendum 4 (ICF KE, February 1999) addressed radiologicals in groundwater, sediment, surface water, and soils with the same objectives as QAPA3 for supplying data suitable for risk assessment. The areas of concern included the WWII Railroad Yard And Maintenance Shop, DM Filling Plant, and G-Street Salvage Yard (IRP Sites 02, 06, 46) areas (G-Street) sites for site characterization data. This included the collection of approximately 32 solid samples and 12 aqueous samples for gamma spectroscopy, 7 aqueous samples for gross alpha and gross beta, and 8 aqueous and 12 solid waste characterization samples.

- USACE, New O-Field, Aberdeen Proving Ground, Edgewood, Maryland (11/97 to 4/98). Mr. Malarek participated in writing the first quality assurance project plan addendum (ICF KE January 1998), laboratory solicitation statement of work (SOW), field sampling, data management, and data validation for the New O-Field site. Site plans and activities were reviewed and approved by the US Corps of Engineers and the local USEPA branch. The site activities included sampling and analysis for approximately 70 soil and 30 aqueous samples for an ongoing remedial investigation and feasibility study. This phase of sampling and analysis is necessary to characterize the areas exposed by a brush fire in early April 1997, determine the impacts of disposal activities, determine whether water quality parameters are favorable for natural attenuation of aliphatic chlorinated organic compounds, and continue to monitor the groundwater for the extent of contamination. The QAPA1 addendum provides site-specific QA/QC requirements for ensuring the integrity of activities associated with the data quality objectives. The implementation of the QAPA1 will help ensure the validity of the data collected, and it will establish a firm foundation for decisions regarding the RI/FS.

RCRA Facility Investigation

- US Army Environmental Center (USAEC), Radford Army Ammunition Plant, Radford, Virginia (10/97 to 2/99). Mr. Malarek participated in preparing the project statement of work, quality assurance addenda 2 and 3, and performing data management, and data validation as project chemist for the Radford Army Ammunition Plant site in Radford, Virginia. The RCRA Facility Investigation (RFI) scope for addendum 2 covers the former lead furnace

area (FLFA), New River Unit (NRU), SWMU 31, SWMU 48, and SWMU 58. The RFI scope for addendum 3 covers SWMU 39. The site activities included sampling and analysis for approximately 143 soil and 38 aqueous samples for an ongoing remedial action at various solid waste management units. The addenda provide site-specific QA/QC requirements for ensuring the integrity of activities associated with the data quality objectives. The implementation of the QAPAs will help ensure the validity of the data collected, and it will establish a firm foundation for decisions regarding the remedial actions.

Site Investigation

- USACE, Fort Ritchie Army Garrison, Washington County, Maryland (3/98 to 4/98). Mr. Malarek was active in preparing and reviewing the project statement of work, quality assurance project plan addendum, laboratory selection, and performing data management, and data validation as project chemist for the Fort Ritchie Army Garrison site. The site activities included sampling and analysis for approximately 100 soil and 30 aqueous samples for an ongoing remedial investigation and feasibility study. These activities will further investigate several of the current operating units to 1) confirm the findings of the initial screening; 2) further evaluate the potential impact of contaminants and/or disposed materials to the environment; and 3) evaluate/implement remedial alternatives. The QAPA addendum provides site-specific QA/QC requirements for ensuring the integrity of activities associated with the data quality objectives. The implementation of the QAPA will help ensure the validity of the data collected, and it will establish a firm foundation for decisions regarding the SI.

Environmental Investigation/Alternatives Analysis

- USACE, Fort Dix, Fort Dix, New Jersey (10/98 to 2/99). Mr. Malarek was active in preparing and reviewing project statement of work, the fourth quality assurance project plan addendum (QAPA4), laboratory selection, and performing data management, and data validation as project chemist at various Fort Dix sites in accordance with an environmental investigation/alternatives analysis (EI/AA). The Fort Dix sites included the Polychlorinated Biphenyl (PCB) Transfer Storage Area (AREE 29), the Old Sewage Treatment Plant (AREE 31), Area 4400 (AREE 37), and the Property Disposal Office (PDO) Landfill (AREE 26). The QAPA4 addendum provides site-specific QA/QC requirements for ensuring the integrity of activities associated with the data quality objectives. The implementation of the QAPA4 will help ensure the validity of the data collected, and it will establish a firm foundation for decisions regarding the EI/AA. The objectives of the field investigation were to define the physical characteristics that comprise the site and to completely define the nature and extent of contamination at the site to assess potential residential risk. The following four major AREEs objectives were identified in the QAPA4.

