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SITE SPECIFIC SAFETY PLAN FOR THE K-65 LOW-ANGLE BORING OPERATIONS MARCH 6, 1991

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IT DOE-FN
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REPORT

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SITE SPECIFIC SAFETY PLAN

FOR

THE K-65 LOW-ANGLE BORING OPERATIONS

MARCH 6, 1991

APPROVALS

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Kenneth N. Fleming 3/6/91
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DOE Representative
For: J.R. Craig

S. Davis, IT

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B - WMCO X-ray analyses of K-65 materials
C - K-65 horizontal boring locations
D - WMCO radiological survey of boring locations
E - External dose calculations for K-65 horizontal borings
F - WMCO 1988 K-65 fenceline Rn-222 airborne concentrations
G - Radon dose calculations for K-65 horizontal borings
H - WMCO graphs depicting Radon concentration vs. time of day
I - Industrial hygiene review of potential organic and lead exposures

1.0 INTRODUCTION

This site specific safety plan has been prepared as a supplement to the overall Site Safety Plan - Volume II and contains information that is unique to the K-65 Horizontal Boring Operations. Considerations unique to this location and tasks are presented in the body of the text; those that apply to the entire facility are also included.

2.0 K-65 BACKGROUND INFORMATION

Contents of the Silo

For this work, a uranium-rich ore called pitchblende was imported from the Belgian Congo. Pitchblende was treated with nitric acid to dissolve the uranium away from the ore. The remaining residues were mixed with water and pumped into the silos, where the solids settled. The liquids at the surface were pumped back out of the silos into a treatment facility. What remains in the silos now is about 9,700 tons of residual solids.

The residues in the silos emit radiation. The radioactivity levels of the residues are higher than ordinary tailings from uranium mining and milling. Like other uranium ore tailings, these residues produce radon gas, although in considerably larger quantities.

The stored residues present a potential hazard and require careful storage techniques to ensure safety and isolation from the environment.

Attachment A is a listing of radionuclides detected within the K-65 silos. The results are from core samples taken from silos 1 and 2. A review of the data shows the primary contaminants to be U-238 and its radioactive daughters, U-235 and trace levels of its radioactive daughters.

Approximately 4600 curies of Ra-226, which produces Rn-222 gas, and its short-lived radioactive daughters is also present. Attachment B shows the elemental constituents in the silos. Major components are Silicon, Iron, Lead, and Calcium.

3.0 TASKS TO BE PERFORMED

Five near horizontal borings will be performed underneath K-65 silos 1 and 2, as seen in Attachment C. Soil cuttings will be monitored and soil sampling conducted during this operation. Borings to be refilled with grout compound.

Will Site Activities:

yes	Disturb Surface Soil	no	Sample Surface Water
yes	Disturb Subsurface Soil	no	Sample Lagoons
yes	Use Heavy Equipment	no	Use Boat
no	Enter Confined Space	yes	Involve Radioactivity
no	Disturb Containerized Matter	no	Involve Trenches

4.0 TASK SPECIFIC HAZARD ANALYSIS

The following hazard assessment is based on historical information and previous sample results in the area. Boring logs and sampling results for monitoring wells 1032, 2032 (West of K-65), 1033 (East of K-65), and 1034, 2034, 3034 (South of K-65) were reviewed and showed no detectable volatile organics or radioactivity above the established action limits. The field team routinely reassesses the hazards before starting work to assure that conditions have not changed. All newly identified hazards will be addressed with the ASI health and safety department to determine the degree of hazard and if any changes to the safety plan are needed.

4.1 Physical Hazards

- Radiological Hazards
  - External
  - Internal
- Radionuclides of Concern
  - U-238 and daughters
  - U-235 and daughters
  - Ra-226 and daughters
- Drill Rig Operation
- Noise
- Heat Stress
- Cold Stress
- Overhead Hazards
- Underground Utilities

RADIOLOGICAL ASSESSMENT

On-Site Measurements (contamination readings for soil boring surface and exposure rate readings at 3 foot height) see WMCO Radiological Survey Attachment D:

Boring 1

Alpha contam.	0-10 cpm	<110 dpm/100 cm^2 (Total)
Exposure Rate	~0.50 mR/hr	

Boring 2

Alpha contam.	0-10 cpm	<110 dpm/100 cm^2 (Total)
Exposure Rate	~0.50 mR/hr	

Boring 3

Alpha Contam.	0-10 cpm	<110 dpm/100 cm^2 (Total)
Exposure Rate	~0.50 mR/hr	

Boring 4

Alpha Contam.	0-10 cpm	<110 dpm/100 cm^2 (Total)
Exposure Rate	~0.50 mR/hr	

Boring 5

Alpha Contam.	0-10 cpm	<110 dpm/100 cm^2 (Total)
Exposure Rate	~0.5 mR/hr	

All Boring Locations

Average radon gas concentration at K-65 = 5pCi/l fence (Attachment F)
Corresponding working level (Radon daughters 50% equilibrium) = 0.025WL.

4.2 Radiological Hazards

Contaminant	Derived Air Concentration (DAC)	Action Level
Thorium-230	3E-12 uCi/ml	1E-12 uCi/ml
Ra-226	3E-10 uCi/ml	1E-10 uCi/ml
Uranium-238	2E-11 uCi/ml	1E-11 uCi/ml
Radon Daughters (Po-218, Pb-214, Bi-214, Po-214)	0.3 WL	0.075WL (WMCO's guide)
Rn-222	60 pCi/l (50% equilibrium)	15 pCi/l
Uranium-235 (trace levels of actinium series)	2E-11 uCi/ml	1E-11 uCi/ml
Uranium-234	2E-11 uCi/ml	1E-11 uCi/ml

4.3 Chemical Hazards

	PEL	Action Level
Lead (Attachment I)	50 ug/m^3	30 ug/m^3
Nitric Acid (trace)	2 ppm	1 ppm
Organics (unknown)	Default Value	See Section 5.1 (HNu)
Methanol (eqpt. Decontamination)	200 ppm	100 ppm

4.4 Routes of Entry

All of the potentially significant site contaminants are particulate in nature. The primary routes of entry are inhalation and ingestion. Direct contact may result in absorption if the compounds are water soluble. Radon gas presents an inhalation hazard as do its sort-lived radioactive daughters. Methanol will be used to decontaminate equipment. This will be done in an open tub for short periods with little or no skin contact.

5.0 MONITORING AND ACTION LIMITS

Air monitoring will be performed to assure that contaminant concentrations in the breathing zone do not exceed the concentrations specified by established exposure levels. The action levels include an additional safety factor of two to account for potential inaccuracies associated with the use of field measurements. If identities of airborne organic concentrations are unknown, default values will be used.

ASI policy requires engineering controls or the use of PPE to limit onsite exposures to the action limits values. It is advisable to keep exposures to chemicals as low as possible since there is insufficient data to predict the combined effects of most chemical mixtures.

5.1 Action Limits

Instrument	Need	Interval	Limit	Action
Exposure Rate Meter	Y	Pre-Job	>2mR/hr	H.P. Review
Alpha Probe[7]	Y	Pre-Job & Intermittent	500 cpm[1]	APR[2]
				Level C
			25,000 cpm	Withdraw
Beta/Gamma Probe[7]	Y	Pre-Job & Intermittent	5000 cpm[1]	APR
				Level C
			250,000 cpm	Withdraw
HNU Meter (Breathing Zone[4])	Y	Intermittent[3]	Detection to 10 ppm [5]	APR
			10-25 ppm	Level C
				SAR[6]
			>25 ppm	Withdraw
Radon and WL Monitor (CAM)	Y	Intermittent Continuous	>15 pCi/l or >0.075WL	APR-Level C
			>750 pCi/l or >3.75WL	Withdraw
Airborne Lead (Breathing zone Sampler)	Y	Continuous	NA-No real time results	
pH Paper (Moist Tailings)	Y	Intermittent	<3	Stop
			>12	

Detection is defined by ASI/IT as an HNU reading of 1ppm above the background reading. The reading must persist for one minute or more. For HNU monitoring around drilling operations the breathing zone is defined as two to three feet above the hole.

1 Above background.
2 Full-face air purifying respirators with organic vapor, acid gas, fume cartridges. Disposable protective clothing, such as Saranax coveralls and a step-off decontamination will also be required at any time APR are used.
3 At intervals of 30 minutes or less at the split spoon and in the breathing zone.
4 Two to three feet from borehole for drilling, <14" in front of employee's shoulder for other operations.
5 1 ppm above background is the minimum detection limit.
6 Supplied Air Respirator.
7 Split spoon samples/tailings monitored for alpha contamination and beta/gamma contamination using hand-held alpha scintillator and Geiger Mueller detectors respectively.

6.0 ALARA MEASURES:

1. Eating, drinking, and smoking will be prohibited in the K-65 area.

2. Breaks and/or planning meetings will be held in a low-radiation exposure area, in order to minimize time in elevated radiation areas.

3. In order to minimize time in elevated radiation areas, maintenance of equipment requiring more than one hour will not be done within the K-65 fence area.

4. Workers will be made aware to work efficiently, in order to minimize their exposure times in the K-65 area.

5. Respirators will be utilized as described in section 5.1, in order to minimize internal exposures.

6. Work crews will be minimized to a six-man crew, in order to reduce collective dose.

6.1 Radiological Exposure Assessment

6.1.1 External Exposure

A radiological survey was conducted at boring locations 1 thru 5 around the K-65 silos on May 7-8, 1990, by WMCO Radiological Safety (See Attachment D). Exposure rates as measured with an air ionization chamber approached 0.5 mRem/hr at all five locations. Based on these measurements and time and manpower estimates supplied by ASI/IT operations supervisors, the total external collective dose to our workers was estimated to be 1.182 Man-Rem. The highest individual external dose to be received during the five borings is estimated to be 192 mRem for field personnel and 30 mRem for the surveyor in 48 days of work. These calculations can be reviewed in Attachment E. The dose estimates are well below applicable WMCO and DOE guides and limits.

6.1.2 Internal Exposure

Radon gas concentration at the K-65 security fence averages 5 pCi/l of air as seen from the WMCO data in Attachment F. Based on this average value, a worker exposed to this concentration of Radon gas and its associated radioactive daughters would receive an estimated whole body dose equivalent of approximately 71 mrem in 48 days of work.

6.1.2 INTERNAL EXPOSURE (CONTINUED)

The total cumulative whole body dose equivalent from internal exposure is estimated to be 0.426 Man-Rem for the six-man crew and 0.011 Man-Rem for the surveyor at the average concentration of 5 pCi/l. These internal dose calculations are in Attachment G. A point worth noting is that day-time Radon concentrations tend to be considerably less than night-time levels as seen in Attachment H.

