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6. Author

Name: Kim J Koegler

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7. Abstract

This integrated test plan describes the use of a commercial Fourier Transform Infrared instrument for measuring Carbon Tetrachloride concentrations. The Fourier Transform Infrared will measure CCL4 concentrations in a line of sight path average mode in mass per cubic meter as a function of time.

The goal of this test is to demonstrate the usefulness of a long path Fourier Transform Infrared instrument in determining CCL4 fluxes from the soil in the 200 area adjacent to disposal cribs where high soil fluxes are believed to exist. The instrument will be set up such that it can have a clear line of site path to it's reflector and this line of site will be as near to the Z-9 fence as possible and have a path length as long as possible.

Tomich, S.D. and E. J. Jensen, 1993, *Integrated Test Plan for the Demonstration of a commercial Fourier Transform Infrared Instrument*, WHC-SD-EN-TP-030, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 PURPOSE AND SCOPE 1
1.2 BACKGROUND 1
1.3 SITE SETTING 3

2.0 TECHNOLOGY DESCRIPTION 3

3.0 DEMONSTRATION OBJECTIVES AND MEASURES OF MEETING THE OBJECTIVES . . 3
3.1 OBJECTIVES 3
3.2 MEASURES OF MEETING THE OBJECTIVES 5

4.0 REGULATORY COMPLIANCE 5

5.0 HANFORD COMPLIANCE 5
5.1 SAFETY 5
5.2 QUALITY ASSURANCE 5
5.3 TRAINING 6

6.0 ORGANIZATION AND RESPONSIBILITIES 6
6.1 DEMONSTRATION OPERATIONS 6
6.2 PROJECT ENGINEER 6
6.3 FIELD TEAM LEADER 6
6.4 PRINCIPAL INVESTIGATOR 6

7.0 DESCRIPTION OF TASKS AND PROCEDURES 8

8.0 DEMONSTRATION SCHEDULE 8

9.0 REFERENCES 8

FIGURES:

1. Hanford Site Map and Location of the 200 West Area. 2

2. Site Map of the 200 West Area. 4

3. Field Demonstration Organization. 7

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This integrated test plan (ITP) describes the use of a commercial Fourier Transform Infrared (FTIR) instrument for measuring Carbon Tetrachloride concentrations. The FTIR will measure CCL4 concentrations in a line of sight path average mode in mass per cubic meter as a function of time.

The goal of this test is to demonstrate the usefulness of a long path FTIR instrument in determining CCL4 fluxes from the soil in the 200 area adjacent to disposal cribs where high soil fluxes are believed to exist. The instrument will be set up such that it can have the longest possible clear line of site path to its reflector as near to the Z-9 fence as possible.

