ISO 9001:2015 CERTIFIED
KCI
ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS
936 Ridgebrook Road • Sparks, MD 21152 • Phone 410-316-7800 • Fax 410-316-7817

June 19, 2019

Mr. Dan Lubeley
Howard County Public School System
9020 Mendenhall Court, Suite C
Columbia, Maryland 21045

Re: GPS Survey to Locate Berm Cap Adjacent to Interstate 70
Villages at Turf Valley Phase 2, Open Space Lot 204
Ellicott City, Maryland 21042
PO-10011678
KCI Job No. 121903594

Dear Mr. Lubeley,

KCI Technologies Inc. (KCI) was present at the above-referenced site on June 17, 2019 to locate and mark endpoints of the 393 square foot berm cap area associated with Environmental Covenant 16101/047.053. The berm cap area is located within Open Space Lot 204, adjacent to the south of Interstate-70 and west of Resort Road in Ellicott City, Maryland. The purpose of the survey was to mark the berm cap area in the field for future reference and inspections.

KCI digitalized the polygon-shaped berm cap area in the Geographic Information System (GIS) using the coordinates given in the Environmental Covenant (see attached Environmental Covenant Exhibit 'A' Drawing). The polygon data was converted to a .kmz file to be readable in Google Maps. KCI then utilized a Trimble R1 unit to boost the Global Positioning Signal (GPS) on a mobile device to sub-meter accuracy to mark the four corners with a pin and cap in the field. An aerial view map depicting the location of the berm cap is attached hereto. Photos of the berm cap were taken in the field at the time of the site visit and are included in the attached photo log.

Per Environmental Covenant 16101/047.053, the property owner is responsible for maintaining the integrity of the clean fill berm cap at all times. Any excavated soil from this area must be tested, properly characterized, and disposed of in accordance with applicable laws.

If you have any questions or comments regarding this letter report, please feel free to contact me at (410) 316-7976.

Sincerely,

Michelle L. Gounaris

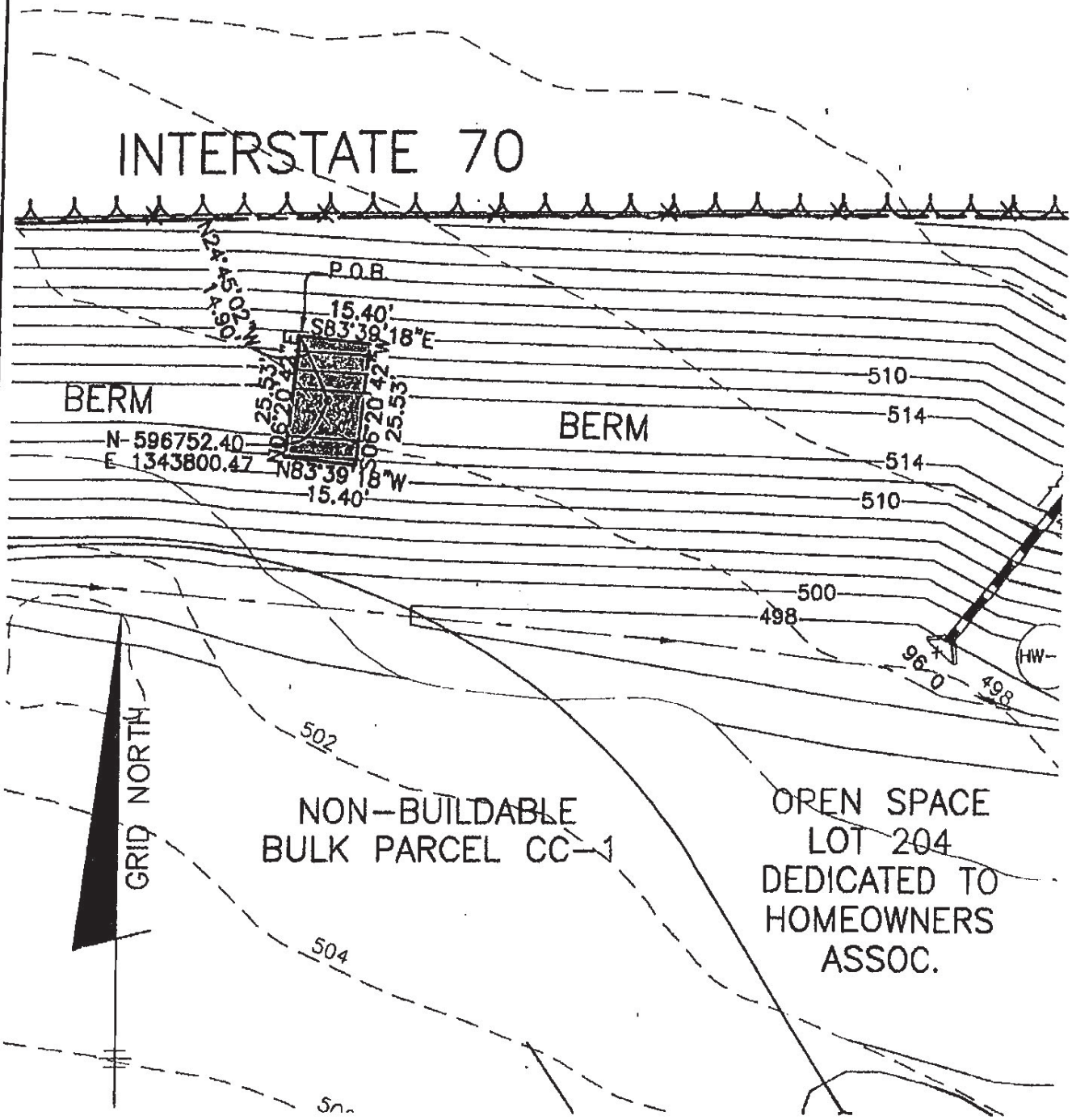
Michelle L. Gounaris
Environmental Scientist
Hazardous Waste and Environmental Compliance Practice