A maximum internal dose to an individual and the work crew can be calculated by assuming a worker is exposed to the ASI/IT action level of 15 pCi/l the entire 48 day operation. The maximum expected individual internal exposure would be: 213 mRem whole body dose equivalent for the field crew and 33 mRem for the surveyor and the total collective internal dose would be 1.31 Man-Rem whole body dose equivalent for the crew and surveyor. These calculations are also in Attachment G.

Air sampling by a constant air monitor during work each day will assure levels of airborne radioactivity below action levels, thus keeping internal exposures to a minimum. All internal dose estimates including the maximums are well below recognized guides and limits in DOE 5480.11 and 10 CFR20.

6.1.3 Total Whole Body Dose Equivalent (Internal and External)

A radiation dose, equivalent to a whole body dose of 263 mRem for field crew individuals and 96 mRem for the surveyor, is projected for each individual of the drilling crew if the same persons are used for all 5 borings and the work takes 48 days to complete. It is worth noting that 73% of the radiation dose expected to be received during the work will be from external exposure from the radioactive elements contained in the K-65 silos. The total collective whole body dose equivalent expected to complete the K-65 horizontal borings is estimated at approximately 1.6 Man-Rem.

7.0 TASK SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

All employees at the Fernald site will wear at least Level D protection. All employees in the task exclusion area will wear the following personal protective equipment. If an ASI/IT Action Level is exceeded for airborne contaminants during the K-65 horizontal boring operation, EPA-Level C protective equipment will be required.

ITEM	Level C NEED	Level C JUSTIFICATION
APR	Y	
Cartridges - Combination OV,AG, HEPA	Y	
Hearing Protection	Y	For Drilling
Hard Hat	Y	Minimum Requirement
Latex Boots	N	
Gloves	Y	
Inner Gloves	N	
Leather-Palm Gloves	Y	For drilling
Nitrile Gloves	Y	For methanol decontamination of eqpt./soil handling.
Process Coveralls	Y	Minimum requirement
Plain Tyvek	N	
PE Tyvek	N	
PVC Gloves	N	
SAR	N	
Safety Glasses	Y	Minimum Requirement
Safety Goggles	N	Optional
Safety Shoes	Y	Minimum Requirement
Saranex	N	

7.0 TASK SPECIFIC PERSONAL PROTECTIVE EQUIPMENT (CONTINUED)

ITEM	NEED	JUSTIFICATION
TL Dosimeter	Y	
Personal Radon Monitor	Y	
Self-Reading Dosimeter	Y	

8.0 SITE ACCESS

8.1 Access

Access to the Feed Materials Production Facility is limited by Westinghouse Security. All site personnel and visitors must register and be issued a pass to enter the DOE property.

8.2 Bioassay Sampling and Whole Body Counting

Bioassay Sampling

Workers will continue to submit urine samples for Uranium assay to WMCO at the end of each ten-day work period.

In addition, a baseline 24-hour urine sample will be submitted to WMCO prior to the start of boring activities and analyzed for Thorium-230 and Ra-226. Sampling kits will be provided by WMCO.

A post-work, 24-hour urine sample will be submitted to WMCO upon completion of work and analyzed for Thorium-230 and Ra-226.

Additional urine samples will be required if air samples indicate an acute exposure of 40 DAC-hours (2 percent of the annual limit of Intake (ALI)). This correlates to a gross alpha activity for the most conservative nuclide, Th-230, of 1E-10 uCi/ml averaged over a one-hour exposure. A one-hour exposure leading to 40 DAC-hours for Radon daughters is 12.0 WL or 1,200 pCi/l for Rn-222 in 100% equilibrium with its daughters. A point worth noting is that no respirator protection factors are built into these action levels.

Whole Body Counting

A pre and post work whole body count will be required for the K-65 horizontal boring program. Additional counts may be required if the 40 DAC-hour action levels are exceeded.

8.3 Medical Monitoring

In accordance with 29 CFR 1910.120 OSHA requirements, all ASI and subcontractor field personnel are required to participate in a medical monitoring program which includes:

- A baseline medical examination
- Annual medical examination
- Medical examinations may be required after potential exposures.
- Exit medical examination
- WMCO respirator physical

8.4 Training Requirements

All ASI and ASI subcontractor personnel assigned to the site tasks will, as a minimum, meet OSHA training requirements including:

- 40-hour OSHA training
- 8-hour annual refresher training
- 8-hour supervisory training (for supervisors)
- 24-hour supervised field experience
- Review of site specific hazards and procedures (tailgate safety meetings)
- WMCO radiation safety training
- WMCO respiratory training and fit test

8.5 Contamination Zones

The Exclusion Zone is the zone of high potential hazard due to physical or chemical dangers. Access to the Exclusion Zone is restricted to employees who are required to enter in order to perform their job functions.

A minimum radius of four feet from the rotating auger will be considered to be the Exclusion Zone. The zone may be expanded if airborne hazards are detected. The Exclusion Zone will be marked with cones or other easily recognizable devices. All areas requiring the use of respiratory protection are included in the exclusion zone.

The K-65 control fence will be utilized as an exclusion zone since it is a highly secure area. The fence will also serve as a contamination, reduction zone if warranted.

9.0 SITE ENTRY PROCEDURES

_X_ Each site crew will radio CONTROL daily to establish radio contact, location, start time and stop time.

_X_ Procure radiation work permit from WMCO for drill rig operations.
- Identifies degree of radiological hazard.
- May limit allowable work time.
- May specify minimum PPE requirements.

_X_ Procure penetration permit from WMCO for drill rig operations.
- Identifies potential underground hazards such as utilities and buried tanks.

_X_ Procure utilities clearance from WMCO subcontractor.

_X_ Conduct ASI/IT Magnetometer survey in area where boring is to be initiated.

_X_ Assign/Issue Personal Radon Dosimeters.

_X_ Rezero/Issue Self Reading Dosimeters.

_X_ All heavy equipment is required to undergo a safety inspection by WMCO Fire and Safety personnel upon initial entry to the FMPC.

_X_ Perform tailgate meeting to familiarize team with site specific hazards. Identify exclusion zone and break area. Discuss alternate communications signals (if applicable).

_X_ Calibrate instruments and log calibrations.

_X_ Visually scan the site for signs of contamination.

_X_ Perform respirator check out and fit test prior to use.

_X_ Monitor for volatile organics using real time instruments such as an HNU.

_X_ Monitor for radiation using radiation meters for alpha and beta/gamma.

_X_ Use buddy system.
Teams of at least two individuals will be used for all activities within an exclusion zone. Team members will monitor each other for signs of heat stroke or other distress and will render aid.

Note: The ASI Site Safety Officer and any member of the ASI field team have the authority to stop work when imminent or serious safety hazards or conditions exist. Restart of work will be allowed only after the hazard or condition has been abated or reduced to a level deemed acceptable by the SSO (or his designated representative) and Project Manager. If there is a question about what is acceptable, the work should be discontinued and the matter discussed with the Director of Health and Safety, Waste Management Division: William Kwoka, (615) 483-1274 - Work; (615) 482-2885 - Home. In Mr. Kwoka's absence, please call the Director of Health and Safety, Corporate Office: Greg McAnarney, (505) 883-0959 - Work; (505) 293-0794 - Home.

10.0 SITE EXITING PROCEDURE

10.1 Contamination Detection

All site personnel are required to decontaminate themselves and then confirm the effectiveness of the decontamination. The effectiveness will be determined by frisking with a hand held radiation monitor.

The monitor must be held within 1/4 inch of the surface to measure radiation. If frisking count exceeds DETECTABLE, additional decontamination is required. This field decontamination will be conducted by scrubbing with soap and water. Frisk at 1" per second over the surface being monitored.

In the event that contamination can not be removed to below the action level (100 cpm beta/gamma or detectable alpha above background), notify the site Safety Officer (Kenny Fleming).

Vehicles and other equipment used onsite must be monitored for contamination (and decontaminated if necessary) before moving them to non-contaminated areas. WMCO personnel will determine when the equipment is safe to move to clean areas.

10.2 Decontamination

Decontamination reduces contaminant concentrations to acceptable levels, but does not generally remove it totally. Try to avoid contamination where possible by making minimum contact with the contaminant.

Personnel: Dry removal of disposable protective equipment, wash hands, face and any other exposed skin. Detergent and water should be used to scrub skin surfaces which have contacted potentially contaminated wastes.

The effectiveness of decontamination must be confirmed by frisking or the use of hand and foot monitors.

Monitoring Equipment: Any exposed areas of the monitoring equipment surface will be wiped with a damp paper towel/cloth to remove contamination. Wiping with cloth dampened with detergent solution may be necessary to remove greasy materials

Heavy Equipment: Heavy equipment generally requires decontamination at the equipment pad for non-production area environmental work. Frisking and/or wipe tests will be performed to confirm the effectiveness of decontamination.

10.3 Dosimetry

Log in self reading dosimeter results and turn in Radon dosimeter with ASI/IT Health and Safety.

11.0 INVESTIGATION DERIVED WASTES

Investigation derived wastes are wastes generated in the performance of onsite activities. These wastes include, but are not limited to:

- Auger cuttings
- Disposable PPE such as Tyvek coveralls, gloves booties.
- Excess sample materials such as soil or water.
- Decontamination solutions such as methanol.

All potentially contaminated waste materials resulting from ASI site activities will be collected and placed in drums or other containers specified by the client. Protective clothing will be placed in plastic bags and disposed of as compactible, potentially contaminated waste through WMCO. Wastes will be segregated, specifically waste solvent such as methanol will not be combined with other wastes such as disposable protective clothing.

Investigation derived wastes are the property of the client and are to be left onsite unless otherwise specified in the written contract.

The client will be responsible for proper transport, shipment or disposal unless otherwise specified in the written contract.

12.0 CONTINGENCY PLANS

WMCO Has an established Emergency Response Plan and this organization will be utilized for any emergency other than minor injuries. ASI personnel will not attempt to treat injuries, fight significant fires or control chemical spills.

Injuries

In the event of injuries, site personnel will try to reduce or eliminate the consequences when possible. The process of determining what is appropriate to do requires that each situation be evaluated on a case by case basis.

It is the policy of WMCO to only permit emergency rescues to the WMCO emergency response team.

12.1 Minor Injuries

Minor injuries (sprains, strains, and cuts) are expected to be controlled by onsite personnel using standard first aid practices. ALL INJURIES WILL BE TREATED BY WMCO MEDICAL AND REPORTED TO ASI PROJECT HEALTH AND SAFETY (KENNY FLEMING).