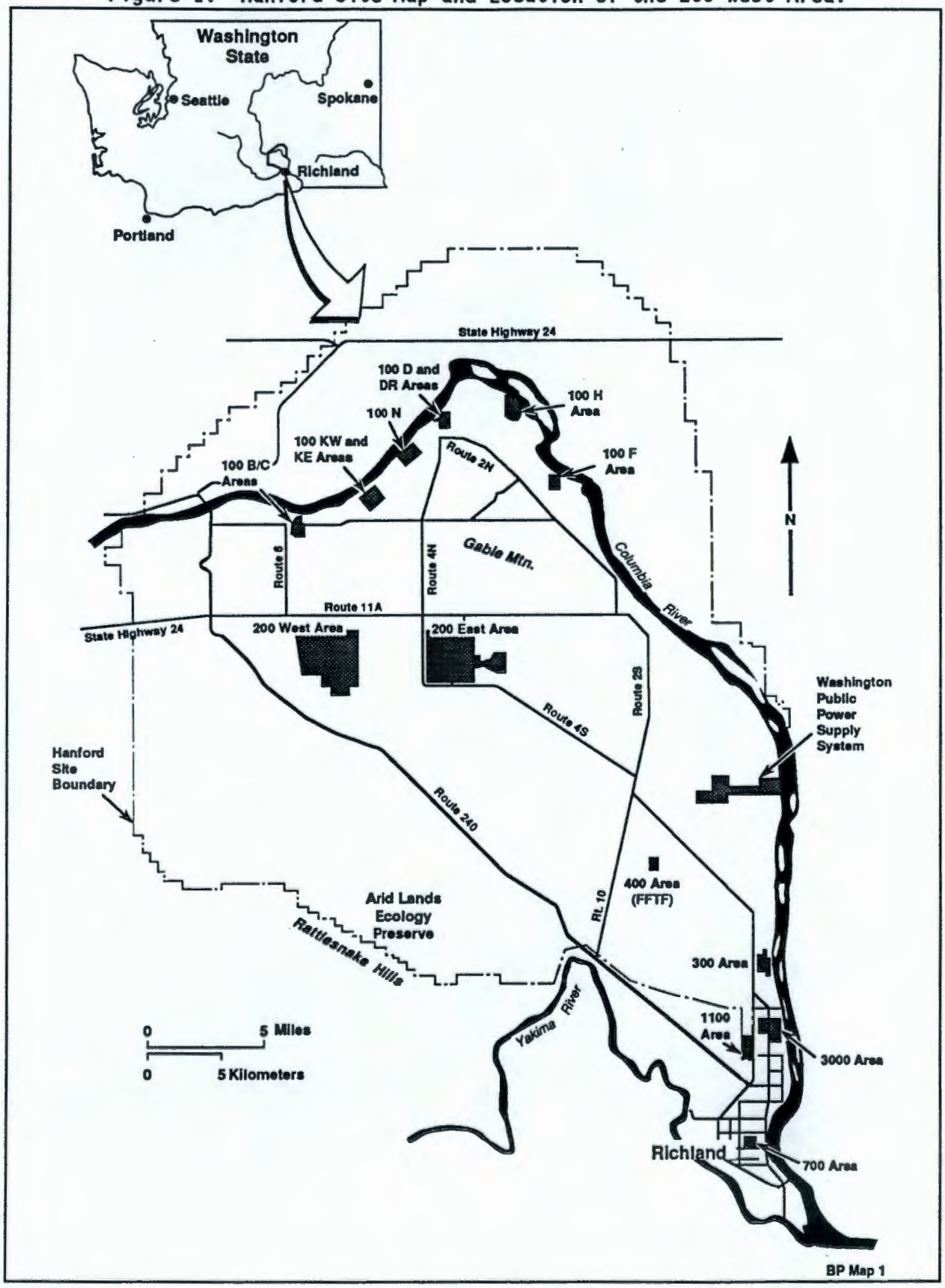
Demonstration of this device will be conducted at the 200 West Area Carbon Tetrachloride Expedited Response Action (ERA) site. The demonstration will be 12 to 48 inches above ground in a line of site mode from the instrument to a reflector and back over a distance of tens to hundreds of feet depending on specific location and obstacles.

1.2 BACKGROUND

The field demonstration described in this ITP is being conducted as part of the Volatile Organic Compound-Arid Integrated Demonstration (VOC-Arid ID). The VOC-Arid ID is one of several U.S. Department of Energy (DOE) integrated demonstrations designed to support the testing of emerging environmental management and restoration technologies. The purpose of the VOC-Arid ID is to identify, develop, and demonstrate technologies that may be used to characterize, remediate, and/or monitor arid or semiarid sites containing VOC's (e.g., carbon tetrachloride) with or without associated metal and radionuclide contamination. Initially, the VOC-Arid ID activities will focus primarily on the carbon tetrachloride contamination and associated contamination found in the 200 West Area of the Hanford Site (Figure 1).

The 200 West Area Carbon Tetrachloride ERA is currently on-going. The ERA is being conducted by DOE at the direction of the U.S. Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology). The ERA is a removal action under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), which allows expedited response to be taken where early remediation will abate imminent hazard or prevent significantly increased degradation that might occur if action was delayed until completion of a remedial investigation/feasibility study (RI/FS) and record of decision (ROD). The ERA is based on concern that the carbon tetrachloride residing in the soils under the 200 West Area continues to serve as a source of contamination to the groundwater. Thus, the purpose of the ERA is to minimize contaminant migration within the unsaturated soils in the 200 West Area by removing the carbon tetrachloride. The proposed action for removing the carbon tetrachloride is to use soil vapor extraction (SVE) with above-ground treatment, using a vacuum system and a network of soil vapor extraction vadose wells.

Figure 1. Hanford Site Map and Location of the 200 West Area.



Although the VOC-Arid ID and the ERA are separate projects, both projects benefit by conducting VOC-Arid ID demonstrations at the ERA site. The ERA site provides a large source of contaminant at a controlled, characterized location. The VOC-Arid ID provides for additional characterization of the contaminant site as well as producing better, faster, and/or cheaper environmental restoration technologies. By combining these two projects, the cost effectiveness of each project rises significantly.