Attachments:

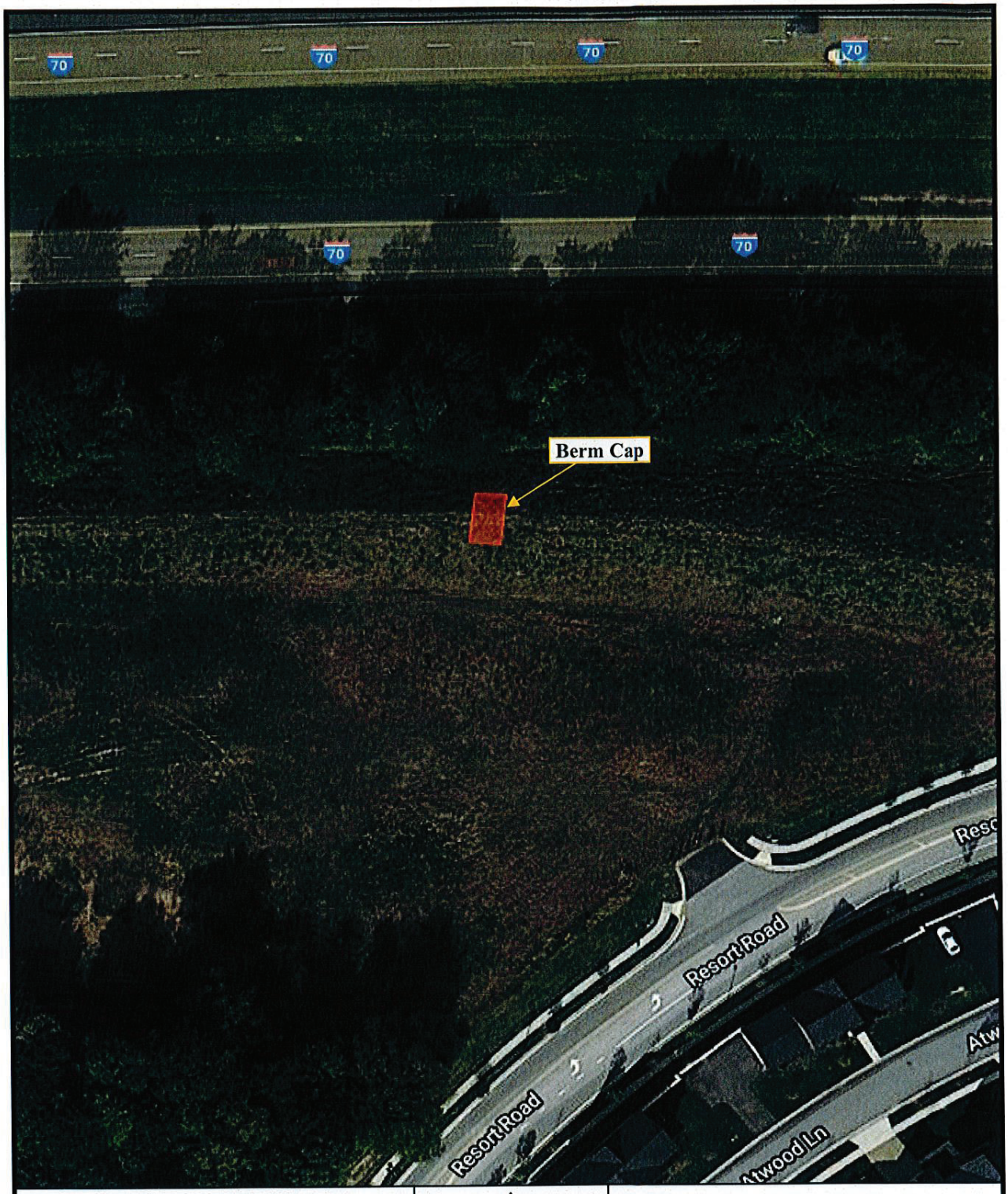
Environmental Covenant Exhibit 'A' Drawing
Aerial View Map – Berm Cap Location
Photo Log

