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D R A F T

**ADDENDUM FOR
HEALTH & SAFETY
PLAN**

DECEMBER 1994

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Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
Aberdeen Proving Ground, Maryland 21010

Prepared by:

EARTH TECH
1420 King Street, Suite 600
Alexandria, Virginia 22314

Under Contract Number DAAA15-91-D-0009,
Delivery Order DA0014

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McCreanor, K.; Barrett, G.; Long, C.; Janiga, K.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

The Earth Technology Corporation
1420 King Street, Ste. 600
Alexandria, VA 22314

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A Biota Sampling Program is proposed for the Woodbridge Research Facility in Woodbridge, Virginia. A Health and Safety Plan was prepared to outline procedures that must be followed by all personnel while working on the site. The addendum addresses health and safety issues that were not included in the Health and Safety Plan written for Delivery Order Number 0001 (November 1994) such as boating safety and fish permitting procedures.

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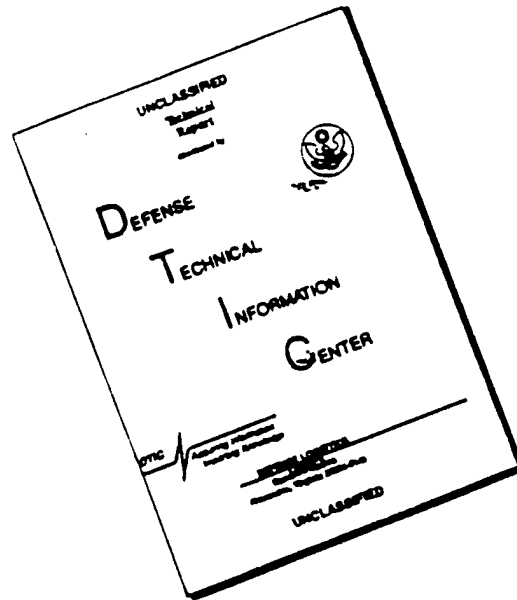
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ADDENDUM TO HEALTH & SAFETY PLAN

This document is an addendum to the Final Health and Safety Plan for the Woodbridge Research Facility, Virginia, September 1993. Delivery Order Number DA0014 entitled "Woodbridge Research Facility Biota Sampling", provides details and rationale for the environmental sampling program to be performed. EARTH TECH shall collect, store, and deliver tissue samples from the waters on and surrounding Woodbridge Research Facility. Signing of the Signature Page indicates that all personnel understand and will comply with the provisions in the Health and Safety Plan and its addendum.

1.0 SCOPE

EARTH TECH will conduct biota sampling to collect a sufficient number of samples of indigenous fish species and to perform clam sampling which will support a future environmental evaluation of water bodies located within and surrounding Woodbridge Research Facility. Details of all biota sampling activities that will be undertaken at Woodbridge Research Facility are defined in the Delivery Order Number DA0014 and the applicable guidance documents referenced therein.

2.0 SITE ACTIVITIES

Indigenous fish sampling and live-box (clam) sampling will be conducted as appropriate to initially determine the possible existence and extent of environmental contamination. Five species of fish will be collected if practicable from Marumsco Creek, the onsite drainage ditch, and the onsite unnamed pond. The live box sampling will involve the deployment of wedge clams at eight locations. The proposed locations are as follows:

1. Upstream of Woodbridge Research Facility in Marumsco Creek.
2. Marumsco Creek near Landfill 2.
3. Occoquan Bay near Landfill 1.
4. Drainage ditch upstream of the Main Compound.
5. Drainage ditch immediately upstream of the Beaver Pond.
6. Drainage ditch near the confluence with Occoquan Bay.
7. Occoquan Bay 150 feet from the shoreline.
8. One additional location within 150 feet of the installation to be specified by the Contracting Officer's Representative (COR).

3.0 HAZARD ASSESSMENT

Collection of water samples away from banks/shores will require the use of a craft to allow the sampling team access. The following guidelines will be observed during such sampling activities.

1. In addition to all other required personal protective equipment (PPE), each person assigned to perform sample collection shall wear a U.S. Coast Guard personal flotation device (life preserver) which is designed to keep the user upright when in use.
2. The craft selected for use shall possess side walls (gunwales) and other protection to help prevent personnel from falling overboard.
3. The size of the sampling team shall be kept to a minimum consistent with the sample collection requirements, but shall include at least two people.
4. Sampling shall be performed in a manner such that personnel will not be required to lean beyond the craft in an unsafe manner.
5. At no time shall sampling personnel stand or move about unnecessarily. Distribution of personnel and materials within the craft shall keep the craft trim and avoid listing or other indications of unbalanced load distribution.
6. Boat operators will have the training and experience to pilot the craft in a safe and efficient manner. Preferred credentials would include a U.S. Coast Guard license.

