

SUBSURFACE CONTAMINANTS PLUMES

EXPEDITED SITE CHARACTERIZATION

TTP #: *FT0-8-C2-62*

SITE CHARACTERIZATION TECHNOLOGY INTEGRATION AND SUPPORT

Principal Investigator: Paul Wang, Concurrent Technologies Corporation, 412-577-2648

Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

TASK 1: This project is to provide a center of expertise in alternative characterization and monitoring solutions to help reduce cost and schedule of groundwater and soil cleanup at U.S. Department of Energy (DOE) sites. The project scope involves providing technical and technology integration support to the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) as well as providing technical assistance to DOE sites. Task activities will be guided by the Site Technology Coordinating Group (STCG) needs documentation and site "Accelerating Cleanup: Paths to Closure" Plans, specifically in reference to site project baseline summary activities and critical closure paths/events. Specific activities will include: 1) serving as the CMST-CP technical point of contact (liaison) to the Subsurface Contaminants Focus Area (SCFA) and other programs listed above and providing these programs with expert review of proposals and projects; 2) assessing development status of technologies from all these programs; 3) linking the Principal Investigators (PIs) with site users and vice versa; and 4) keeping the CMST-CP program and its customers informed about the availability, applicability, strengths, and limitations of technology development efforts.

TASK 2: This effort is aimed at facilitating timely responses to Headquarters (HQ) inquiries and forward relevant documentation from HQ to the DOE Field Lead. Activities include: 1) Coordinate collection and incorporate monthly performance reports from program facilitators into the monthly CMST-CP Business Review presentation; 2) help DOE/Nevada (NV) obtain guidance for documents and other required HQ actions and to help support the timely delivery of documents back to DOE HQ; 3) support HQ Program Manager in development of presentations, notes, or collection of other information related to CMST-CP.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Assist in Technology Gap Analysis and Documentation of Response to STCG Needs	04/30/00	03/31/00
2	Prepare Draft Innovative Technology Summary Report (ITSR) on Topic to be Determined	07/15/00	07/10/00
<i>Updates:</i> Report deliverable was changed from an ITSR to a “white paper” in ITSR format (Pre-ITSR report) due to request from Mixed Waste Focus Area (MWFA) to postpone release of ITSR on Particulate Matter (PM) Continuous Emission Monitors (CEMs)			

Accomplishments and Technical Progress:**TASK #1 ITEMS:**

- Reviewed and provided comments on the draft “Long-Term Stewardship Needs Assessment and Technology Baseline Inventory 2000” document. The comments address 1) preliminary categories as provided in Attachment 1, 2) technologies and technology needs that have been overlooked, and 3) general concerns.
- Prepared two placeholder short Technical Task Plans: 1) NV0-0-C2-21, “Evaluation of Long-Term Monitoring Technologies,” and 2) NV0-1-C2-21, “Implementation of Geophysical Techniques for Dense Non-Aqueous Phase Liquid (DNAPL) Delineation.”
- Revised the statement of program objectives for the upcoming DOE industry solicitation for applied research and exploratory development of technologies addressing soil and groundwater contamination. The revision includes a table of technology areas with corresponding Needs Management System (NMS) associated needs and Environmental Management Science Program (EMSP) related research references, as well as general references and a statement of research needs.
- Attended the Long-Term Stewardship Workshop on August 7-9, 2000, in Denver, Colorado. Participated in the Science and Technology session to obtain relevant information for inclusion in the draft CMST-CP Road Map report.
- Prepared and submitted two draft sections on improved characterization and long-term monitoring for inclusion in the DOE Office of Environmental Management (EM) CMST-CP Road Map report. Comments on the draft Road Map report will be sought in the next few months by the DOE/NV, and the final report is targeted for publication by the end of December 2000.
- Finalized and delivered the draft ITSR on the *Adaptive Sampling and Analysis Programs* (ASAPs, Office of Science and Technology [OST] #2946). After receiving and incorporating the PI’s review response, a final, revised draft was sent to DOE/NV for management approval. Delivery of this report fulfills all of the Fiscal Year (FY) 2000 deliverable requirements of this Task.
- With regard to an independent assessment of the passive magnetic resonance technique (also known as Geocolog), the peer review of this technology was recently conducted under the auspices of the American Society of Mechanical Engineers (ASME). Major findings of the

review panel included the unknown scientific principles on which this technology is based and lack of confirmatory data to corroborate the results of the technology. The review panel report has been sent to the technology providers for comments.