LIBER 6181 PG 051

EXHIBIT A



VILLAGES AT TURF VALLEY
PHASE 2, SECTION 1
OPEN SPACE LOT 204
EXHIBIT 'A'
DATE: FEBRUARY 12, 2015
SCALE: 1" = 50'



GPS Survey to Locate Berm Cap Adjacent to Interstate 70 Villages at Turf Valley Phase 2, Open Space Lot 204 Ellicott City, Maryland 21042	NORTH NTS (Site boundaries and sample locations are approximate.)	**Aerial View Map –Berm Cap Location**

KCI TECHNOLOGIES

Site Visit Photo Record
Turf Valley Site
KCI Job No. 121903594
June 17, 2019

1. View of berm cap facing east

4. View from berm cap of the adjacent property to the east/southeast

2. View of north side of berm cap facing west

5. View of grass-covered field to the south of the berm cap

3. View of pin cap marking southwest corner of berm cap

6. View of wooded area and I-70 located to the north of the berm cap

HEALTH AND SAFETY PLAN

For

EXCAVATION ACTIVITIES

At

BERM CAP ADJACENT TO INTERSTATE 70
VILLAGES AT TURF VALLEY PHASE 2, OPEN SPACE LOT 204

Located at

VILLAGES AT TURF VALLEY, OPEN SPACE LOT 204
ELLICOTT CITY, MARYLAND 21042

Prepared for:

Howard County Public School System
9020 Mendenhall Court, Suite C
Columbia, Maryland 21045

Prepared by:

KCI Technologies, Inc.
936 Ridgebrook Road
Sparks, Maryland 21152
KCI Job Order No. 121903594

June 19, 2019

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HEALTH & SAFETY PLAN

TABLES

APPENDICES

1.0 INTRODUCTION

1.1 Purpose

KCI Technologies, Inc. (KCI) has prepared this Health and Safety Plan (HASP) in accordance with OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120; 54 FR 9294). This HASP has been developed as a guideline for implementing health and safety protocols and practices applicable to field work associated with excavation activities at the Berm Cap Adjacent to Interstate 70 – Villages at Turf Valley Phase 2, Open Space Lot 204 (Berm), located in Ellicott City, Maryland. In addition to the specific procedures outlined in this HASP, all field activities will be conducted in compliance with applicable federal, state and local occupational safety and health laws, regulations and codes.

1.2 Background

The Berm site is a 393 square foot area within the berm located at Lot 204, adjacent to the south of Interstate 70 and west of Resort Road in Ellicott City, Maryland. Environmental Covenant 16101/047.053 pertains to the 393 square foot area Berm site. According to the covenant, the property owner is responsible for maintaining the integrity of the clean fill (berm) cap at all times, and conducting annual inspections of the area. A site specific HASP is to be developed prior to conducting any excavation activities at the property, and any excavated soils must be tested, properly characterized, and disposed of in accordance with applicable laws. Any soils from this property also shall not be reused in current or future residential areas and/or areas zoned for residential use.