1.3 SITE SETTING

Field testing will be conducted adjacent to the 216-Z-9 trench. This trench is one of several carbon tetrachloride disposal sites located near Z-Plant in the 200 West Area (Figure 2).

2.0 TECHNOLOGY DESCRIPTION

The FTIR is a large instrument, measuring 13 by 19 by 25 inches, coupled to a telescope measuring 24 inches long by 15 inches in diameter. The instrument weights approximately 150 pounds and is typically operated from a large tripod. It makes use of a remote reflector to establish a long path length. An eye safe calibrated light beam is used to generate a spectra from approximately 3 to 14 microns which is aimed at a reflector placed from 10 to 650 meters distant. The reflector bounces the light beam back to the instrument and is routed to a cooled photodetector where the spectra is analyzed for absorption in numerous wavelengths.

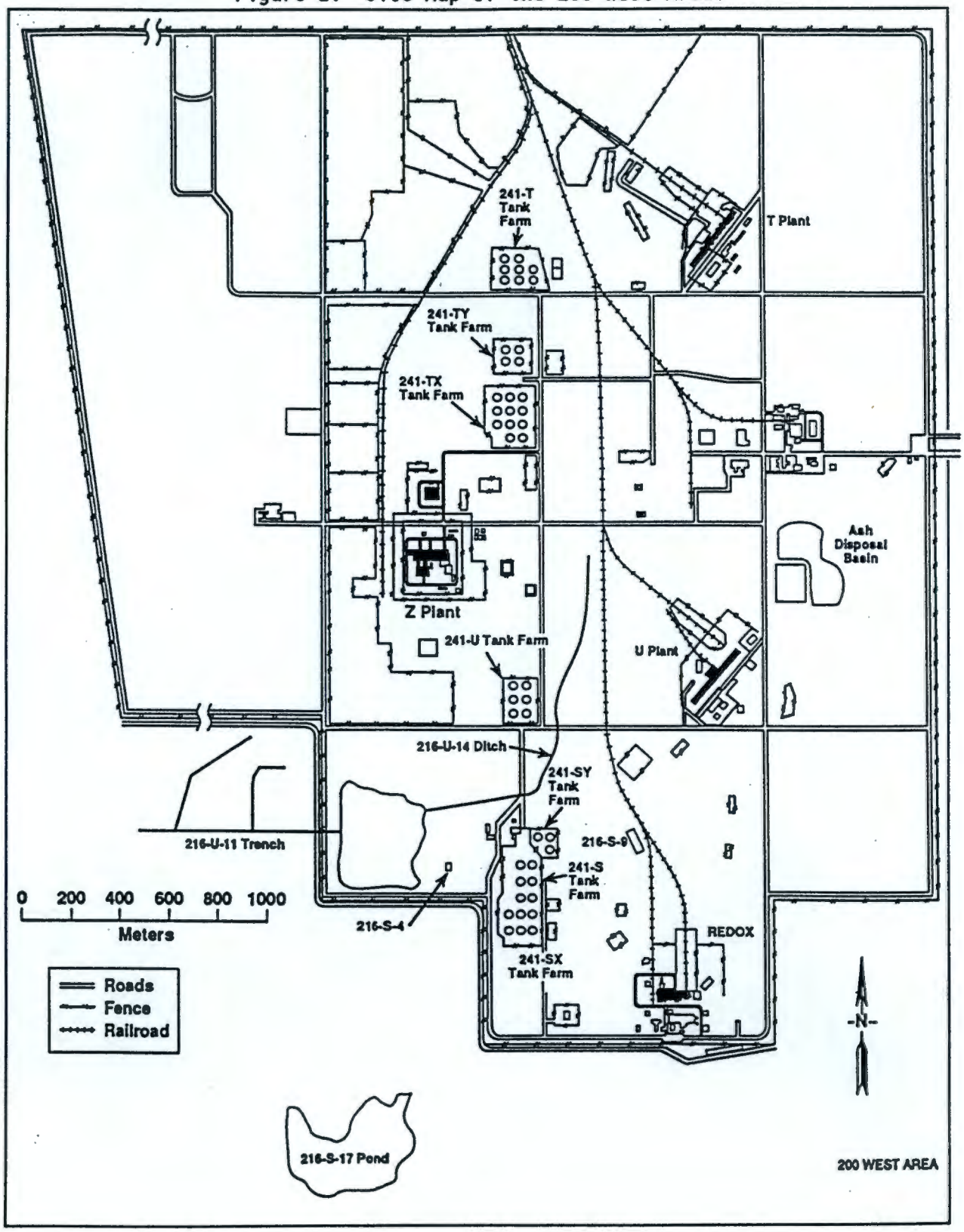
The instrument is capable of detecting, identifying, and measuring multiple gas species simultaneously in near real time on a continuous basis. Data are downloaded to a portable computer and can be analyzed on site or stored for later analysis. The minimum detection levels for most chemical species is in the 5 to 30 ppb range for typical on site measurement setups. The only site requirement for this demonstration will be 120 VAC at 4 amps for operating power.