A PCB investigation was performed at AREE 29. The purpose was to determine the nature and extent of PCB concentrations at Building 8432. The analytical data was available for risk assessment. A mercury nature and extent investigation was performed at AREE 26. The purpose was to determine if mercury concentrations are steadily decreasing in groundwater, surface water, and sediment. Furthermore, the type of mercury compounds (i.e., organic or inorganic) was also investigated. The mercury analysis may be used for risk assessment. Sediment bioassays will determine if toxicity to benthic organisms has decreased since analysis performed in 1996. Sludge samples were taken for analysis at AREE 31. The purpose was to determine if nature and extent of contamination sludge samples for organic and inorganic parameters. A pilot scale and microbial study was performed at AREE 37. The pilot scale study for the treatment of VOC contamination was performed with an on-site chemical oxidation process using GeoCleanser™. A microbiological identification study was

performed of the chemical (containing hydrogen peroxide and iron) before and after usage to determine the effects on the microbial environment in the subsurface soil.

V. Professional Affiliations:

- 1985 to Present: Member of the American Chemical Society
- 1992 to 1997: Member of the Florida Association of Environmental Professionals

VI. Selected Publications and Presentations:

None

VII. Selected Company Reports:

ICF Kaiser Engineers, Inc., December 1997. Quality Assurance Project Plan (Addendum 2) G-Street Salvage Yard Feasibility Study, Natural Attenuation Study of Chlorinated Volatile Organic Compounds in Groundwater. Final.

ICF Kaiser Engineers, Inc., January 1998. O-Field Remedial Investigation Feasibility Study, Quality Assurance Project Plan Addendum for New O-Field. Final.

ICF Kaiser Engineers, Inc., March 1998. Radford Army Ammunition Plant, Virginia, Master Work Plan, Addendum 002 and 003. Draft.

ICF Kaiser Engineers, Inc., March 1998. Quality Assurance Project Plan Addendum, Fort Ritchie Army Garrison Site Investigation and Cleanup. Draft.

ICF Kaiser Engineers, Inc., September 1998. Quality Assurance Project Plan for Additional Characterization to Support the Feasibility Study at the G-Street Salvage Yard (IRP Site 46) Addendum 3. Final.

ICF Kaiser Engineers, Inc., November 1998. Site-Specific QAPP Checklist for Remedial Action Work Plan PCB Removal at the Defense Reutilization and Marketing Office (DRMO) Scrap Yard Addendum to Depot-Wide Quality Assurance Project Plan for Environmental Analytical Services to Support Investigation, Removal, and Disposal Activities Performed by Contractors at Letterkenny Army Depot Chambersburg, Pennsylvania. Preliminary Draft.

ICF Kaiser Engineers, Inc., February 1999. Site-Specific QAPP Checklist for Remedial Action Work Plan PCB Removal at the Defense Reutilization and Marketing Office (DRMO) Scrap Yard Addendum to Depot-Wide Quality Assurance Project Plan for Environmental Analytical Services to Support Investigation, Removal, and Disposal Activities Performed by Contractors at Letterkenny Army Depot Chambersburg, Pennsylvania. Final.

ICF Kaiser Engineers, Inc., February 1999. Site-Specific QAPP Checklist for Long-term Monitoring Effort at Property Disposal Office Area Operable Units 2, 4A, and 4B Addendum to Depot-Wide Quality Assurance Project Plan for Environmental Analytical Services to Support Investigation, Removal, and Disposal Activities Performed by Contractors at Letterkenny Army Depot Chambersburg, Pennsylvania. Draft Final.

ICF Kaiser Engineers, Inc., February 1999. Quality Assurance Project Plan for Additional Support for the Fort Dix Environmental Investigations/Alternatives Analysis Addendum 4. Draft.

ICF Kaiser Engineers, Inc., February 1999. Quality Assurance Project Plan for Radiological Sampling to Support the Remedial Assessment at the WWII Railroad Yard and Maintenance Shop, DM Filling Plant, G-Street Salvage Yard (IRP Sites 02, 06, 46) Addendum 4. Draft.

VIII. Patents:

None

IX. Expert Testimony:

None

X. Security Clearance:

None

XI. Citizenship:

USA

XII. Languages:

English

XIII. Employment History:

- Chemist IV, ICF Kaiser Engineers, Edgewood, MD, 9/97-Present.
- Technical Services Manager, VOC Analytical Laboratories, Inc., Boca Raton, FL, 3/97-9/97.
- Laboratory Director & Safety Officer, Orlando Laboratories, Inc., Orlando, FL, 12/93-3/97.
- QA Officer & Safety Officer, Orlando Laboratories, Inc., Orlando, FL, 10/89-12/93.
- QA Officer, Elson T. Killam Associates, Millburn, NJ, 9/87-10/89.
- Chemist, U.S. Environmental Protection Agency, Edison, NJ, 6/86-9/87.

XIV. Client References:

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