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3		W.H. Price			H4-16						
3		K.J. Koegler			H6-05						

18. Signature of EDT Originator <i>J.D. Fancher</i> Date: 7/1/93		19. Authorized Representative Date for Receiving Organization		20. Cognizant/Project Engineer's Manager <i>W.S. Thompson</i> Date: 7-2-93		21. DOE APPROVAL (if required) Ltr. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments	
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**Title** EMFLUX Passive Soil-Gas Sampling Test Specification **Unclassified Category** UC- N/A **Impact Level** 3Q

New or novel (patentable) subject matter?  No  Yes  
 If "Yes", has disclosure been submitted by WHC or other company?  
 No  Yes Disclosure No(s).  
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			Name (printed)	Signature	Date
Classification/Uncontrolled Nuclear Information	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Patent - General Counsel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	} S.W. Bergin	<i>[Signature]</i>	7/7/93
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Information conforms to all applicable requirements. The above information is certified to be correct.


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**INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP**

Stamp is required before release. Release is contingent upon resolution of mandatory comments.



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**SUPPORTING DOCUMENT**

1. Total Pages **9**

2. Title

**EMFLUX Passive Soil-Gas Sampling Test Specification**

3. Number

**WHC-SD-EN-TP-029**

4. Rev No.

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**APPROVED FOR PUBLIC RELEASE**

*U. Buckland 7/8/93*

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7. Abstract

EMFLUX<sup>1</sup> Passive Soil-Gas Samplers will be emplaced at the Hanford 200 West Area in support of site characterization at the carbon tetrachloride site. The EMFLUX passive soil-gas sampling system is a trace-gas detection system based on the theory that gravitational forces are the primary forces governing changes in vertical gas-migration rates through the vadose zone.

<sup>1</sup>Quadrel Services Inc., Ijamsville, Maryland.

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10. RELEASE STAMP

**OFFICIAL RELEASE 28**  
**BY WHC**  
**DATE JUL 08 1993**  
*Station 21*

9. Impact Level **3Q**

## EMFLUX Passive Soil-Gas Sampling Test Specification

### 1.0 PURPOSE

EMFLUX\* passive soil-gas samplers will be emplaced at the Hanford Site 200 West Area as part of site characterization in support of the Volatile Organic Compounds-Arid Integrated Demonstration (VOC Arid-ID). This test will assist in the soil flux studies by providing a measurement of the rate at which volatile organic compounds (VOCs) are moving out of the soil to the atmosphere (Rohay et al. 1993).

Previous work (Rohay and Last 1992) using the EMFLUX and another passive technology involved testing the sampler's emplacement, retrieval, durability, representativeness of sample collection systems, and associated costs.

The EMFLUX passive soil-gas sampling system is a trace-gas detection system based on the theory that gravitational forces are the primary forces governing changes in vertical gas-migration rates through the vadose zone. Earth tides are thought to increase soil-gas velocities by 3 to 5 orders of magnitude, which may overshadow other influences such as barometric pressure. Quadrel's earth tide computer model can predict the periods of maximum emission of soil gas. If accurate, this predictive capability allows field sampling during the maximum emission periods, thus improving the accuracy and reliability of the soil-gas measurements.

The EMFLUX field collection system is a passive, surface-based system that employs a sorbent collector dependent on the nature and number of target contaminants. These samplers are rapidly deployed and retrieved for a near simultaneous sampling of all points. Once retrieved, the trace gases are thermally desorbed from the sorbent collectors and analyzed using a chromatograph/mass spectrometer.

### 2.0 OBJECTIVE

This is a dual-purpose test, to (1) collect additional soil-gas emission data to assist in site characterization, and (2) provide data to evaluate Quadrel's predictive model.

### 3.0 DESCRIPTION OF TEST

EMFLUX samplers will be emplaced in locations at the 200 West Area selected by the Project Scientist and Cognizant Engineer. A portion of the samplers will

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\* a service mark of  
\* Quadrel Services, Inc. ~~Ijamsville, Maryland.~~

be emplaced at the same location during two different periods (one period of maximum emissions, one period of minimum emissions). Other samplers may be emplaced at different locations in the 200 West Area to assist in site characterization.