Weather reports will be checked before embarking away from the shoreline. Personnel will be watchful for signs of impending bad weather and will cease all operations upon any indication that weather conditions are changing.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Every effort will be made to avoid skin contact with the water at the locations to be sampled. Work should be performed from a stable fishing boat or from shore. A full-body, water-proof suit as well as a U.S. Coast Guard personal flotation device will be worn while walking in water where water depths may be encountered which could result in the complete immersion of an individual.

5.0 BOATING REGULATIONS

While working on, or near, a stable fishing boat, all personnel will comply with the following federal boating regulations as administered and enforced by the U.S. Department of Transportation - U.S. Coast Guard:

- Federal Boat Safety Act of 1971 (FBSA/71).
- Motor Boat Act of 1940 (MBA/40) - Commercial Vessels.
- Inland Navigational Rules Act of 1980 and updates.
- Federal Water Pollution Control Act.
- Refuse Act of 1899.

All undocumented boats equipped with propulsion machinery will be registered in the state of principal use. Boating accidents will be reported according to the Boating Accident Report CG-3865 or the state equivalent. Boat operators will abide by all boat manufacturing safety standards.

U.S. Inland Rules apply to all vessels in inland waters. If a self-propelled Vessel 12 meters (39.4 feet) or more is used, the operator will be required to have on board a copy of the Inland Navigational Rules for reference. All boat operators will be responsible for knowing and following the applicable navigational rules.

Federal regulations define four types of boat classes:

- Class A: Boat is less than 16 feet
- Class B: Boat is greater than or equal to 16 feet, but less than 26 feet
- Class C: Boat is greater than or equal to 26 feet, but less than 40 feet
- Class D: Boat is greater than or equal to 40 feet.

All boating activities will be in compliance with U.S. Coast Guard specifications and regulations relating to materials, construction, and performance. Table 1 illustrates the required Coast Guard approved equipment approved by the commandant of the U.S. Coast Guard according to boat class.

6.0 FISH PERMITTING

All onsite personnel will be included on a scientific collection/salvage permit obtained from the Commonwealth of Virginia, Department of Game and Inland Fisheries.

Fish sampling using electrofishing equipment will comply with Aquatic Systems Corporation's Standard Operating Procedure (SOP) Number 5.2.31.53 titled, "Fish Sampling-Electrofishing" (Attachment 1).

For all additional Health and Safety issues please refer to the Draft Final Health and Safety Plan.

**TABLE 1
REQUIRED EQUIPMENT**

Required Equipment	Boat Class			
	A	B	C	D
Personal Floatation Device	(1) Type I, II, III, IV for each	(1) Type I, II, III for each, (1) IV to be thrown		
Fire Extinguisher				
Fire Extinguisher System Not Installed	(1) B-I unless no vapor spaces		(2) B-I or (1) B-II	(3) B-I, or (1) B-I and (1) B-II
Installed	None		(1) B-I	(2) B-I or (1) B-II
Ventilation	At least 2 ventilator ducts with cows or equivalent, to efficiently relieve vapor in bilges.			
Whistle	Up to 39.4 feet - "efficient" audible ½-mile. 39.4 to 65.7 feet - meet technical standards of Inland Rules Annex (IRP) III, audible ½-mile.			
Bell	Up to 39.4 feet - any device capable of making efficient noise. 39.4 to 65.7 feet - must meet technical specifications IRA II, mouth diameter 7.9 inches			
Backfire Flame Arrester	One approved on each carburetor except outboards.			
Visual Distress Signals	Required only where operating at night with six or fewer for hire	Orange flag with black square and disc; S-O-S electric light; or 3 smoke signals, hand held or floating; meteor or parachute flare.		

A T T A C H M E N T 1

STANDARD OPERATING PROCEDURES FOR ELECTROFISHING

**AQUATIC
SYSTEMS
CORPORATION**



FISH SAMPLING - ELECTROFISHING

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Scope: Electrofishing immobilizes or attracts fishes entering or caught within the electric field, allowing their capture. It is used to collect fishes occurring in shallow waters along lake shores, rivers, streams and tidal estuaries.

Application: Electrofishing is most effective where the water is shallow (maximum 10-15 ft) and the conductivity is high. Electrofishing is conducted by wading or from a boat.

For wading operations using A.C. power, two persons each holding an electrode (see Equipment) proceed parallel to each other for a prescribed distance. Water depth is noted so that the area sampled can be estimated. The conductivity of the water determines how far apart the individuals may be. Following behind the "shockers" are two additional people to aid in netting the tetanized fish. All persons (4) involved, carry dip nets to scoop up the shocked fish. In swift waters two shockers proceed downstream towards a seine stretched across the water to capture the fish as they drift into the net. Where conductivity is high and the area to be sampled large, a boat carrying a generator is towed by the shockers to extend the shocking distance beyond the cord length.