12.2 Serious Injuries Radio CONTROL

The WMCO Medical Department maintains an emergency life squad crew and ambulance on all shifts, seven days a week. This crew will be notified immediately of any serious injury. The ASI crew will use standard first aid procedures to stabilize the injury pending arrival of WMCO response personnel.

CPR should be administered only by persons currently certified in CPR. Prior to performing CPR, the rescuer should consider what caused the victim to collapse. Chemicals around the nose and mouth can endanger the rescuer.

12.3 Injuries Complicated by Contamination Radio CONTROL

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

12.0 CONTINGENCY PLANS (CONTINUED)

12.3 Injuries Complicated by Contamination (continued)

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

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

12.4 Fire Hazards Radio CONTROL

Fire hazard operations include field activities such as drilling near pipelines, using flammable decontamination solutions, etc. All uncontrolled fires will be reported to WMCO, and the fire brigade requested before attempting any fire suppression activity. Emergency requests will be made by radio to CONTROL.

Small fires which appear to be controllable by field personnel should be controlled only if the safety of the field personnel is not jeopardized. Resources such as water, fire extinguishers, and soil may be used to contain or extinguish small grass or solvent fires. WMCO shall be contacted before any attempt to control the fire is made.

12.0 CONTINGENCY PLANS (CONTINUED)

12.5 Chemical/Radiological Releases Radio CONTROL

If a release in the form of a spill, leak or vapor cloud is observed, ASI personnel will withdraw at least 300 feet upwind and immediately notify authorities in the following order:

1. Radio to "CONTROL"
   Control will dispatch the necessary personnel to handle the situation.

If possible, the following information should be included in the notification:

- Cause of release if known
- Location of release
- Time of release
- Chemical identify
- Quantity involved
- If there is radioactive involvement
- If materials are leaving the area as a vapor/gas
- If there is fire involvement
- The number of known exposures or injuries (if any)

Additional information may be requested such as:

- What has been/is being done to minimize the hazard.
- Degree of hazard to responders based on your knowledge of the contaminants.

12.0 CONTINGENCY PLANS (CONTINUED)

12.6 Chemical Splashes

Eyes
Move the victim to an uncontaminated area. Hold the victims eyes open[1] and flush eyes for 15 minutes with water (or isotonic saline).

- Notify Control.
- Tell the Control the name of the chemicals, if known. Tell them what was done to treat the patient(s).
- Tell how many patients to expect.

Skin
Move the victim to an uncontaminated location. Remove contaminated clothing and wash the affected skin areas. Flush the skin for 15-30 minutes and notify Medical.

ROUTE TO HOSPITAL FROM SITE

First aid station and ambulance service is available onsite. Radio contract CONTROL. WMCO maintains an emergency response capability which includes an ambulance and EMT medical personnel.

HOSPITALS

The nearest medical facility is the WMCO Medical Facility. It is the primary choice for onsite injuries. The WMCO ambulance will transport the injured to the nearest hospital if necessary.

1 The natural response to eye pain is to close the eyes. The rescuer must keep the eyes open to remove chemical from under the eyelids. The flushing solution can cause extreme discomfort if it is too hot or too cold. Try to maintain solution near body temperature.

12.7 Adverse Weather

Work will be stopped if lightening, rain or other adverse weather conditions are in the area.

ROUTE TO WMCO INFIRMARY

12.0 CONTINGENCY PLANS (CONTINUED)

12.8 Emergency Telephone Numbers

Ambulance: Radio to Control
Hospital: Radio to Control
Fire: Radio to Control

	Work	Home	Radio
Bill Kwoka, Dir. H&S (WMD):	(615)483-1274	[redacted]	
Alvin Luttrell, V.P. (WMD):	(615)483-1274		
John Wood: Project Manager:	(513)738-3100		
Doug Harmel, Site Manager:	(513)738-3100		
Kenny Fleming, H.P.:	(513)738-3100		810
Bob Galbraith,	(513)738-3100		
Everett Trollinger, Field PM (IT):	(513)738-3100		817
Susan Birner, Personnel:	(505)883-0959		
Greg McAnarny, H&S (Corp.):	(505)883-0959		
Leo Singleton, WMCO:	(513)738-8908		
Dick Kasparek, WMCO:	(513)738-6899		
Mark Turner, H.P.:			824
Oba Vincent (DOE)	(513)738-6937		
EMERGENCY RESPONSE	**(513)738-6511**	**or**	**CONTROL**
Industrial Hygiene:	(513)738-6207		357
Radiation Safety (WMCO):	(513)738-6889		355
Fire and Safety (WMCO):	(513)738-6235		303
Utility Engineer (WMCO):	(513)738-6431		202
J.T. Grumski (WMCO Facility Owner)	(513)738-6280		

13.0 CONFINED SPACE ENTRY

No Confined Space Entry is Permitted.

14.0 PERSONAL PROTECTIVE EQUIPMENT

This discussion of personal protective equipment is generic in nature. Specific site requirements are presented in the site specific section.

14.1 Level-B

Hardhat (optional)
Face Shield (optional)
Self contained breathing apparatus (Air line or bottled air)
Disposable coveralls: Saranex, Tyvek or equivalent
Inner gloves: Latex or PVC
Outer gloves: (chemical resistant): Nitrile, butyl etc.
Chemical resistant boots
Latex booties (optional)
Level-B PPE is to be worn in any of the following environments:

- Atmospheres containing chemicals having poor warning properties.
- Unknown atmospheres
- IDLH atmospheres
- Air concentrations exceeding 3X exposure standard
- Contaminants do not pose significant threat of exposure through skin absorption.

14.2 Level-C

Hardhat (optional)
Face Shield (optional)
Air purifying respirator cartridges (organic vapors, acid gas, pesticides, radionuclides, particulates)
5-minute escape apparatus (optional *1)
Disposable coveralls: Saranex, Tyvek or equivalent
Inner gloves: Latex or PVC
Outer chemical resistant: Nitrile, butyl etc.
Chemical resistant boots
Outer Disposable booties:latex
Level-C is intended to be used where:

- Contaminants have good warning properties
- Cartridges are approved for use with the contaminant
- Oxygen concentrations are between 19.5 and 25%
- Toxic contaminant concentrations are not IDLH
- Concentrations are known and continuously monitored
- **Contaminant concentrations do not exceed 3X exposure**

14.0 PERSONAL PROTECTIVE EQUIPMENT (CONTINUED)

Cartridges will be changed:

- Daily.
- If color indicator shows that the cartridge is spent.
- If breakthrough is detected.

14.3 Level-D

Hardhat (optional)
Eye protection: safety glasses or goggles
Coveralls
Work boots
Work gloves

Level D PPE is basically a work uniform and provides no protection against chemicals. Level D is intended for sites where there is no risk from contaminants which can enter the breathing zone. Since most nonvolatile chemicals can adhere to particulates and be resuspended in the air, Level D is generally not permitted on contaminated sites. Level D can be used to work in areas where there is no risk of contamination such as upgradient installation of "Background" monitoring wells. Level D is not street clothes.

15.0 CALIBRATION OF SITE ENTRY EQUIPMENT

It is the designated Site Safety Officer's duty to check the log book(s) before site entry to verify that the site entry equipment was calibrated. If the following information is not present, the SSO should notify the team leader who is ultimately responsible for the overall operation. The team leader is then responsible for getting the items corrected.

15.1 HNU Photoionization Detector

Calibrate daily before entry
Record the following information for each calibration:

- Date
- Time
- Site name

Calibration gas: Concentration and identity
Span potentiometer setting
Difficulties
Calibrator's name (printed)
Probe type

15.2 Radiation Meter

Semi-annual calibration by manufacturer or NBS traceable standard.
Daily field function check using check source or gas mantle bags.
Record:

- Date
- Time
- Radiation source

Results: Note that the readings should be stable. If the results start to change while testing under the same conditions, notify the ASI Health and Safety Department.

16.0 DRILL RIG OPERATIONS

All drilling operations are dangerous. Several safety tips will make monitoring safer.

UNDERGROUND HAZARDS

No ground penetration employing heavy equipment is permitted until public/facility representatives have determined that underground utilities are not present.
Electricity
Gas
Sewer
Telephone(metallic and fiberoptical cables)
Water
Steam
Cave-in hazards my be present in Karst topography or near storage tanks
Fire and explosion hazards are also present if containerized chemicals are present underground.
(geophysical testing should be performed if there is doubt about the presence or location of underground structures.)

OVERHEAD HAZARDS

Wires
- 10 feet from a 50 KV or less line;
- 20 feet from a 50 KV to 345 KV line; and
- 34 feet from a 345 KV to 750 line.

Buildings (25' clearance needed to raise boom)
Tree limbs (25' clearance needed to raise boom)

MISCELLANEOUS HAZARDS

Lightening
Rain on Cathead
Weak cables, ropes or hydraulic lines
Loose fitting clothing tends to snag on the rotating auger
Volclay contains crystalline silica which can cause silicosis.
Noise

PROCEDURES

No one but the drillers should be within 4 feet of the rotating auger. Monitoring should be performed during periods of auger change or when the auger is stopped.

The drilling crew is responsible for maintaining the drill rig and stopping work if unsafe conditions develop.

16.0 DRILL RIG OPERATIONS (CONTINUED)

The designated health and safety personnel are expected to be familiar with the chemical and radiological hazards associated with the site operations, but are not experts in drill rig operations. If they notice something that appears to be a hazard, the will notify the drillers so that the drillers can assess the condition. Actions taken (including no action) will be documented. The safety personnel will also assure that:

1. The drilling crew demonstrates to the field team, that the kill switch is functional, and shows its location. No drilling is to be permitted if the kill switch is not operational or if the field crew is not familiar with its location and operation.

2. A minimum of two persons will be present at the drill rig at all times of operation.

3. Respiratory protection is worn when conditions warrant it. Personal protective equipment impairs the operator's vision. Gloves and other safety equipment can make "normal operations" more difficult to perform. Unnecessary use of respiratory equipment should not be required. If a driller feels more comfortable using respiratory protection to reduce exposures which will not exceed the published exposure levels, he must be aware of the increased physical hazards.

4. That at least five (5) feet of clearance is maintained on all sides of the drill rig for emergency egress.

NOISE

Noise can exceed the levels set by OSHA during certain operations such as driving a split spoon. Hearing protection shall be worn any time noise levels exceed 90 dBA.

16.0 DRILL RIG OPERATIONS (CONTINUED)

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment should include:

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

DECONTAMINATION

Decontamination of drill rigs generally requires the use of power cleaners such as pressure sprayers or steam cleaners. Wipe tests are required to confirm the effectiveness of decontamination efforts. No contaminated heavy equipment is to leave the site without the written permission of the site operator (Westinghouse).