If available, equipment may be installed to monitor and record water levels in one or more adjacent groundwater well(s).

### 3.1 Test Site

EMFLUX samplers will not be emplaced in radiologically controlled areas. The locations will be staked, and a health physics survey will be performed at each sample location before sampler emplacement to confirm the absence of radiological contamination.

### 3.2 Requirements

Field deployment and retrieval shall be performed as indicated in Attachment 1 except for sampler shipping. Sampler shipping back to Quadrel Services will be provided by a carrier selected by Westinghouse Hanford Company shipping.

### 3.3 Precautions

Care should be taken to ensure that no contamination of the sampler sorbents occurs during emplacement or retrieval. Field deployment and retrieval will be documented in a controlled logbook in accordance with WHC-CM-7-7 EII 1.5.

### 3.4 Sampler Emplacement

Samplers used for evaluation of Quadrel's predictive model will be emplaced in two different groupings, one during a period of predicted maximum volatile emissions, the other during a period of predicted minimum volatile emissions.

During each predictive sample grouping emplacement, a minimum of 8 field samples will be emplaced, one trip blank will be used, and a minimum of one control (ambient) sample will be collected.

### 3.5 Sample Custody/Analysis Results

Sample custody will be maintained, and chain-of-custody forms will be used. Results of the analyses will be traceable to original samples through a unique code or identifier assigned to each sample in the field and recorded on the chain-of-custody form.

## 4.0 CONSTRAINTS

Emplacement shall not begin until predictive modeling of maximum and minimum emission dates/times is completed. A radiological survey shall be completed at each sample location before sampler emplacement.

## 5.0 SPECIAL EQUIPMENT

Emplacement equipment provided in the sampling kit shall be reviewed prior to sampling to ensure proper quantities of equipment are provided in each kit.

## 6.0 ACCEPTANCE CRITERIA

Satisfactory completion of this test falls into two categories: field operations and vendor deliverables. Successful field operations require emplacement and retrieval without sampler sorbent contamination. Required vendor deliverables include a survey report, isopleth maps, laboratory procedures, and raw laboratory data.

## 7.0 DATA REQUIRED

Beyond the required laboratory data, the following will be recorded in a controlled logbook in accordance with WHC-CM-7-7 EII 1.5:

- Time required to deploy and retrieve the samples
- Names of personnel deploying and retrieving samples
- Limitations of sampling (difficulties in handling, deploying, and retrieval)
- Observations concerning sampler integrity and/or visitor intrusion made during retrieval.

## 8.0 SAFETY

No safety impact is anticipated.

## 9.0 REFERENCES

Rohay, V. J. and G. V. Last, 1992, Integrated Test Plan for Demonstration of EMFLUX and PETREX Passive Soil Gas Sampling Technologies, WHC-SD-EN-AP-103, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Rohay, V. J., K. J. Swett, G. V. Last, D. C. Lanigan, and L. A. Doremus, 1993, Fiscal Year 1993 Site Characterization Work Plan for the VOC Arid-ID and 200 West Area Carbon Tetrachloride ERA, WHC-SD-EN-AP-109, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

VOC-Arid ID HWOP dated 3/10/93.

WHC-CM-7-7, Environmental Investigations and Site Characterization Manual. 1.5, "Field Logbooks."

**EMFLUX Trace-Gas Detection System****FIELD KIT GUIDE**

[PLEASE READ ENTIRE GUIDE BEFORE STARTING SURVEY]

**I. General Information**

A. Quadrel is furnishing this Kit to (Client) ((Client)) specifically for use on (Location). To obtain optimum results it is imperative that the sampling devices be deployed no later than **XXXX** hours on (Start date) and retrieved as soon after **XXXX** hours on (Finish date) as possible. These specific timing parameters have been determined by Quadrel's predictive model. If deployment of the devices is delayed, please let us know so that we can determine if it is necessary to adjust the timing of retrieval.