- Tiffany Zachry of Concurrent Technologies Corporation (CTC) presented the paper titled “Publications Management from an Ecological Perspective: Three Documentation Case Studies” during the International Professional Communication Conference/Special Interest Group in Documentation (IPCC/SIGDOC) 2000 Conference held in Boston, Massachusetts. The conference is jointly sponsored by the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM). The paper was also published in the peer-reviewed conference proceedings.

TASK #2 ITEMS:

- The CEM ITSR task was completed by August 4, 2000. The final product, in the form of a report designed to be a basis for a future DOE report, was submitted to the NV Field Office. The interim report was further updated. It analyzed a new technology demonstration of PM CEMs at the Oak Ridge TSCA incineration facility. The new information was incorporated into the pre-ITSR Technology Management System (TMS) #2973, titled *Particulate Matter Continuous Emission Monitors* of which a summary version was already written for the demonstration at the DuPont facility in Delaware. The pre-ITSR report included a description of the program design, PM CEM correlation tests, reference tests, instruments used, test protocol, some results, and discussion.
- The demonstration at Oak Ridge involves testing of three different CEMs. Two are beta technology and one is laser light scattering technology. The instruments used are Durag F-904 K Beta Monitor, Emission SA Beta 5M Monitor, and Sigrist CTNR Light-Scattering Monitor. The demonstration team also includes representatives from the Mixed Waste Fuel Focus Area, Idaho National Engineering & Environmental Laboratory (INEEL); Special Technologies Laboratory (STL), Bechtel-Nevada (BN), DOE Oak Ridge Office, University of Tennessee; and Florida International University (FIU). The Airtech Environmental Services (AES) does the M5I reference method measurements. The personnel from the University of Tennessee do the analysis of the data collected from the TSCA facility stack. There is a general technical problem with obtaining correlation curves, covering the full range of emissions to meet the new Environmental Protection Agency (EPA) Performance Standard (PS 11) requirements. Also, the limiting factors are that the tested CEMs are still in the developmental stages and there are some facility operational difficulties.
- There appears to be a technical issue associated with the CEM technology demonstration both at DuPont and at Oak Ridge. The demonstration was done with the use of the CEM monitors which were not equipped with state-of-art light sources (e.g., lasers) that give reliable data on particle concentration. The CEM technologies tested use conventional light sources which are not well suited to meet the detection limits, accuracy, and reliability.
- The Emission SA monitor which came from France did not produce reliable data and was returned to the manufacturer. Moreover, it was not received back in time for the testing at Oak Ridge and was not included in the preliminary demonstration report.
- All the commitments planned for the CMST-CP program in FY 2000 have been completed as of August 4, 2000.

FIELD ANALYSIS

TTP #: SRI-7-C2-21

DEVELOPMENT AND DEPLOYMENT OF INNOVATIVE DENSE NON-AQUEOUS PHASE LIQUIDS CHARACTERIZATION METHODS

Principal Investigator: Joe Rossabi, Westinghouse Savannah River Site, 803-725-5220

Project Objectives:

The purpose of this task is to enhance the applicability of the Ribbon NAPL Sampler (RNS), by FLUTE, to provide definitive detection of separate phase organics in the subsurface. The method, which is simple to use and broadly applicable, has been successfully deployed both above and below the water table and in open boreholes and through cone penetrometer rods. Successful deployments at Savannah River Site (SRS), Paducah GDP, and the McCormick-Baxter creosote site have established the utility of the RNS technology. To further enhance the utility of the technique, it is necessary to develop modes for addressing other common access methods. For example, other modalities that would enable greater applicability of the FLUTE method would include deployment in fractured rock systems (open boreholes) and deployment through the center of drill pipes.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Manufacture of #1 RNS	06/30/00	02/29/00
2	Complete Manufacture of #2 RNS	07/31/00	02/29/00
3	Complete Innovative Technology Summary Report (ITSR) for RNS	09/30/00	10/02/00

Accomplishments and Technical Progress:

- A comprehensive characterization of the CMP pits at SRS was completed using the Dense Non-Aqueous Phase Liquids (DNAPL) Characterization Toolbox.
- The small diameter (1.5" o.d., .8" i.d.) RNS has been successfully deployed through Geoprobe rods.
- The very small diameter (1.25" o.d., .7" i.d.) RNS has been successfully deployed through Geoprobe rods.
- Immediate demand for the small diameter RNS has enabled the manufacturer to sell the small diameter RNS to consultants in the United States and abroad.
- A handbook of the Ribbon Non-Aqueous Phase Liquid (NAPL) Sampler for FLUTE has been written which provides a description of the technology and deployment methods as well as data from actual sites.