CHEMICAL AND RADIOLOGICAL HAZARDS

Will be dealt with in the hazard assessment section.

17.0 HEAT STRESS

Heating of the body occurs from three sources:

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

Cooling occurs through three mechanisms:

1. Respiration: The air we exhale is warm. As the body overheats, the respirations become more rapid.
2. Radiation: Heat is released at the surface of the skin. As the body overheats, the surficial blood vessels dilate and allows more heat to be lost.
3. Evaporation: Perspiration is released to the skin surface and evaporates. The skin is cooled by evaporative cooling.

Personal protective equipment reduces the body's ability to shed excess heat through radiation and evaporation of sweat. Personal protective equipment (for chemicals) can also act like a greenhouse and prevent heat dissipation by preventing evaporation.

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

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

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

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

17.0 HEAT STRESS (CONTINUED)

Heat Exhaustion

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

Treatment of Heat Exhaustion

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

Heat Stroke

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

HEAT STROKE VICTIMS MUST BE TRANSPORTED TO A HOSPITAL FOR IMMEDIATE TREATMENT. The individual must not be allowed to drive himself, since cases are on record where the victim's condition worsens, he lapses into unconsciousness and dies. Heat stroke victims are not to return to field work without the physician's consent.

PREVENTION OF HEAT STRESS

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

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

17.0 HEAT STRESS (CONTINUED)

Monitoring:

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

Oral Temp.: less than 99:	Continue Work
Oral Temp: 99-100.3 F	Reduce rate of work or take more frequent breaks. Consume more cool fluids.
Oral Temp: > 100.4 F	Remove from work until temp. reduced to 99 F or less a.
Pulse Rate: > 110 bpm	Remove from work until pulse rate falls below 110 beats per minute.

If the body temperature exceeds 100.4, the pulse rate exceeds 110 bpm at rest the person must not continue to work. These conditions have been found to prevent most heat related illnesses. Occasionally, high heat conditions combined with poor eating, sleeping and drinking habits has resulted in heat stroke occurring in less than 20 minutes.

Heat stress monitoring must be performed at least once per hour for documentation, but may have to be increased under severe circumstances.

Table 3 Signs and Symptoms of Heat Stress

- **Heat rash** may result from continuous exposure to heat or humid air.

- **Heat cramps** are caused by heavy sweating with inadequate electrolyte replacement.

  Signs and symptoms include:
  - muscle spasms
  - pain in the hands, feet, and abdomen

- **Heat exhaustion** occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:
  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- **Heat stroke** is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool and body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include:
  - red, hot, usually dry skin
  - lack of/or reduced perspiration
  - dizziness and confusion
  - strong, rapid pulse
  - coma

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

18.0 COLD STRESS

Cold stress is manifested in many different ways, but generally follows the following progression:

1. Frostnip
2. Frostbite
3. Hypothermia

18.1 FROSTNIP

Frostnip is the most likely form of cold stress to occur at FMPC. This is because warm buildings and warm vehicles are generally within a few feet of the environmental work being performed. These site resources are used to prevent more serious forms of cold stress from occurring.

Frostnip is a mild form of frostbite. Frostnip mainly involves the extremities and exposed skin. Affected areas usually include ears, fingers, toes, and facial skin. Frostnip is not a serious condition, but may progress into more severe frostbite if not treated. Frostnip is the local freezing of surface layers of skin and is characterized by initial reddening and then whitening of the affected area. Frostnip is aggravated by handling of metal objects or working in cold solutions such as those used for decontamination of field equipment.

The signs of frostnip are often ignored by the affected person. The victim feels numbness in the affected area and may even by unaware of the condition. Team members must remember to observe each other to detect early sign of frostnip.

Prevention of frostnip:

* Cover all skin areas. Be sure to wear gloves and a warm hat.
* Avoid direct skin contact with cold air or cold fluids.
* If protective equipment gets wet, change into dry protective equipment.
* Visually observe your partner for signs of frostnip. Treat if signs appear.

Treatment of frostnip: Warm the affected area, by resting inside a heated area such as a heated vehicle, or building.

18.2 FROSTBITE

Frostbite is a deeper freezing of the surface skin and is characterized by a white or waxy appearance. A mottled or blotchy appearance is sometimes seen. The frostbitten area often feels numb to the victim. Exposed skin areas and the extremities are the most likely parts to be affected.

Prevention of frostbite: Same as prevention of frostnip.

Treatment of frostbite:

If frostbite occurs, the worker should report to the WMCO infirmary for treatment.

If medical attention is not available, the part should be carefully warmed. If warming is done, it should be done by immersing the affected area in water that is approximately body temperature (100-105°F). Do not allow the affected body parts to touch the sides or bottom of the container (bath tub). Do not place pressure on the affected area.

Warming of the affected area will be painful to the victim. The presence of pain is usually a good indicator of successful rewarming. The warmed part should be wrapped in gauze and the victim transported to the hospital for treatment.

18.3 HYPOTHERMIA

Hypothermia is the general cooling of the entire body. Hypothermia is extremely unlikely unless the victim has had a long-term exposure or has been immersed in a cold liquid. Hypothermia can be life threatening.

Symptoms of hypothermia include:

- Shivering
- Numbness
- Slowed breathing and pulse rate
- Drowsiness and an unwillingness to do even the simplest of activities
- Failing eyesight
- Incoordination
- Unconsciousness
- Freezing of body parts

Prevention of hypothermia

* Schedule work for warm times of year when possible
* Work during warmer times of day, when sun is shining
* Set up wind blocks to minimize the wind chill factor
* Layer clothing so that layers can be added/removed as necessary to prevent sweating and maintain body temperature.
* Change into dry clothing if it becomes wet
* Do not "overdress". Too much clothing causes sweating and reduces the effectiveness of your protective clothing.
* Monitor oral temperature periodically. If the oral temperature drops below 96.8°F, remove the worker from field work. Get him to a warm building or vehicle so he can warm up. Do not allow the person to work unit the body temperature is back to normal.
* Only perform emergency work when the wind chill index is below Minus 40°F. Refer to 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. (This will allow drillers to work up to 55 minutes before a break is required.)

Monitoring

Monitoring should be performed at least once every four hours at temperatures below 68°F. The frequency of monitoring should be increased as the temperatures drop below freezing. The frequency of monitoring requires some judgement, and should reflect the work activity level required to perform each job function. Personnel performing sedentary functions such as documentation, will be more susceptible to cold stress than will physically active workers.

Oral Temperature	Action
97.6 - 99.6°F	Body temperature is approximately normal, to keep on working.
<97.6 - °F	Increase monitoring frequency to at least once per hour.
<96.8 - °F	Remove employee from field work; move into heated environment. Treat for mild hypothermia. See medical attention.

Treatment of Hypothermia

If the oral temperature drops below normal, it is likely that the person has other cold stress injuries such as frostbite. Take the individual to the WMCO infirmary for treatment.

If medical attention is not readily available:

* Remove wet clothing
* Dry the person
* Keep victim at rest
* Slowly warm core without warming legs
* If person is alert, give warm (not hot) liquids
* Transport to hospital as soon as possible

NOTE:

If a person has recently been a victim of cold stress, he/she is very likely to remain more susceptible to cold for an indefinite period of time.

NOTE 2: Bulky winter clothing is dangerous for drilling operations. Safe drilling operations generally recommend that loose fitting/bulky clothing be avoided because it snags on moving parts.

19.0 APPROVAL AND COMPLIANCE STATEMENT

This site specific safety plan was produced for the use of ASI employees and ASI subcontractors. It was intended for the Feed Materials Production Center, Fernald, Ohio.

The undersigned persons have read and understand the attached site specific safety plan and agree to follow its provisions*1:

Name (lettered)	Signature	Date
_____	_____	_____
TEAM LEADER		
_____	_____	_____
DESIGNATED SITE SAFETY OFFICER		
_____	_____	_____
EQUIPMENT OPERATOR		
_____	_____	_____
_____	_____	_____

The following individuals are not obligated, by contract, to follow ASI safety policies, but have read and understood the safety plan:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

*1 Compliance with the provisions of this HASP may be audited through announced or unannounced site visits. Be sure that you are implementing the provisions of the safety plan and documenting the reasons for field actions/changes when they are necessary. Site visits may be performed:

___ By ASI

___ By Client

___ By OSHA

ATTACHMENT A

From: V. R. Gill

WMCO:AN:88-162

Date: August 29, 1988

Subject: ANALYTICAL RESULTS ON K-65 PROBE SAMPLES

To : B. L. Speicher

Tabulated below are the analytical results of the analysis of the K-65 probe samples taken in July, 1988. All results are reported on an "as-received" basis, except for the uranium isotopes which are reported on a uranium basis.

K-65 ANALYTICAL RESULTS

	Silo #1	Silo #2
Laboratory Number	12-0799	12-0800
Constant Moisture Loss @ 125° C. -	30.27%	47.37%
Total Uranium -	1400 ppm	1800 ppm
Uranium Isotopes: (in wt %)		
U-233 -	<0.001	<0.001
U-234 -	0.0055	0.0054
U-235 -	0.71	0.71
U-236 -	<0.001	0.001
U-238 -	99.29	99.28
Total Thorium -	322 ppm	301 ppm
Thorium Isotopes:		
Th-228 -	0.85 ppt	0.77 ppt
Th-230 -	1.5 ppm	2.1 ppm
Ra-226 -	0.21 ppm	0.13 ppm
Ra-228 -	0.22 ppt	0.18 ppt

RADIOISOTOPE IDENTIFICATION

Alpha Emitters: Th-230, Ra-226, Rn-222, Po-218, Po-214, Po-210

Gamma Emmitters: Ra-226, U-235, Ra-223, Rn-219, Th-231, Pb-214, Bi-214

From: V. R. Gill (6520) WMCO:AN:88-180

Date: September 14, 1988

Subject: X-RAY FLUORESCENCE ANALYSES OF K-65 MATERIALS

To : G. J. Krieger

As requested, additional analyses were performed to determine the elemental constituents of K-65 probe samples. The following data was obtained using X-Ray Energy Dispersive Fluorescence spectrometry.

ELEMENT	SILO NO. 1	SILO NO. 2
Al	3.7	2.6
Ba	2.0	2.1
Ca	4.0	13.2
Ce	0.2	0.1
Co	0.6	1.1
Cr	ND	0.4
Cu	0.2	0.4
Fe	8.3	9.8
K	2.8	2.1
La	0.2	0.1
Mo	0.4	<0.1
Ni	1.0	1.8
Pb	7.5	10.3
Sb	<0.1	ND
Si	68.9	55.1
Sr	<0.1	0.1
U	0.2	0.6
Zn	<0.1	<0.1
Zr	0.1	0.2

NOTE: Relative Values in Wt.%
ND = Not Detected

1. Analyses were performed on a dried subsample. The elemental concentrations determined are on a dry sample basis and not on an "as received" basis.

