REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	**2. REPORT DATE** 23-27 Oct. 1995	**3. REPORT TYPE AND DATES COVERED** Abstract presented 23-27 Oct. 1995

4. TITLE AND SUBTITLE
Comparison of *In Situ* Laser-Induced Fluorescence(LIF) Measurements of Petroleum Hydrocarbons in Soils with Conventional Laboratory Measurements

5. FUNDING NUMBERS
N/A

6. AUTHOR(S)
S.H. Lieberman, T. Hampton, D. Knowles, M. Davey and W.C. McGinnis

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

Naval Command Control and Ocean
Surveillance Center RDT&E Division,
53475 Strothe Road Rm267D, San Diego,
CA 92152-6325

Computer Sciences Corporation, 4045
Hancock Street, San Diego, CA 92110

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
SERDP
901 North Stuart St. Suite 303
Arlington, VA 22203

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
N/A

11. SUPPLEMENTARY NOTES
Presented at Tenth Annual Conference on Contaminated Soils, 23-27 Oct. 1995, Amherst, MA. No copyright is asserted in the United States under Title 17, U.S. code. The U.S. Government has a royalty-free license to exercise all rights under the copyright claimed herein for Government purposes. All other rights are reserved by the copyright owner.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release: distribution is unlimited

12b. DISTRIBUTION CODE
A

13. ABSTRACT ***(Maximum 200 Words)***

This presentation reports the results of a comprehensive field validation effort in which measurements from the cone penetrometer deployed LIF sensor are compared directly with results from conventional laboratory-based chemical analyses of samples collected using traditional methods. To minimize spatial and temporal variability associated with sampling, discrete samples were collected immediately after push measurements by overboring the push hole with an auger and collecting soil samples with a split spoon sampler. Secondary fluorescence measurements were made on splits of the laboratory samples to provide direct comparison with laboratory results. All discrete samples were analyzed by EPA Methods 418.1, Total Recoverable Petroleum Hydrocarbons (TRPH) and DHS Method 8015-Modified, TPH. At some sites samples were also analyzed for SVOC, EPA Method 8270, and/or an enhanced 8270 that quantifies 40 individual polynuclear aromatic hydrocarbons (PAHs).

14. SUBJECT TERMS
LIF, TRPH, TPH, SVOC, PAHs, SERDP

15. NUMBER OF PAGES
1

16. PRICE CODE
N/A

17. SECURITY CLASSIFICATION OF REPORT unclass	**18. SECURITY CLASSIFICATION OF THIS PAGE** unclass	**19. SECURITY CLASSIFICATION OF ABSTRACT** unclass	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

143 - 1995

Abstract of Oral Presentation to be given at:
Tenth Annual Conference on Contaminated Soils
23-27 Oct. 1995; Amherst, MA.

Comparison of *in situ* laser-induced fluorescence (LIF) measurements of petroleum hydrocarbons in soils with conventional laboratory measurements

S. H. Lieberman and T.Hampton
Naval Command, Control and Ocean Surveillance Center, RDT&E Division,
San Diego, CA 92152
D. Knowles, M. Davey and W.C. McGinnis
Computer Sciences Corporation, San Diego, CA 92110

The Tri-Service (Army, Navy, Air Force) Site Characterization and Analysis Penetrometer System (SCAPS) program conducted the first demonstration of the use of real-time chemical sensors deployed with a cone penetrometer for delineation of subsurface contaminant plumes. The spectroscopic based sensor uses an optical fiber (up to 100 meters long) to transmit 337 nanometer excitation energy from a pulsed nitrogen laser located at the surface through a sapphire window in the penetrometer probe. Fluorescence induced in aromatic hydrocarbons in the soil that contacts the window is returned to the surface over a second optical fiber where it is spectrally quantified using a photodiode array detector. Over the last several years this first generation nitrogen laser-based LIF sensor and more recently the "tunable" wavelength-based LIF system (operated at 290 nm) have been demonstrated at different sites. However, until recently, there has not been a well orchestrated effort to compare sensor results with conventional laboratory-based chemical measurements.

This presentation reports the results of a comprehensive field validation effort in which measurements from the cone penetrometer deployed LIF sensor are compared directly with results from conventional laboratory-based chemical analyses of samples collected using traditional methods. To minimize spatial and temporal variability associated with sampling, discrete samples were collected immediately after push measurements by overboring the push hole with an auger and collecting soil samples with a split spoon sampler. Secondary fluorescence measurements were made on splits of the laboratory samples to provide direct comparison with laboratory results. All discrete samples were analyzed by EPA Methods 418.1, Total Recoverable Petroleum Hydrocarbons (TRPH) and DHS Method 8015-Modified, Total Petroleum Hydrocarbons (TPH). At some sites samples were also analyzed for Semi-Volatile Organic Compounds (SVOC), EPA Method 8270, and/or an enhanced 8270 that quantifies 40 individual polynuclear aromatic hydrocarbons (PAHs).

Results from ten sites investigated to date (representing different fuel products and different hydrogeological conditions) indicate that the *in situ* sensor data agrees with TPH measurements and TRPH on a detect/non-detect basis approximately 85% of the time. This compares favorably with the agreement (93%) between the two lab methods (TRPH and TPH) on splits of the same samples. Use of qualitative information derived from the spectral signature of the sensor output for discriminating different fuel product types will also be discussed. Finally, results from a demonstration conducted as part of the US. Environmental Protection Agency Consortium for Site Characterization Technology (CSCT) at the Hydrocarbon National Test Site in Pt. Hueneme CA will be presented.