B. It is also essential that, prior to returning the Kit to Quadrel, (Client) seal the EMFLUX sorbent cartridges in the vials provided, and place the holders back in the sealed inner and outer plastic component bags for transport.

C. Before going to the field, please inventory the contents of the Kit, cross-checking against the enclosed list to verify item counts and to become familiar with all components. (Because the components have been conditioned to be free of contaminants the inventory should be conducted without opening the plastic bags.) Note that Control Samples are designed to give representative samples of ambient air trapped by collection shells during deployment. Trip Blanks are to remain sealed throughout the survey.

D. Quadrel requests that (Client) sign and date the enclosed Chain-of-Custody Form immediately upon receipt of the Kit, fill out the Field Deployment Report during the course of the survey, and after signing the release section of the Chain-of-Custody Form, return both documents to the company, together with two copies of a scaled Site Map, one showing precise sample locations.

E. Upon completion of the Survey, please pack the EMFLUX Kit, associated materials, and requisite documentation in the original shipping carton; affix the preprinted airbill and custody seal; and call Federal Express for pick-up (1-800-238-5355).

II. Contents

A. This EMFLUX Field Kit contains the components needed for a 00-point trace-gas survey, plus sufficient additional cartridges for control sample(s) (use the cartridge(s) in the vial(s) marked **XX**), one trip blank (vial **XX**, not to be opened), and one field and one control sample replacement cartridges (unnumbered, for use in the event of breakage or accidental contamination). Assuming that instructions are followed, due care is exercised in QA/QC procedures, and timing schedules are observed, the Kit provides users with the most advanced, accurate, and reliable soil-gas system available. Components have been processed and sealed in clean bags to avoid contamination. A practice sampling unit is enclosed. Do not open bags until deployment.

<u>Code/Item</u>	<u>Quantity</u>
(Removable Tray)	
(1) EMFLUX SAMPLE CARTRIDGES (in labeled vials)	0
(2) CARTRIDGE STAKES	0
(3) PRACTICE SAMPLING UNIT (collection shell, cartridge stake, sample cartridge)	0
(4) CONTROL SAMPLE ASPIRATOR-BULB	0
(Lower Compartment)	
(5) DISPOSABLE PLASTIC GLOVES	0 box(es)
(6) COLLECTION SHELLS	0
(7) CAMOUFLAGE COVERS	0

B. In addition to the materials found in the Kit, field teams will need:

- o A TROWEL or SHORT-HANDLED HOE for clearing ground;
- o SOIL or SAND to form ambient-air collars around collection shells as needed (where usable soil is unavailable at sample-point locations, carry 0 pounds of sand); and
- o SOIL or ROCK to secure camouflage covers.



### III. Instructions

#### A. General:

Deployment and retrieval of EMFLUX devices require a two-person Team. The Team Leader (L) is designated "clean" and has sole responsibility for handling components which must be protected from contamination (i.e. EMFLUX sample cartridges, cartridge stakes, control sample cartridges, and inside of collection shells). The Team Support Person (S) performs all work involving contaminated surfaces. Step-by-step duties of the team are detailed below.

**Note: Exposure of sample cartridges to ambient air must be kept to a minimum.**

#### B. Collector Deployment:

1. S carries Field Kit, hoe/trowel, and sand/soil to, from, and between survey points whenever L is wearing clean plastic gloves.
2. At each sampling point S prepares site, clearing away vegetation, debris, etc. creating a flat surface, then sets Field Kit within easy reach, opens it, and places tray in the lid. With assistance from S, L dons plastic gloves, being careful not to touch surfaces of glove which will come in contact with EMFLUX components. (If at any time these surfaces of the glove come in contact with any object other than the cartridge or stake, change to new gloves.)
3. S removes twist ties from bag containing the collection shells and withdraws a shell (touching outside of shell only), refolds end of bag and puts it back in kit. S scores ground with open end of shell to mark specific sample location and places the shell nearby on its side.
4. S opens cartridge-stake bag, L withdraws stake, and S closes and replaces bag.
5. S takes numbered cartridge vial corresponding to the sample point from bag (Trip Blank is vial **XX**), removes and opens vial, pours cartridge into L's gloved hand, then caps and replaces empty vial in holder and re-seals bag.
6. L affixes cartridge to stake by inserting stake's hook through top loop of wire coil around cartridge (see Figure 1) and pushes sampler assembly into ground within scored sample area. (If stake will not penetrate earth or stay in position, shell will hold it upright. To do this, L holds base of stake upright, while S lowers shell over the sampler assembly. This variation must be noted on Field Deployment Report to ensure proper care during retrieval.)