2. The X-Ray technique used gives only elemental information; no identification of compounds is available using this technique.

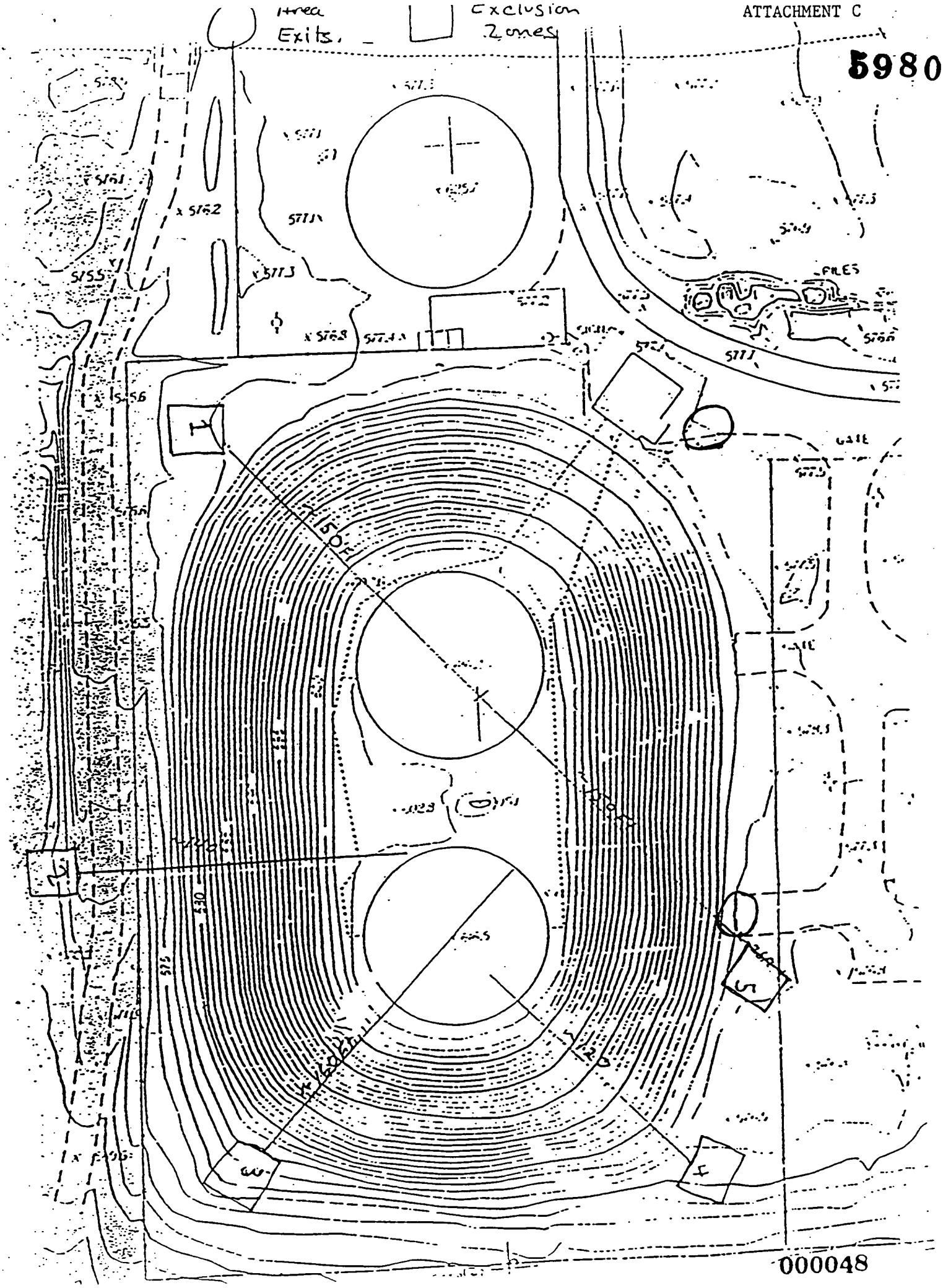
3. Concentration values presented are <u>not</u> absolute values based on sample weights. Relative Wt:% values presented were calculated as a percentage of individual value to the total of elemental concentrations determined.

V. R. Gill

V. R. Gill

VRG/br

cc: R. N. Bolin
R. D. Ohlinger
D. A. Palmer


Area
Exits.
Exclusion
Zones
FILES
GATE
GATE
530
575

ATTACHMENT D

5980

FMPC
OPERATIONS SAFETY & HEALTH - RADIOLOGICAL SAFETY
RADIOLOGICAL SURVEY REPORT

Date: 5-2-90	LOCATION: K-65 SILOS	RST: [illegible]	Page 1 of 2
Time: 1445	LEVEL:		

REASON FOR SURVEY: ☐ ROUTINE ☑ SPECIAL REQUEST ☐ RWP ☐ INCIDENT

COMMENTS:
Direct & Frisk on soil and general area & dose rates @ locations 1, 3, & 5 on map. Soil was exposed by kicking away grass.

FOLLOW-UP SURVEY ATTACHED ☐YES ☑NO
SURVEY MAP ATTACHED ☑YES ☐NO

INSTRUMENTS

MODEL	SERIAL NUMBER	CALIBRATION DATE	BKRD.	EFF.
177-1	57829	DUE 9-90	0	12%
RO3C	416	DUE 8-90	<0.5	—

ANALYZE FOR: ☑ ALPHA ☑ BETA-GAMMA ☐ OTHER

TYPE OF SURVEY: ☑ CONTAMINATION ☑ RADIATION ☐ OTHER

ITEM NUMBER	GRID COORDINATES	DESCRIPTION	CORRECTED DOSE RATE (mRem/hr) γ CONTACT	β/γ CONTACT	γ 3 FT.	β/γ 3 FT.	DPM ALPHA 100 CM²	DPM ALPHA PROBE	DPM BETA-GAMMA 100 CM²	DPM BETA-GAMMA PROBE
1		APPROXIMATELY 20 PROBE LOCATIONS			<0.5		BKGD			
3		↓			↓		↓			
4										
5										
		SURVEYS PERFORMED IN AREA IS RADIUS @ EACH LOCATION								

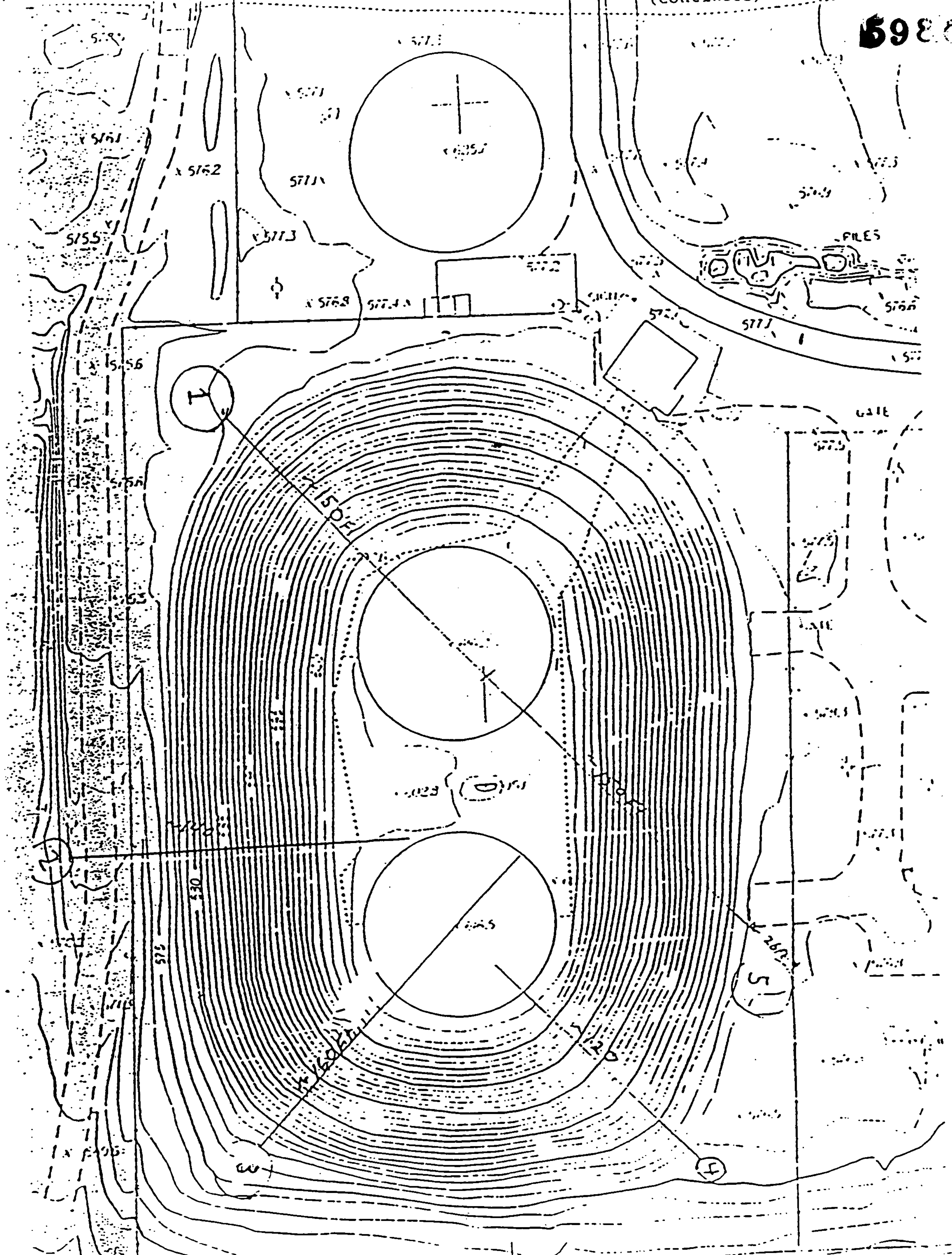
NO.	DISTRIBUTION OF COPIES
1	Radiological Safety Technician Supervisor
2	Radiological Safety Engineer
3	Facility Supervisor

NOTIFICATION OF SURVEY RESULTS

SUPERVISOR NOTIFIED	TIME	DATE	NOTIFIED BY	REVIEWED BY	DATE

ATTACHMENT B
(continued)

5980



K-65 SLANT BORINGS

Assumptions:

a) Field crew will consist of 6 full-time people.
b) One surveyor will be necessary on a part-time basis to set up pad (8 hours/boring) and assure that boring is correctly positioned (4 hours/boring).
c) Pad set up will take 2 days (i.e., set anchors and place pad at boring location)
d) Dose equivalent rate is 0.5 mRem/hr at the boring locations per Attachment D.
e) Rig setup will take 2 days.
f) Boring will be at a rate of 40 ft/day.
g) Grout and demobilization will take 2 days.
h) A working day will consist of 8 hours of exposure time.
i) The distances to be drilled at the 5 locations are:

Boring 1	150 ft.	Boring 4	120 ft.
Boring 2	140 ft.	Boring 5	150 ft.
Boring 3	160 ft.		