- The small diameter (1.25") RNS's for both open borehole and through the rod installation have been fabricated and shipped.
- The fractured rock RNS has been fabricated and shipped.
- The RNS is gaining rapid acceptance from environmental contractors.

Plans for the Next Quarter:

- Will get started on next fiscal year's work to develop replacements for the Sudan IV dye for the RNS and other potential enhancements for that technology.

TTP #: FT0-9-C2-21

RAPID SAMPLING USING 3M TECHNOLOGY

Principal Investigator: David Seely, 3M Corporation, 612-736-6057

Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

The objective of this project is to develop, optimize, test, and demonstrate innovative rapid field water sampling systems that are user-friendly and applicable to a wide range of contaminants. This technology is based on 3M's Empore™ membrane technology for solid phase extraction. Phase I of the program developed the field sampling system and membrane disk holders. Membrane materials were developed to selectively sample for lead and technetium. The system has been field-tested and demonstrated at various sites around U.S. Department of Energy (DOE). Phase II has extended the sampling technology to strontium, cesium, and radium. Phase III will add sampling technology for uranium, as well as direct-read (self-indicating) techniques such as self-scintillating and colorimetric disk materials and direct radiometric counting for radioactive contaminants such as cesium. Also, the membrane packaging design will also be optimized, in addition to integrating the sampler with real-time, state-of-the-art instrumentation and determining the arrangement of disk holders in a series when multiple contaminants are being sampled at once.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	N/A		

Accomplishments and Technical Progress:

- Optimize Rapid Liquid Sampler (RLS) System: Laboratory work continues with scintillating disks for Tc, Ra, and Cs. Results for cesium are being compared to results that can be obtained by other means (direct beta counting survey meter, gamma survey meter) to evaluate whether a scintillating technique has merit.
- Technology Demonstration: The Cs RLS continues to be used with the cartridge remediation demonstration at Savannah River Site (SRS).

- Prototype Instrument Coupling: A demonstration of the Environmental Measurements Laboratory (EML) prototype inexpensive field gamma detector for use with the Cs RLS is planned for October 2000 at SRS.
- SRS R-basin demonstration has surpassed 2.5-million gallons. The prototype 50 Gallons Per Minute (GPM) system is in place and ready for initial lab testing on 6" x 22" cartridges.

Plans for the Next Quarter:

- Continue SRS R-Basin demonstration.
- Determine a set of in-series analytes with attention to probable DOE needs.
- Complete assembly of the 50 GPM system for laboratory testing.
- Identify potential remediation/analytical demonstration sites for uranium.
- Identify a site for a 50 GPM demonstration.

CONTAMINANT DETERMINATION & MIGRATION

TTP #: *AL2-7-C2-21*

ENVIRONMENTAL MEASUREMENT WHILE DRILLING

Principal Investigator : Cecelia Williams, Sandia National Laboratories - Albuquerque,
505-844-5722

Project Objectives:

The objective of this project is to distinguish contaminated from non-contaminated areas in real time while drilling at hazardous waste sites. The Environmental Measurement While Drilling (EMWD) system represents an innovative blending of new and existing technologies in order to obtain real-time data during drilling.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Deployment of Integrated EMWD Tool at U.S. Department of Energy (DOE) Site	09/30/00	

Accomplishments and Technical Progress:

- Continue to work with Rocky Flats Environmental Technology Site (RFETS) to develop a deployment plan for characterizing two sites using EMWD.

Plans for the Next Quarter:

- Prepare for planned RFETS deployment.
- Design, test, assemble, and calibrate the EMWD tool for the RFETS deployment.