7. S covers sampler assembly, twisting collection shell to embed it to a depth of 1/4" to 1/2". When shell is in place, S covers it with a camouflage cloth cover and secures the cloth and shell with soil or sand around base of shell. (If the shell will not penetrate the ground, S packs soil or sand around base of shell and cloth to form a one-inch-high collar.)
8. S replaces tray, closes Field Kit, and on the Field Deployment Report records: (a) sample-point number; (b) date and time of emplacement (to nearest minute); and (c) other information deemed relevant (e.g., unusual weather or ground conditions). L changes gloves if contaminated (not normally necessary at each sample point).
9. Team moves to next location.

C. Control Sample Collection:

1. At pre-determined sample point locations, control samples are collected to measure the representative ambient air contamination present at the site during deployment.
2. After the EMFLUX sampling device has been deployed at a selected sample location, S takes a vial marked **XX** (containing a cartridge with a stainless steel casing) from the bag.
3. After placing the control sample aspirator-bulb within arm's reach (in the field kit tray), S opens vial and pours the control sample cartridge into L's gloved hand, then temporarily closes empty vial and places it in tray of field kit.
4. S takes the control sample aspirator-bulb and holds it vertically so the long tube is pointing upwards. While S holds the black bulb in one hand, S stabilizes the top tube with the other hand. L then places either tip of the stainless steel control sample cartridge into the top tube keeping it in a vertical position. S squeezes the bulb 25 times at a moderate pace (approximately for 10 seconds).
5. L removes the control sample cartridge from the tube (twisting slightly while pulling). S returns the control sample aspirator-bulb to the field kit tray and retrieves the empty control sample vial. S opens vial and L puts the control sample cartridge in open vial. S closes vial (screwing lid on firmly), replaces it in holder, and seals bag.

6. S replaces tray, closes Field Kit, and on the Field Deployment Report records: (a) the control sample letter; (b) date and time of collection; (c) location of collection (adjacent sample point); and (d) other information deemed relevant. L changes gloves if contaminated.

D. Retrieval:

1. S carries Field Kit to, from, and between survey points whenever L is wearing clean plastic gloves.
2. L dons plastic gloves with the assistance of S, being careful not to touch surfaces of glove which will contact EMFLUX components. At each sample point, S takes numbered cartridge vial corresponding to sample point from appropriate bag. While holding vial, S pulls aside camouflage cloth and shell with free hand. When L has retrieved cartridge, S opens vial.
3. L puts cartridge in open vial. S closes vial (screwing lid on firmly), replaces it in holder, and seals bag. On the Field Deployment Report, S records: (a) date and time of retrieval (to nearest minute); and (b) any other information deemed relevant.
4. S stows collector shell, camouflage cloth, cartridge stake, etc. in Field Kit. L changes gloves if contaminated. Team moves to next location.
5. After all samples have been retrieved, Team verifies that bags containing cartridge vials have been properly sealed and places them in the Field Kit tray. Team stows the remaining components (including Practice Device) in the lower compartment of the Field Kit, nesting as required to fit.

IV. Forms

The Field Kit also contains a Chain-of-Custody Form and a Field Deployment Report.

- A. The Chain-of-Custody Form is to be completed in accordance with the "General Information" section.
- B. The Field Deployment Report is to be filled out as indicated in the "Instructions" section.