Boring 1

A) Pad Set up [(6 men x 16 hours) + (1 man x 8 hours)] x 0.5 mRem/hr x 1Rem/1E3mRem = 0.052 Man-Rem

B) Rig Setup 6 men x 16 hours x 0.5 mRem/hr x 1Rem/1E3mRem = 0.048 Man-Rem

C) Drilling $[(6 \text{ men} \times \frac{8 \text{ hours}}{\text{day}} \times 150 \text{ ft.} \times \frac{\text{day}}{40 \text{ ft}}) + (1 \text{ man} \times 4 \text{ hours})] \times 0.5 \text{ mRem/hr} \times 1\text{Rem}/1\text{E}3\text{mRem} =$ 0.092 Man-Rem

D) Grout & Demob. 6 men x 16 hrs x 0.5 mRem/hr x 1Rem/1E3mRem = 0.048 Man-Rem

Boring 2

A+B+D) 0.052 Man-Rem + 0.048 Man-Rem + 0.048 Man/Rem = 0.148 Man-Rem

C) $[(6 \text{ men} \times \frac{8 \text{ hours}}{\text{day}} \times 140 \text{ ft.} \times \frac{\text{day}}{40 \text{ ft}}) + (1 \text{ man} \times 4 \text{ hours})] \times 0.5 \text{ mRem/hr} \times$ 1 Rem/1E3mRem = 0.086 Man-Rem

Boring 3

A+B+D) 0.052 Man-Rem + 0.048 Man-Rem + 0.048 Man/Rem = 0.148 Man-Rem

C) $[(6 \text{ men} \times \frac{8 \text{ hours}}{\text{day}} \times 160 \text{ ft.} \times \frac{\text{day}}{40 \text{ ft}}) + (1 \text{ man} \times 4 \text{ hours})] \times 0.5 \text{ mRem/hr} \times 1 \text{ Rem/1E3mRem} = 0.098 \text{ Man-Rem}$

Boring 4

A+B+D) 0.052 Man-Rem + 0.048 Man-Rem + 0.048 Man/Rem = 0.148 Man-Rem

C) $[(6 \text{ men} \times \frac{8 \text{ hours}}{\text{day}} \times 120 \text{ ft.} \times \frac{\text{day}}{40 \text{ ft}}) + (1 \text{ man} \times 4 \text{ hours})] \times 0.5 \text{ mRem/hr} \times 1 \text{ Rem/1E3mRem} = 0.074 \text{ Man-Rem}$

Boring 5

A+B+D) 0.052 Man-Rem + 0.048 Man-Rem + 0.048 Man/Rem = 0.148 Man-Rem

C) $[(6 \text{ men} \times \frac{8 \text{ hours}}{\text{day}} \times 150 \text{ ft.} \times \frac{\text{day}}{40 \text{ ft}}) + (1 \text{ man} \times 4 \text{ hours})] \times 0.5 \text{ mRem/hr} \times 1 \text{ Rem/1E3mRem} = 0.092 \text{ Man-Rem}$

TOTAL MAN-REM **1.182**

Expected external dose equivalent to field perosnnel:

Field Crew: Total expected external dose (per individual) = 0.192 Rem for 6 individuals

Surveyor: Total expected external dose (per individual) = 0.030 Rem for 1 individual

Use of air purifying respirators will raise external exposure by a factor of 1.25 to 1.5 times the above estimates.

1988 AVERAGE VALUES

Location	Rn-222 + Rn-220	Rn-222 only	Rn-220	1988 AVERAGE RADON
K65-A	4.10	3.78	0.32	3.99
K65-B	6.78	5.53	1.24	6.36
K65-C	6.29	6.80	-0.51	6.46
K65-D	6.63	7.28	-0.65	6.84
K65-E	4.94	5.73	-0.79	5.20
K65-F	5.01	5.23	-0.21	5.08
K65-G	3.07	2.98	0.10	3.04
K65-H	3.28	3.05	0.22	3.20
K65-I	4.26	4.90	-0.64	4.48
K65-J	4.03	2.80	1.23	3.62
K65-K	4.09	4.48	-0.39	4.22
K65-L	5.85	5.48	0.38	5.73
K65-M	4.55	6.00	-1.45	5.03
K65-N	4.66	6.10	-1.44	5.14
K65-O	3.99	3.30	.069	3.76
K65-P	3.26	2.10	1.16	2.87
				X = 4.68

RADON DOSE EQUIVALENT CALCULATIONS
K-65 BORINGS

ATTACHMENT G

Calculation 1 - Dose estimates for Radon concentration of 5 pCi/l

Assumptions:
1) 50% equilibrium between Radon and its short-lived daughters exists in the open environment around the K-65 perimeter fence.
2) Average Radon gas concentration is 5 pCi/l based on WMCO's Radon monitoring program. See Attachment F.
3) A member of the drilling crew is exposed for 48 days at 8 hours per day.
4) The surveyor works 12 hours at each boring.

The dose expected to the individual is calculated as follows:

Field Crew

48 days x 8hr/day x 5pCi/l x 1/2 x 1WL Rn-222/100pCi/l x 1 month/170hrs x 1.25 Rem WBDE/WLM x 1E3mRem/1Rem = 71 mRem whole body dose equivalent from Radon daughters

Surveyor

$$5 \text{ borings} \times \frac{12 \text{ hours}}{\text{boring}} \times \frac{5 \text{ pCi}}{\text{liter}} \times \frac{1}{2} \times \frac{1\text{WL Rn-222}}{100 \text{ pCi/l}} \times \frac{1 \text{ month}}{170 \text{ hrs}} \times \frac{1.25 \text{ Rem WBDE}}{\text{WLM}} \times \frac{1\text{E3 mRem}}{1 \text{ Rem}} = 11 \text{ mRem}$$

The total collective dose to the crew would be: [(71 mRem x 6 men) + (11 mRem x 1 man)] x 1Rem/1E3mRem = 0.437 Man-Rem

Calculation 2 - Dose estimates for Radon concentrations of 15 pCi/l (IT/ASI Action Level)

The maximum dose expected to the individual is as follows:

Field Crew

71mRem WBDE/5pCi/l x 15pCi/l = 213 mRem whole body dose equivalent from Radon daughters

Surveyor

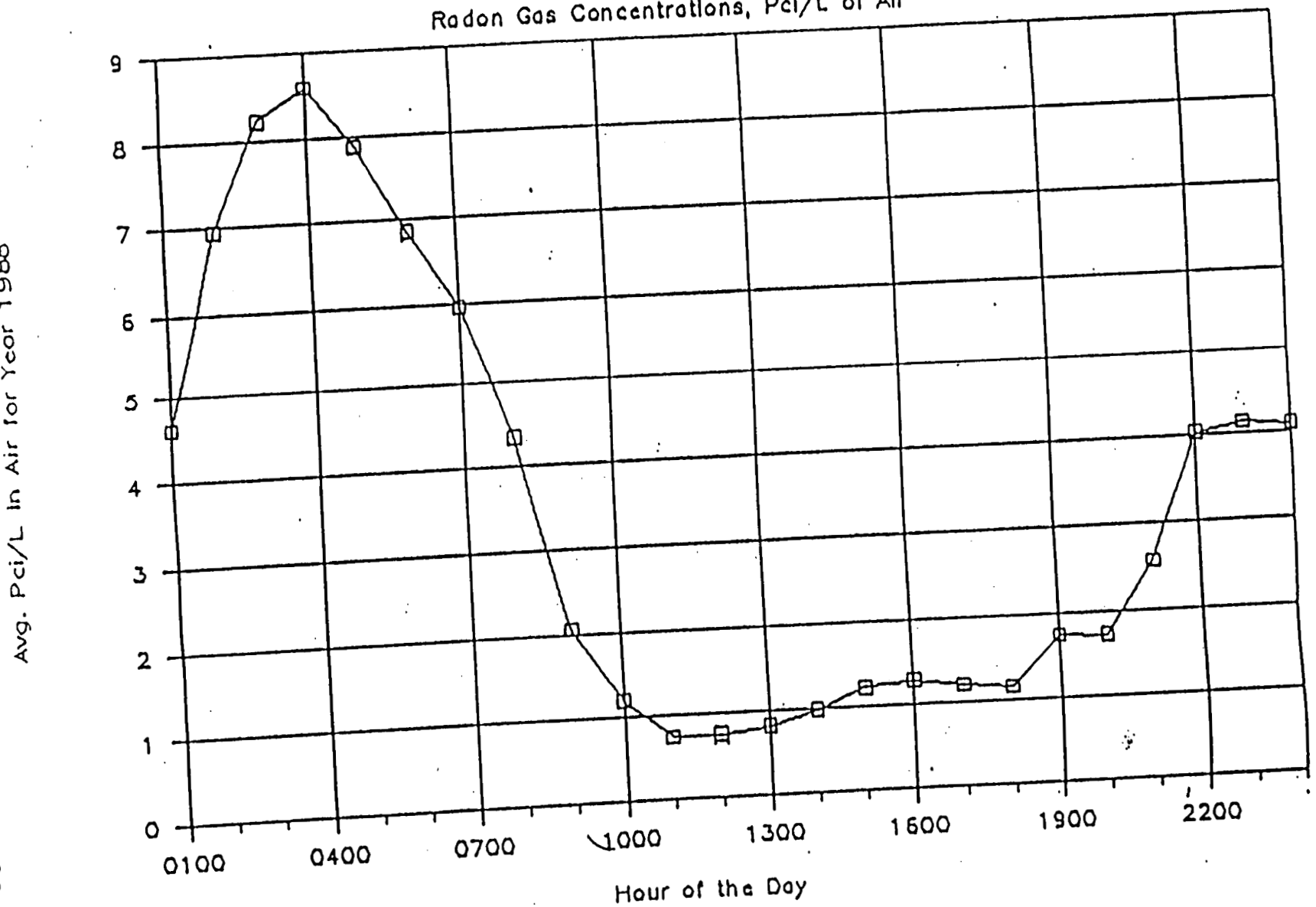
$$\frac{11 \text{ mRem WBDE}}{5 \text{ pCi/l}} \times 15 \text{ pCi/l} = 33 \text{ mRem}$$