3.0 DEMONSTRATION OBJECTIVES AND MEASURES OF MEETING THE OBJECTIVES

3.1 OBJECTIVES

The objective of this demonstration is to attempt to measure soil gas fluxes over time during a 72 hour period.

Figure 2. Site Map of the 200 West Area.



3.2 MEASURES OF MEETING THE OBJECTIVES

Since atmospheric conditions such as a building high pressure event can radically influence the success of flux measurements from the soil, the only measure of meeting the objectives for this demonstration will be the successful deployment of the instrument, its operation, and removal.

4.0 REGULATORY COMPLIANCE

Because the instrument is non-intrusive and will be used only in areas outside of controlled zones, no requirements under federal or state environmental laws are specifically applicable.

5.0 HANFORD COMPLIANCE

This section identifies Hanford compliance areas for this field demonstration.

5.1 SAFETY

Activities under this ITP will be governed by the existing Hazardous Waste Operation Plan for the test site.

5.2 QUALITY ASSURANCE

All work on the Hanford Site is subject to the requirements of DOE Order 5700.6C, *Quality Assurance* (DOE-RL 1991), which establishes broadly applicable QA program requirements.

To ensure that the field demonstration activities are consistent with DOE-RL Order 5700, *Quality Assurance*, all work will be performed in compliance with Westinghouse Hanford's QA manual, WHC-CM-4-2 (WHC 1988) and with applicable procedures outlined in the QA program Plan, WHC-EP-0383 (WHC 1990). This QA program plan describes the various plans, procedures, and instructions that will be used by Westinghouse Hanford to implement the requirement of DOE-RL Order 5700.6C.

The objective of the test plan and the appendices is to ensure that the data obtained and the conclusions drawn are sufficiently accurate and reliable to support decisions associated with the evaluation of the demonstration.

5.3 TRAINING

No special health and safety considerations are expected. No special training will be required; however, standard training, including the OSHA training for personnel working at hazardous waste sites plus all relevant training required to be on the Hanford site, will be required for any personnel entering the exclusion zone.

Safety training requirements are listed in the Hazardous Waste Operations Plan. Security Requirements are consistent with those needed for visitor access to the test site.

6.0 ORGANIZATION AND RESPONSIBILITIES

The field test will be performed by Demonstration Operations working with the principal investigator (Figure 3). General organization and responsibilities for the VOC-Arid ID, Demonstration Operations, and the ERA can be found in their respective Project Management Plans. Organization for the field demonstration is shown in Figure 3. General responsibilities and specific responsibilities to the field demonstration follow.

6.1 DEMONSTRATION OPERATIONS

Demonstration Operations is responsible for site characterization, engineering, and conduct of field demonstrations. Demonstration Operations ensures regulatory and DOE/Hanford compliance for field demonstration activities.

6.2 PROJECT ENGINEER

The project engineer is responsible for coordinating with the principal investigators and the field team leaders and ensuring the availability of needed equipment and materials.