In boat operations, two electrodes are suspended 10 ft in front of the boat. Two persons, one operating the boat and one using a dip net proceed throughout a given area. A.C. and D.C. power are used in boat electroshocking (see Equipment). Different combinations of power may be selected by the operator for each set of conditions encountered. In swift, deep waters the boat proceeds downstream along shore and the fishes are swept up into the dip net.

Electrofishing normally harms fishes the least of commonly used collecting methods, such as seining, gill net and trawling. Fishes caught in alternating current are tetanized and show complete loss of muscle control. Fishes in a D.C. field are stimulated to swim towards the anode. Different electrical currents affect various species differently. Fish body size is important, and electroshockers are normally selective toward larger-sized fishes. There is a direct proportion between conductivity and electrofishing potential. Electrofishing is affected negatively by turbidity and is selective against bottom-swelling fishes and fishes which tend to sink when shocked.

Safety precautions are a must when electrofishing. Each probe contains a safety switch which must be depressed for current to pass between the electrodes. Any switch not depressed stops current flow. Probes used in wading have thumb controlled safety switches, whereas, boat probes are controlled by foot switches. In wading, rubber waders and arm length rubber gloves are used to prevent shock to the workers. Electrofishing apparatus should be used with care and only by experienced personnel.

Field notations include area of water sampled and exact shocking time permitting a quantification of fishing effort. The following data are included in the field trip report: site, station location, area sampled,

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type of voltage used, electroshock time in minutes, collector and specimen identification, length, weight and occasionally special information.

3. Definitions:

A.C. - alternating current, causes tetany in fishes

Anode - positive electrode

Cathode - negative electrode

Conductivity - the quality of conducting power or an electrical current

D.C. - direct current, causes taxis of fishes toward the anode

4. Equipment: The electrofishing systems used consists of a power source, multi-control unit and electrodes with safety switches.

The power sources are gasoline-driven alternators. Three sizes are used: 110 volts/1000 watts; 110 volts/1500 watts, and 110-240 volts/3500 watts. The variety of power ratings help insure effective electro-fishing under a wide range of conductivity.

Either of two control units may be used. One is a 110-240 volt/1000 watt unit for use with 110 volt alternators. This unit contains transformers for stepping voltage down to 70 or 45 volts, or up to 220 volts. Also within the unit are rectifiers for producing rectified AC voltage (D.C.) relays for the low-voltage probe safety switches, timers, ammeters, fuses and circuit breakers. Actural control positions include 110 volt A.C. @ 60 cycles per second (C.P.S.), 110V D.C. @ 120 pulses per cycle (P.P.S.) 220V A.C. @ 60 C.P.S., 220V D.C. @ 120 P.P.S., 45V D.C. @ 60 P.P.S. and 70V D.C. @ 60 P.P.S. The second control unit is similar except it is capable of 240 volt production only, A.C. or rectified A.C. (~~A~~ D.C.). It is used with a 240 volt/3500 watt alternator and receives most use in high conductivity waters.

Either type control unit contains circuit breakers, switch selectors and power timers. A timer is triggered in the main control unit when both activation switches are on. This allows a precise measurement of actual "shock" time, useful in catch-per-unit effort studies. Timers record in minutes and are reset to zero.

The electrodes used for shallow areas where wading is possible, consists of copper tubing one foot long and two inches in diameter attached to a six foot length of two inch PVC tubing. Low voltage activating switches are sealed into the handle of each probe, allowing each operator to turn on or shut off power. Both switches must be on for current to be sent through the water. This allows one person to "kill" the current to the water and is a safety factor. These safety switches carry only six volts. Key relays within the control unit send the voltage (45-240 volts), dependent on switch selection, to the electrodes.

Special probes are used for boat electrofishing. Two foot lengths of copper pipe are suspended into the water 5-15 ft. (adjustable) in front

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of the boat. The electrodes are suspended from adjustable lengths of electrical cord allowing their suspended depth to be regulated. The low voltage activation switches are foot pressure switches. The electrical arrangement of the boat electrofishing system is the same as described for the hand-held electrode system. This allows each operator for safety reasons to stop the current flow.

In either the hand-held or A.C. boat electrode system, one electrode is the cathode and the other is the anode. For D.C. boat use where additional effectiveness is desired, the control unit is rewired to permit the use of two positive electrodes (the two normal probes) and a large negative electrode. A 3 ft x 4 ft copper screen attached to the boat underside is used as the negative electrode.

Two types of dip nets are used. One type has a four foot handle with an 18 inch diameter, 1/4 inch mesh bag for use in wading operations. The second type has an eight foot handle with a 30 inch diameter 1/2 inch mesh bag for boat operating. After capture, fishes are placed in live wells to be identified, weighed and measured. The fishes can then be returned to the water. Small fishes are examined in the field or preserved in 10% formalin (see Preservation of Fishes) for laboratory identification.

5. References: General information on the theory of electrofishing may be found in:

FAO, 1967, Fishing with Electricity (R. Vibert ed.) Fishing News (Books) Ltd., London, 276 p.