The total collective dose to the crew would be:

[(213mRem/man x 6 men) + (33 mRem/man x 1 man)] x 1Rem/1E3mRem = 1.31 Man-Rem

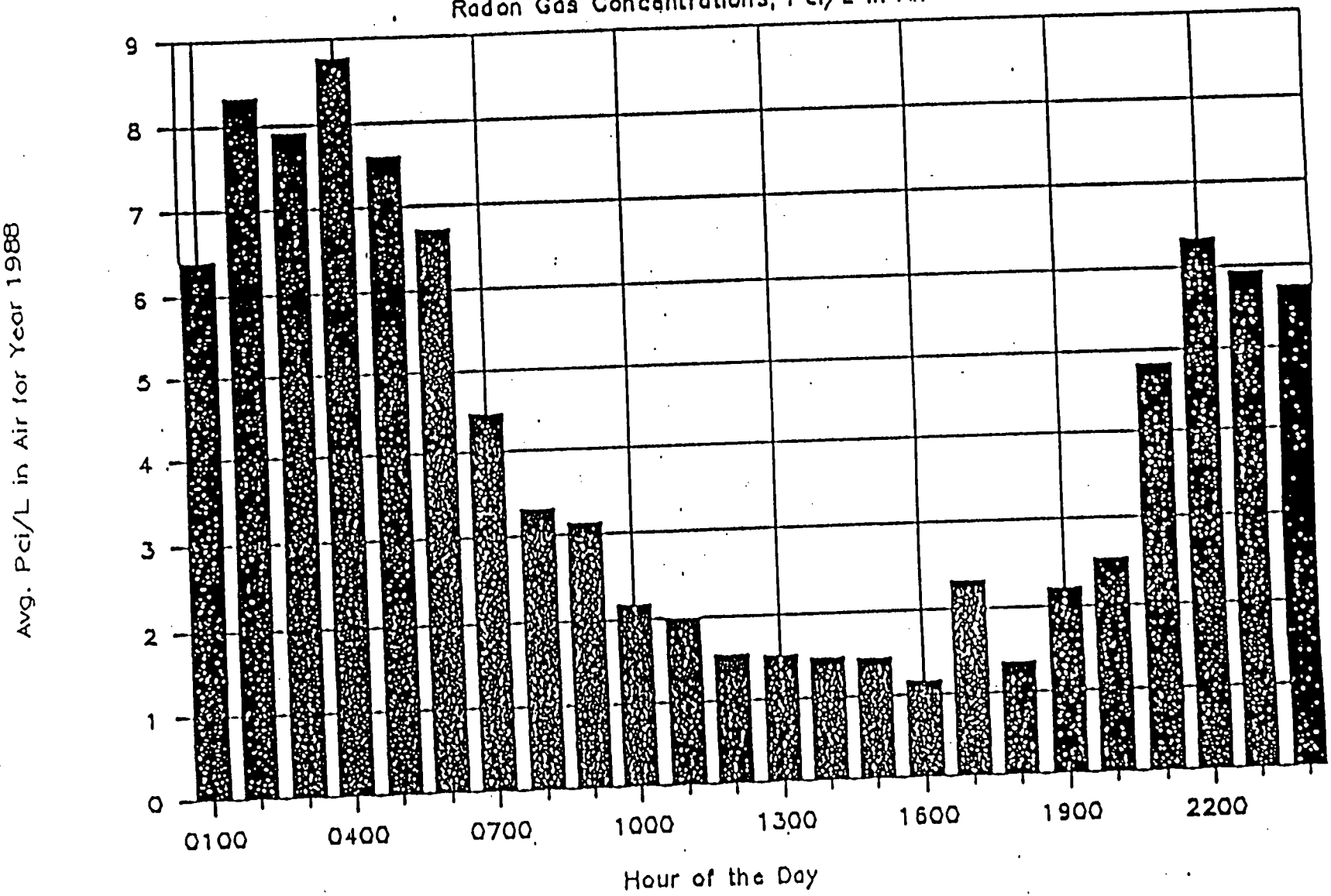
RGM88U94 Yearly Average

Radon Gas Concentrations, Pci/L of Air



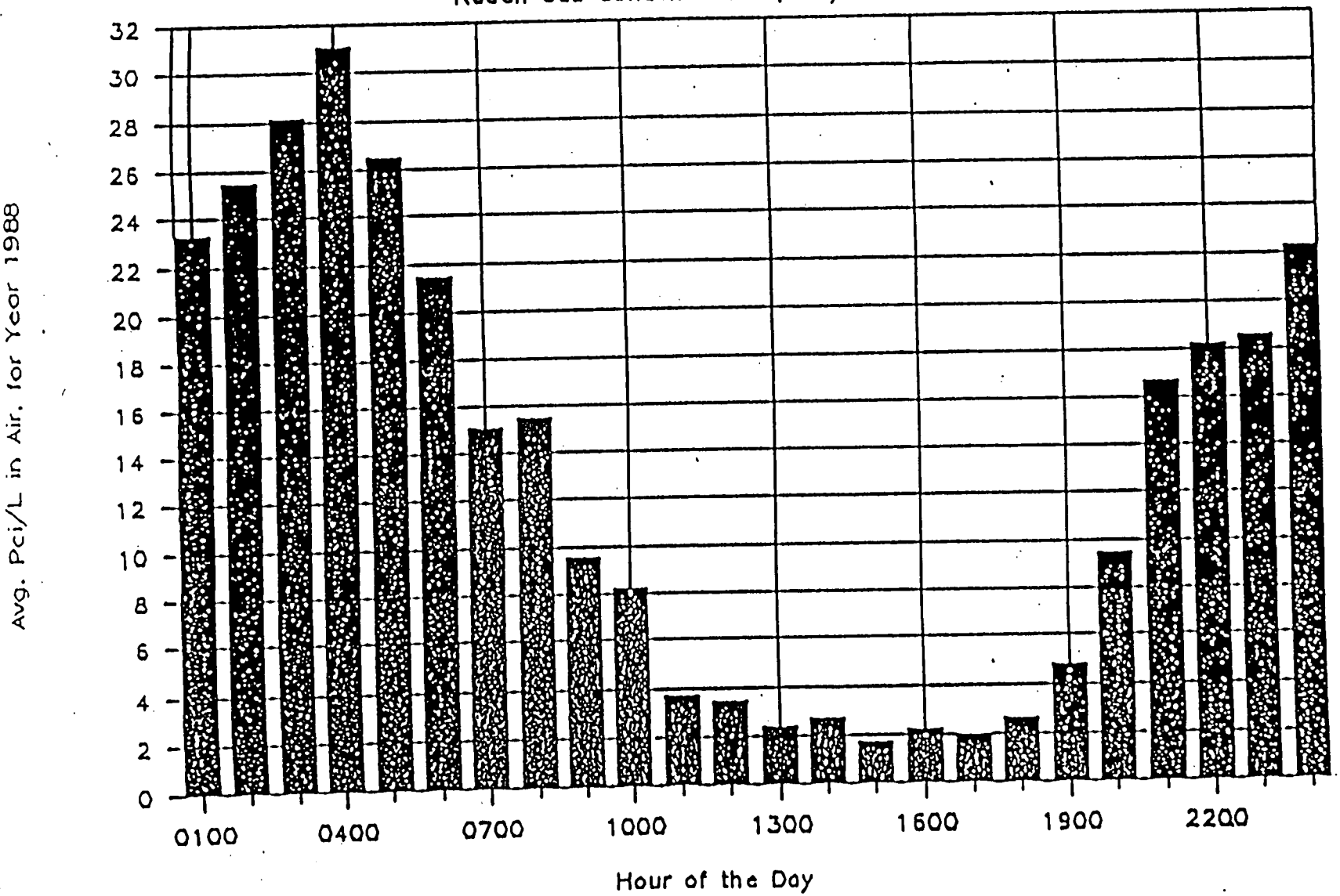
RGM88U14 YEARLY AVERAGE

Radon Gas Concentrations, Pci/L in Air



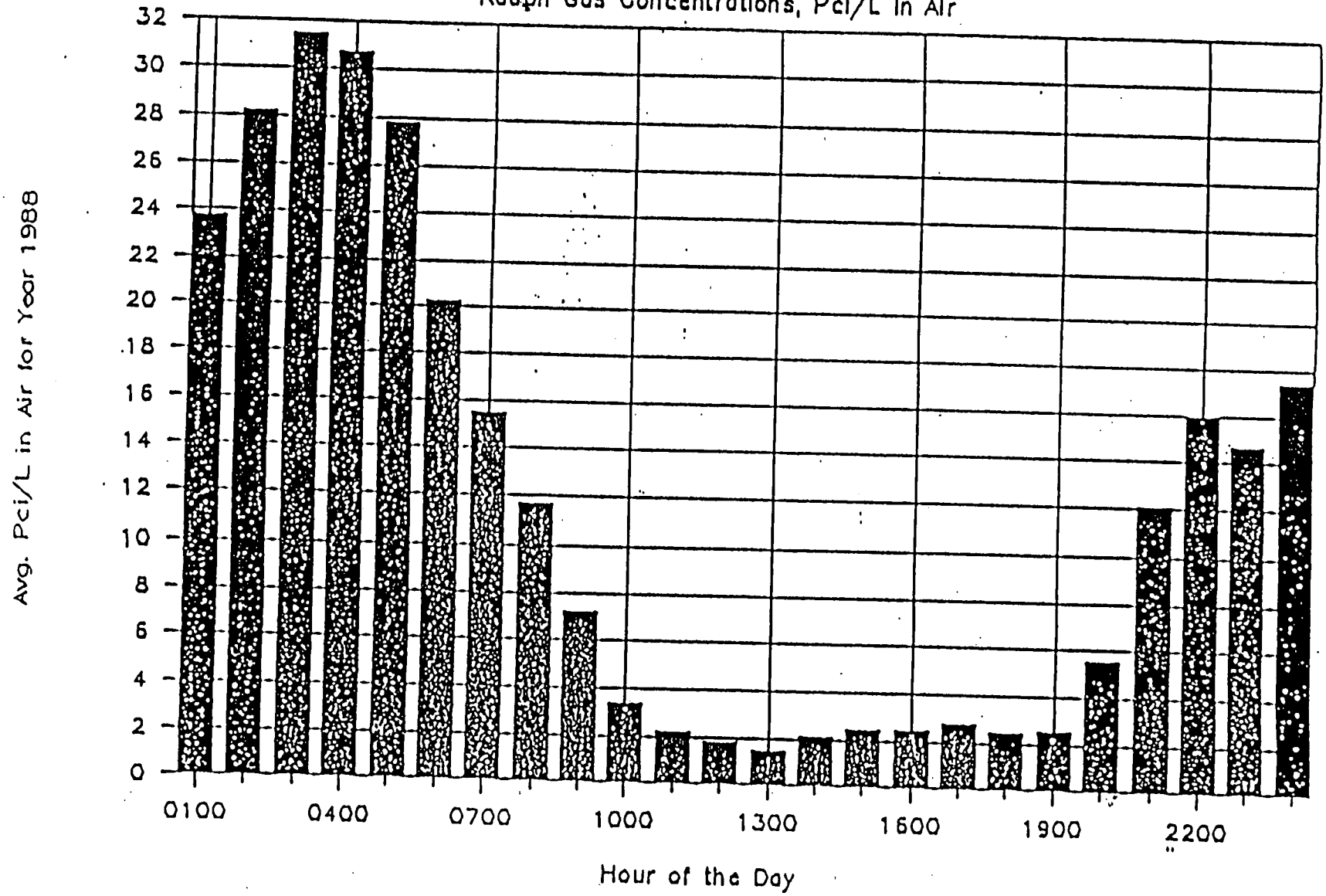
RGM88U92 Yearly Average

Radon Gas Concentrations, Pci/L in air



RGM88U21 Yearly Average

Radon Gas Concentrations, Pci/L In Air



Attachment I

To: Joseph Poliziani CHP

From: Stephen L. Davis CIH

Subject: Response to comments on Site Specific Safety Plan for The K-65 Horizontal Boring Operations, dated May 9, 1990

This memo addresses comments number 3, 4, 5, and 7 from Oba Vincent of DOE. Listed below are the relevant comments (paraphrased) with IT's responses.

3. The PEL for lead is 50 micrograms per cubic meter and the action level is 30 micrograms per cubic meter.

RESPONSE: These limits are prescribed in 29CFR 1910.1025(2)(b)and (c) respectively. The Permissible Exposure Limit is 50 micrograms per cubic meter and the Action Level is 30 micrograms per cubic meter. The appearance of 50 mg/m3 as the PEL was a typographical error. The units for the action level should also have been micrograms per m3. The figure 25 is used rather than 30 in order to comply with the general ASI requirement of using one half of the OSHA standard as the exposure limit. In other words, it is the intent of the ASI/IT team to maintain airborne lead exposures at less than 25 micrograms per cubic meter.

4. Compliance with 29CFR 1910.1025 must be evaluated for the slant boring project.

RESPONSE: The following is an evaluation of the state of compliance with the major requirements of 29CFR 1910.1025.

(a)Scope and Application. This section applies to all occupational exposure to lead, except construction and agriculture, and is potentially applicable to this project. For the sake of this analysis, it is assumed that this standard applies to this project.

(b) Definitions. This section defines the Action Level as 30 micrograms/m3. As previously stated, the ASI/IT team intends to comply with the requirements of the action limit.

(c) Permissible Exposure Limit. The Permissible Exposure Limit is 50 micrograms/m3. The ASI/IT team intends to assure that employee exposures are less than the Permissible Exposure Limit.

(d) Exposure Monitoring. This section requires an initial determination of airborne lead exposure in operations that present a potential for exposure. Additionally, this section requires further monitoring if the initial determination indicates a potential for exposure above the action level or if there is a production, process, control or personnel change.

The silos contain approximately 10% lead and if significant leakage has occurred, there is a potential for lead exposure. Under the anticipated conditions, open environment, little dust generation, and moist soil, it appears very unlikely that airborne lead concentrations will exceed 25 micrograms/m3.

Representative air samples will be collected during these borings in order to make initial determination of lead concentration as required by this section. Employees will be notified of sampling results as required in this section. In addition, real time radiation monitors will be used during drilling operations. Radioactive contamination will serve as a marker of lead contamination. Calculations have been made to justify this assumption.

(e) Methods of Compliance. This section mandates engineering and work practice controls if airborne lead exposure exceeds 30 micrograms/m3 for 30 days or more per year. The airborne lead concentrations during this project are expected to be well below 30 micrograms/m3. If air monitoring reveals airborne exposures greater than 30 micrograms/m3, procedures will be put in place to minimize exposure.

(f) Respiratory Protection. This section requires that the employer provide appropriate respiratory protection when employee exposure exceeds the Permissible Exposure Limit and other control measures fail to reduce the exposure. If this occurs, employees will be provided with full face respirators with combination organic vapor, acid gas, and HEPA cartridges.

(g) Protective Work Clothing and Equipment. This section requires the use of hardhats, coveralls, gloves, scuffs, and eye protection by employees exposed to concentrations greater than the PEL. These requirements are currently being met by ASI/IT employees in the process area and will be met during this project.

(h) Housekeeping. This section requires that working surfaces and floors be kept free of lead accumulation. This requirement is not directly relevant to the planned tasks as the work will be done outdoors. However, the procedures normally used for drilling on the FMPC (drumming tailings) comply with the spirit of this section.

(i) Hygiene Facilities and Practices. This section requires the implementation of a number of practices such as prohibiting eating and drinking in regulated areas, and showering, if airborne concentrations in the work area exceed the PEL. Current site procedures already satisfy these requirements.

(j) Medical Surveillance. This section requires that employees exposed to concentrations greater than 30 micrograms/m3 be enrolled in a medical surveillance program that includes blood tests to detect lead. Should lead sampling results exceed this concentration, the exposed ASI/IT employees will be enrolled in a medical surveillance program as required by this section.

(k) Medical Removal Protection. This section specifies that employees with elevated blood lead concentrations be removed from tasks that involve lead exposure. If airborne concentrations of lead exceed 30 micrograms/m3, and if medical surveillance results exceed specified levels, the impacted employee(s) will be removed from tasks that involve lead exposure.