Specific contaminants potentially in the soil within the 393 square foot berm area are not wholly known. According to KCI's Phase I ESA of the Turf Valley Site, (report dated September 21, 2018), an interview with the property owner indicated that the soil buried within the berm area was from another golf course property that was not tested as per Code 16.129 for redevelopment of golf courses.

Note that this HASP is intended to be updated after the Soil Characterization activities (Section 9.0) are completed.

2.0 SCOPE OF WORK

The scope of work presented below applies to excavation activities that may be performed at the Berm and thus subject to the HASP. All personnel performing on-site work will have their 40-hour Health & Safety Training in accordance with OSHA regulations contained in 29 CFR-1910.120.

Excavation activities include but are not limited to:

- Surface and subsurface soil excavation and removal;
- Excavation of subsurface debris;
- Collection of soil samples for characterization;
- Staging and stockpiling of soils and subsurface debris prior to final disposition; and
- Geotechnical drilling or other drilling activities;

3.0 PROJECT ORGANIZATION

3.1 Personnel

Health and Safety Officer (HSO):	TBD
Client:	Howard County Public School System
Client Contact:	Dan Lubeley (410) 313-8203

3.2 Responsibilities

The HSO will report directly to the Client with respect to health and safety concerns involving excavation activities. The HSO will have the following duties and responsibilities:

- Implementation of this HASP.
- Conducting site safety and health checks, as needed.
- Performing air monitoring in support of excavation activities.
- Assisting in the training of personnel assigned to the site.
- Conducting on-site "Field Health and Safety Meetings" if required.
- Enforcing the use of proper personal protective equipment (PPE).
- Ensuring all on-site personnel have current 40-hour Hazardous Waste Site Training to include annual refreshers, if applicable.
- Implementing air monitoring and control procedures as required.
- Coordinating site safety and health activities with personnel.
- Performing additional tasks as necessary to ensure the health and safety of employees and subcontractors.

4.0 HAZARD EVALUATION AND HAZARD CONTROL

4.1 General

The primary hazards of concern associated with the scope of work are:

- Inhalation or ingestion of contaminated soil or hazardous waste.
- Injuries from being struck by/run over by construction equipment.

- Heat stress during adverse weather conditions (see Appendix B).
- Noise hazards from excavation operations.

4.2 Chemical Hazards

Chemical hazards include possible ingestion of, inhalation of, or dermal contact with contaminated dust, soil, water, gases, or waste.

4.3 Physical Hazards

The following physical hazards may be encountered during the construction inspection activities:

- Slips, trips and falls.
- Hazards from working around moving equipment.
- Physical eye hazards associated with flying dirt and mud.
- Hazardous noise levels associated with excavation activities.
- Excavation hazards from entering unprotected excavations.
- Fall hazards from unprotected edge of excavations.

4.4 Biological Hazards

The following biological hazards may be encountered at the site:

- Deer ticks with the potential for carrying Lyme disease.
- Black widow and brown recluse spiders.
- Eastern rattlesnakes and copper head snakes.
- Poison ivy and poison oak.

5.0 SITE CONTROL AND SECURITY

5.1 Standard Work Zone Rules

All excavation activities shall be in accordance with the following requirements:

- All site personnel must be briefed on the contents of this HASP by the HSO prior to commencing work at the site and acknowledge this training by signing the ***Site Safety Briefing Form*** found in Appendix A.

- Eating, drinking, contact lenses, chewing gum or tobacco, taking medication and smoking are prohibited within the work site.
- Contact with potentially contaminated soil or waste shall be avoided whenever possible.
- Abide by safe work practices and procedures regarding the site activities.
- No facial hair, which interferes with a satisfactory fit of the mask-to-face seal, will be allowed on personnel who may be required to wear respiratory protective equipment at the site.
- All personnel who may be required to wear respiratory protection shall have current respiratory fit test certifications prior to the use of respiratory protection devices and be medically approved to wear respiratory protection (29 CFR 1910.134).
- A first-aid kit shall be available at the site during all work activities.
- Adequate quantities of drinking water shall be available at the site for all personnel within the work site.
- All activities at the site shall be terminated immediately in the event of thunder and/or electrical storms.

6.0 EMPLOYEE TRAINING AND MEDICAL SURVEILLANCE

6.1 Employee Training

All employees, subcontractors, and visitors at the site who may be exposed to hazardous substances, health hazards, or safety hazards shall receive site specific training before they are permitted to engage in site operations. Personnel will not be permitted to participate in or supervise field activities until they have been trained to a level required by their specific job function and responsibility.