6.3 FIELD TEAM LEADER

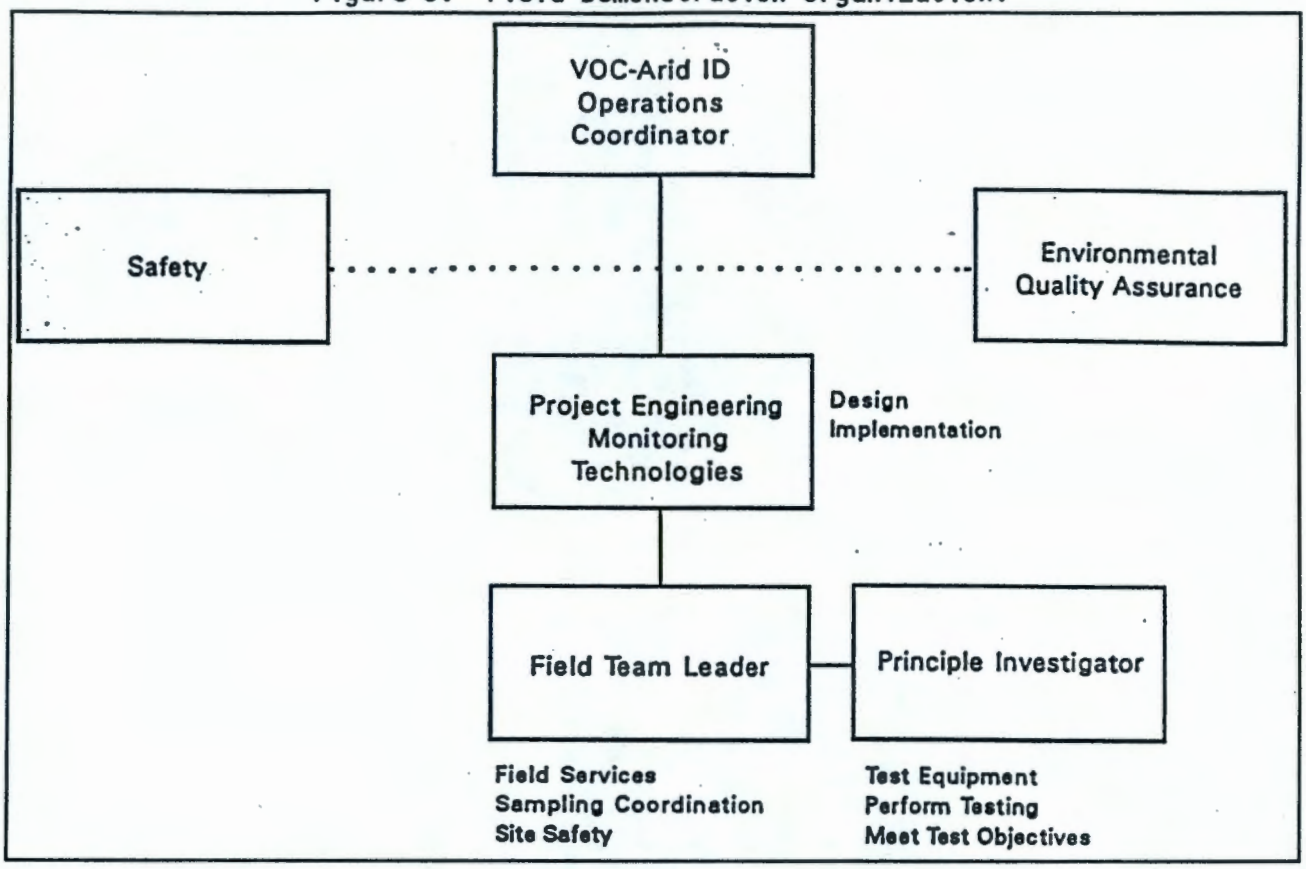
The field team leader is responsible for overall technical field management of the project and control of site access. All on-site personnel report through the on-site field team leader to accomplish their work.

6.4 PRINCIPAL INVESTIGATOR

The principal investigator will:

- Ensure that the test objectives are met

Figure 3. Field Demonstration Organization.



- Conduct the testing through coordination with the field team leader
- Provide all monitoring equipment to be tested
- Provide personnel to set up the equipment, perform the test, and analyze the results
- Prepare a performance evaluation report that reviews the results of the testing related to each objective.

7.0 DESCRIPTION OF TASKS AND PROCEDURES

Site preparation will consist of laying down a 3 by 3 foot sheet of 1/4-inch plywood on the ground to allow the instrument to have steady support either on or off its tripod. The reflector will be placed on its tripod at a distant location with a clear line of site path to the instrument. No disturbance of top soil, plant life, or other surface features is envisioned.

The instrument will be operated by the vendor in accordance with their operating manual and procedures. PNL and WHC staff involved in this demonstration will be observers only. WHC operations will need to supply up to 300 feet of 120 VAC extension cord which will deliver 4 amps of current at 120 VAC to the instrument.

8.0 DEMONSTRATION SCHEDULE

Field setup will begin on July 26, 1993 and the demonstration will commence upon its operation through July 30.

9.0 REFERENCES

DOE-RL 1991, *Expedited Response Action Proposal (EE/CA & EA for 200 West Area Carbon Tetrachloride Plume*, DOE/RL-91-32, Draft B, U.S. Department of Energy, Richland Field Office, Richland, Washington.

WHC 1988, *Quality Assurance*, WHC-CM-4-2, Westinghouse Hanford Company, Richland, Washington.

WHC 1990, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Environmental Engineering Group, Westinghouse Hanford Company, Richland, Washington.

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