(l) Employee Information and Training. This section requires that information (Appendices A and B of the lead standard) on the hazards of lead exposure be given to all employees potentially exposed to lead. It further requires that a training program be provided to employees that are exposed to airborne lead concentrations equal to or greater than the action level.

ASI/IT field employees assigned to this project will be given copies of Appendices A and B of the lead standard prior to the beginning of field work. Further training will be given if sampling indicates that airborne lead concentrations equal or exceed the action level of 30 micrograms/m3.

(m) Signs. This section requires lead warning signs be posted at the entries to any work area where the PEL is exceeded. Should airborne lead concentrations exceed the PEL, such signs will be posted.

(n) Recordkeeping. This section requires recordkeeping for exposure monitoring, medical surveillance, and medical removal. It further requires the maintenance of these records for 40 years or the duration of employment plus 20 years. These records must be made available upon demand to the employee, to OSHA and to NIOSH. These records must be detailed and include such items as dates of sampling or examination, sampling methods, sampling results, respiratory protection in use, names, social security numbers, job classifications, medical opinions, etc.

The recordkeeping procedures currently in use on the site comply with the general requirements of this section. All data generated in relation to potential lead exposure will be maintained in accordance with the requirements of this section.

(o) Observation of Monitoring. This section requires that affected employees be allowed to observe and understand lead sampling procedures. This includes being informed of the results. These procedures are currently being followed for onsite monitoring and will be followed for lead sampling.

5. Comment number 5 has been divided into 3 sections for response as follows.
   5.1 Level of protection
   5.2 Concentration and identity of organic compounds in silos
   5.3 Organic or inorganic lead in silos

5.1 RESPONSE: Level of Protection.
29CFR1910.120 (g)(3)(i) requires that PPE be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter. Level D protection has been selected for this project. Other options are levels A, B, and C.

29CFR1910.120(g)(3)(iv) requires that level A be used when skin absorption may result in substantial possibility of immediate death, serious injury, or impair escape. Recent analyses of silo contents (see 5.2) revealed no concentrations of organic or inorganic materials which would pose such a threat.

29CFR1910.120(g)(3)(iii) Specifies that positive pressure SCBA be used when potential chemical exposures are expected to create substantial possibility of immediate death, immediate serious injury, or impair ability to escape. Analyses of silo contents indicate that there

is no potential for airborne concentrations of organic and/or inorganic contaminants to reach immediately dangerous airborne concentrations.

Appendix B of 29CFR1910.120 provides guidance on selecting level C protection. Basically, this section states that level C can be used if skin contact does not pose a serious hazard, airborne concentration(s) are greater than the PEL(s), and air purifying respirators will effectively remove the contaminants. Analyses of the silo contents do not, of course, provide measurements of airborne concentrations during drilling. However, the relatively low concentrations of organic contaminants in the silos makes the occurance of airborne concentrations greater than the relevant PELs very unlikely. Real-time organic monitors will be used and will provide a check on this evaluation.

Appendix B of 29CFR1910.120 provides guidance on selecting level D protection. Basically, this section specifies that level D will be used when airborne concentrations of hazardous chemical(s) are not expected to reach significant levels and work functions preclude splashes or other contact with hazardous chemicals. These are the conditions expected during this project. In order to assure that these assumptions are correct, continuous, real-time monitoring for radioactive and organic contamination will be performed. Action levels have been established which specify upgrading the level of protection based on instrument readings.

5.2 RESPONSE: Organic content of the silos. The silos were filled with residues from processing pitchblende. Pitchblende is an ore containing uranium oxides and other inorganic compounds. This ore was treated with acids to remove the uranium. For this reason, the silos are not expected to contain significant concentrations of organic compounds. In addition, recent analyses of silo samples (April 6, 1990) indicate that the concentrations of organic constituents are relatively low. All analyses for specific analytes were less than 50,000 micrograms/kilogram. Based on prior experience with similar drilling operations, it is unlikely that airborne concentrations of hazardous organic chemicals (excluding radioactive components) would be exceeded even if the auger passed through the silo.

5.3 RESPONSE: State of lead, organic vs. inorganic. Silo records indicate that lead deposited with the original residue and generated by subsequent radioactive decay would have been inorganic. It is possible that

microbial action may have produced organic lead compounds inside the silos but it is unlikely that such organic lead would occur at significant concentrations because;

-The total organic content of the silos appears to be very low so there is very little fuel to support microbial metabolism.
-The insides of the silos are, of course, devoid of light so photosynthesis would not take place.

The primary concern with organic vs. inorganic lead is that some organic lead compounds are very toxic and can be absorbed through intact human skin. Based on what is known about silo history and recent analyses, it appears that the concentrations of organic lead compounds (if any) would not be significant.

7. Medical Monitoring for Lead.

RESPONSE: See response to comment number 4.