Certification for having completed a 40-hour Hazardous Site Workers Course and 8-hour annual recertification, as appropriate, must be presented by subcontractor personnel and visitors to the HSO and maintained on-site for the duration of the project. Individuals without proper records of their training will not be permitted to work on-site.

7.0 SAFETY MEETINGS

Health and Safety procedures will be reviewed when new personnel enter the work area.

8.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

All site personnel are required to wear at a minimum the following Level D PPE while on site:

- Safety Glasses with side shields or safety goggles

- Hard hat
- Hearing protection, either ear plugs or ear muffs, when exposed to noise above 85 dBA
- High visibility vest
- ANSI-approved protective footwear
- Disposable gloves

If the HSO determines through monitoring the breathing zone of site personnel that an inhalation hazard exists, operations will be safely terminated and personnel will evacuate the work area until the HSO determines that it is safe to continue operations. Personnel shall comply with all OSHA respiratory protection requirements (29 CFR 1910.134).

9.0 SOIL CHARACTERIZATION

Prior to conducting excavation activities at the Berm, soil characterization sampling should be conducted by the sub-contractor at various depths of the excavation to determine any additional monitoring requirements. Soil should be collected at surface and sub-surface depths corresponding to the depth of the excavation and should include analysis for the following: Total Petroleum Hydrocarbons (TPHs); Volatile Organic Compounds (VOCs); Semi-Volatile Organic Compounds (SVOCs); Pesticides; Herbicides; and Priority Pollutant Metals.

The data collected shall be used to make site-specific updates to this HASP, prior to excavation or any other activities that may disturb the cap and/or underlying soil.

10.0 AIR QUALITY MONITORING

The HSO will use a Dust-trac Model 8520 or equivalent to monitor the area for PM-10 dust concentrations in real time. Air sampling will be conducted using NIOSH, OSHA, or other validated methods. Any PM-10 detections of more than 15 milligrams per cubic meter (mg/m^3) for more than five minutes will result in a work shutdown and safety review by the HSO. The safety review / consultation will address possible dust controls and improvements such as:

- Increase use of water to control dust (all waste water must be contained);
- Additional filtration to control dust;
- Use of mechanical exhaust systems to move dust away from the work zone;
- Use of temporary containment to restrain migration of dust;
- Use of respirators with air-purifying filters (all employees using respirators must be in compliance with an active Respiratory Protection Program).

These air quality monitoring requirements shall be modified based on the results of the Soil Characterization sampling described above.

11.0 DECONTAMINATION

Personnel will wash their hands, face, and exposed skin surfaces with soap and water each time upon leaving the work site, prior to ingestion of food or liquids or smoking, and at the end of each shift.

12.0 EMERGENCY RESPONSE PLAN

This section describes contingencies and emergency planning procedures to be implemented at this site. This plan is compatible with local, state, and federal disaster and emergency management plans as appropriate.

12.1 Emergency Contacts

The HSO will maintain the emergency contact numbers as shown in Table 12-1 below.

12.2 Pre-emergency Planning

An emergency evacuation route(s) will be chosen immediately upon arrival at the site. During the site briefings, all site personnel will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. If an emergency occurs, personnel will be expected to mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry is authorized by the HSO.

The plan will be reviewed and revised if necessary by the HSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

TABLE 12-1: EMERGENCY CONTACTS

EMERGENCY CONTACTS	NAME	PHONE
Health & Safety Officer	TBD	TBD
Howard County Public School System	Dan Lubeley	410-313-8203
Environmental Agency	EPA Region 3	215-597-9800
State Police	State of Maryland	911
Poison Control Center	National	1-800-332-6633
MEDICAL EMERGENCY		
Hospital Name: Howard County General Hospital 5755 Cedar Lane Columbia, MD 21044		(410) 740-7890
Ambulance		911

ROUTE TO HOSPITAL:

TURN RIGHT ONTO RESORT ROAD AND TAKE SECOND LEFT ONTO TURF VALLEY ROAD. TURN LEFT ONTO BALTIMORE NATIONAL PIKE/US-40E. SLIGHT RIGHT ONTO FREDERICK ROAD. TURN RIGHT ONTO CENTENNIAL LANE. TURN RIGHT ONTO CLARKSVILLE PIKE/MD-108. TURN LEFT ONTO HARPERS FARM ROAD. TURN RIGHT ONTO CEDAR LANE. TURN LEFT. TAKE THE 1ST LEFT ONTO CEDAR LANE.

12.3 Fire and Explosion

In the event of a fire or explosion, the fire department will be summoned immediately. Upon their arrival, personnel will advise the fire commander of the location, nature, and identification of the hazardous materials on-site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on-site to control or extinguish the fire.
- Remove or isolate easily accessible, flammable or other hazardous materials which may contribute to the further development of the fire.

12.4 Spills and Leaks

In the event of a spill or a leak, site personnel will:

- Inform the HSO immediately.
- Locate the source of the spillage and stop the flow if it can be done safely.
- Begin containment and recovery of the spilled materials.

The HSO will immediately notify the HCPSS in the event of a spill.

13.0 RECORD KEEPING

The following forms will be provided to the HSO during final preparations and before departure to the job site:

- Plan Acceptance Form
- Plan Feedback Form
- Accident Report Form
- Site Safety Briefing Form

The Plan Acceptance Form will be filled out by all employees working on the site. The Plan Feedback form will be filled out by the HSO any other on-site employees who wishes to fill one out. The Accident Report Form will be filled out by the HSO in the event that an accident occurs. The Site Safety Briefing Form is filled out by the HSO and signed by all persons who received the site safety briefing.

ALL COMPLETED FORMS SHOULD BE RETURNED TO HOWARD COUNTY PUBLIC SCHOOL SYSTEM FOR RETENTION IN PROJECT FILES.

Example of the forms are included in Appendix A.

APPENDIX A
FORMS

ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the HSO.

Client: **Howard County Public School System**

Site: **Berm Cap Adjacent to I- 70 – Villages at Turf Valley Phase 2, Open Space Lot 204**

Location: **Ellicott City, MD**

Date: _____

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Name (Printed)

_____
Signature

_____
Date

SITE SAFETY BRIEFING FORM

Project _____

Date _____ Time _____

Job No. _____

Address _____

Specific Location _____

Type of Work _____

_____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

_____

_____

Physical Hazards _____

Emergency Procedure

Hospital/Clinic _____ Phone _____

Hospital Address _____

Special Equipment _____

_____

Other _____

_____

ATTENDEES

Name (Printed)	Signature

Meeting Conducted by: _____
Name (Printed)

Site Safety Coordinator _____

Team Leader _____

ACCIDENT REPORT FORM

To _____ From _____

Telephone (include area code)_____

Name of Injured or Ill Employee _____

Date of Accident _____

Time of Accident _____

Exact Location of Accident _____

Narrative Description of Accident _____

Nature of Illness or Injury and Part of Body Involved _____

Lost Time Yes __ No

Probable Disability (Check One)

No Lost Work Day		First Aid Only	
Lost Work Day With Days Away From Work		Fatal	
Lost Work Day With Days of Restricted Activity		Other	

Corrective Action Taken by Reporting Unit _____

Corrective Action That Remains to be Taken (by whom and by when)

_____

Name of Supervisor _____
Title _____
Signature _____
Date _____

PLAN FEEDBACK FORM

Job Number: _____

Job Name: _____

Date: _____

Problems with plan requirements: _____

Unexpected situations encountered: _____

Recommendations for future revisions: _____

APPENDIX B
HEAT STRESS INFORMATION

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health
April 1986

INTRODUCTION

- From iron workers to pastry bakers, Americans work in a wide variety of hot or hot and humid environments:
- Outdoor operations in hot weather, including surface mining, roofing, road repair and construction, dam building, and other construction
- Farming operations
- Iron, steel and nonferrous foundries
- Brick-firing and ceramics operations
- Glass products manufacturing plants
- Rubber products manufacturing plants
- Electrical utilities (particularly boiler rooms)
- Bakeries
- Confectioneries
- Restaurant kitchens
- Laundries
- Food canneries
- Mines
- Smelters
- Steam tunnels
- Being uncomfortable is not the major problem with working in high temperatures and humidity. Workers who are suddenly exposed to working in a hot environment face additional and generally avoidable hazards to their safety and health. The employer should provide detailed instructions on preventive measures and adequate protection necessary to prevent heat stress.

HOW THE BODY HANDLES HEAT

The human body, being warm blooded, maintains a fairly constant internal temperature, even though it is being exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6°F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to shed large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat glands pour liquids containing electrolytes onto the surface of the skin and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. Under conditions of high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

SAFETY PROBLEMS

Certain safety problems are common to hot environments. Heat tends to promote accidents due to the slipperiness of sweaty palms, dizziness, or the fogging of safety glasses. Wherever there exists molten metal hot surfaces, steam, etc., the possibility of burns from accidental contact also exists.

Aside from these obvious dangers, the frequency of accidents, in general appears to be higher in hot environments than in more moderate environmental conditions. One reason is that working in a hot environment lowers the mental alertness and physical performance of an individual. Increased body temperature and physical discomfort promote irritability, anger, and other emotional states which sometimes cause workers to overlook safety procedures or to divert attention from hazardous tasks.

HEALTH PROBLEMS

Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders.

Heat Stroke

Heat stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105°F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should be directed to the continuation of the cooling process and the monitoring of

complications which often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms which may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drinks plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

CAUTION
Persons with heart problems or those on a low *sodium* diet who work in hot environments should consult a physician about what to do under these conditions.

Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen, but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relived by taking salted liquids by mouth.

CAUTION
Persons with heart problems or those on a low *sodium* diet who work in hot environments should consult a physician about what to do under these conditions.

Fainting

A worker who is not accustomed to hot environments and who stands erect and immobile in the heat may faint. With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

Heat Rash

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not easily removed from the surface of the skin by evaporation and the skin remains wet most of the time.

The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

Transient Heat Fatigue

Transient heat fatigue refers to the temporary state of discomfort and mental or psychological strain arising from prolonged heat exposure. Workers unaccustomed to the heat are particularly susceptible and can suffer, to varying degrees, a decline in task performance, coordination, alertness, and vigilance. The severity of transient heat fatigue will be lessened by a period of gradual adjustment to the hot environment (heat acclimatization).

PREPARING FOR THE HEAT

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or water are present in the work area or when the workplace itself is outdoors and exposed to varying warm weather conditions.

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

LESSENING STRESSFUL CONDITIONS

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often

make it possible to isolate workers from the heat sources (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

- Postponement of nonessential tasks,
- Permit only those workers acclimatized to heat to perform the more strenuous tasks, or
- Provide additional workers to perform the tasks keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

- Opening windows in hot work areas,
- Using fans, or
- Using other methods of creating airflow such as exhaust ventilation or air blowers.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76/F appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

Drinking Water

In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake

during the workday be about equal to the amount of sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. Whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided--never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets *should not* be used.

CAUTION
Persons with heart problems or those on a low sodium diet who work in hot environments should consult a physician about what to do under these conditions.

Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body's ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. However, this advantage may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, protective clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

AWARENESS IS IMPORTANT

The key to preventing excessive heat stress is educating the employer and worker on the hazards of working in heat and the benefits of implementing proper controls and work practices. The employer should establish a program designed to acclimatize workers who must be exposed to hot environments and provide necessary work-rest cycles and water to minimize heat stress.

SPECIAL CONSIDERATIONS DURING PROLONGED HEAT SPELLS

During unusually hot weather conditions lasting longer than 2 days, the number of heat illnesses usually increases. This is due to several factors, such as progressive body fluid deficit, loss of appetite (and

possible salt deficit), buildup of heat in living and work areas, and breakdown of air-conditioning equipment. Therefore, it is advisable to make a special effort to adhere rigorously to the above preventive measures during these extended hot spells and to avoid any unnecessary or unusual stressful activity. Sufficient sleep and good nutrition are important for maintaining a high level of heat tolerance. Workers who may be at a greater risk of heat illnesses are the obese, the chronically ill, and older individuals.

When feasible, the most stressful tasks should be performed during the cooler parts of the day (early morning or at night). Double shifts and overtime should be avoided whenever possible. Rest periods should be extended to alleviate the increase in the body heat load.

The consumption of alcoholic beverages during prolonged periods of heat can cause additional dehydration. Persons taking certain medications (e.g., medications for blood pressure control, diuretics, or water pills) should consult their physicians in order to determine if any side effects could occur during excessive heat exposure. Daily fluid intake must be sufficient to prevent significant weight loss during the workday and over the workweek.

SOURCES OF ADDITIONAL INFORMATION

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