TTP #: NV0-5-C2-21

ENVIRONMENTAL REMOTE SENSING FOR MONITORING PLANT HEALTH (EPCOT)

Principal Investigator: Gene Capelle, Special Technologies Laboratories, 805-681-2252

Project Objectives:

The long-term goal is to develop methodologies and hardware to detect subsurface contamination at U.S. Department of Energy (DOE) sites by means of remote monitoring of signatures (via reflectance and laser-induced fluorescence) from vegetation overgrowth. Fiscal Year (FY) 2000 is currently planned as the last year of the project so that the primary work is concentrating on analyzing and writing up data that have been collected on controlled stressed populations of plants.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Draft Articles and Submit for Publication	06/30/00	06/30/00
<i>Updates:</i> Articles are being peer reviewed.			
2	Orderly Shutdown of Operations at Epcot	09/30/00	09/30/00
3	Presentation and Written Final Report	09/30/00	09/15/00

Accomplishments and Technical Progress:

- A manuscript, "Detection of Zinc Stress in Bahia Grass (*Paspalum notatum* Flugge) by Remote Sensing: I. Comparison of Hyperspectral Imaging and Laser-Induced Fluorescence Measurements," has been accepted for publication in the *Journal of Plant Physiology*.
- Two more manuscripts are in review prior to submission:
 - 1) "Detection of Zinc Stress in Bahia Grass (*Paspalum notatum* Flugge) by Remote Sensing: II. Laser-Induced Fluorescence Spectroscopy (LIFS) and Laser-Induced Fluorescence Imaging (LIFI) Measurements" and
 - 2) "Effects of Light Intensity on the Laser-induced Fluorescence of Bean (*Phaseolus vulgaris* L.) and Wheat (*Triticum aestivum* L.) Leaves."
- Principal Components Analysis (PCA) on both LIFI and LIFS data from a group of 50 Bahia grass plants in a zinc stress experiment produced a good separation between unstressed (i.e., 0.5 ppm treatment) vs. stressed plants (0ppm, 25ppm, 50ppm, and 100ppm).
- Normalized Difference Vegetation Index (NDVI) for Excitation/Emission Matrix (EEM) analysis on this same set of plants separated stressed from unstressed plants quite well. NDVI may be a simple but good way for analyzing LIFS data for plant stress.
- Neural Net Analysis on normalized spectral data using only two categories (stressed and unstressed) resulted in a 97% successful classification rate.

- The project final oral presentation was presented August 28, 2000, at DOE/Nevada (NV). Representatives from the Savannah River Site (SRS) were in attendance by videoconferencing. The final report was delivered to Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) in mid-September.
- A manuscript, "Detection of Zinc Stress in Bahia Grass (*Paspalum notatum* Flugge) by Remote Sensing: III. Correlation Between Leaf Phenolic Compounds and Blue Fluorescence in Leaves," is in preparation. Experiments completed in August 2000 have purified the unknown phenolic peak that was present in the soluble leaf extracts of Bahia grass grown under different levels of zinc. This peak has very strong blue fluorescence and matches almost exactly the EEM spectrum of intact Bahia grass leaves. We believe that this particular phenolic compound is key to understanding the correlation between blue fluorescence in leaves and concentrations of phenolic compounds.
- A manuscript, "Detection of Unique Fluorescence Spectra in Plants Expressing Green Fluorescent Protein (GFP) Gene Product," is in preparation. GFP expression can be easily detected in plants using LIFI or LIFS, but not spectral reflectance. The fluorescence spectrum of GFP is unique and cannot be mistaken for normal leaf fluorescence.
- Fieldworthy, portable, remote sensing LIFS and LIFI systems have been developed and are being coupled with advanced databasing and data analysis methods for monitoring and sampling area reduction in DOE Remediation (e.g., phytoremediation) and Stewardship Programs. LIFI and LIFS remote sensing systems provide consistent results over widely varying daylight (or nighttime) conditions!

Plans for the Next Quarter:

- Project has been closed out.
- CMST-CP developed technology will continue to be developed and utilized under other funding opportunities.
- Principal Investigator (PI) will continue to respond to DOE Environmental Management (EM) site needs.
- Investigate funding to continue writing up results for publications.
- Investigate possibilities for funding for joint field work at SRS.

LANDFILLS

POST-CLOSURE MONITORING

TTP #: *AL2-8-C2-21*

ALTERNATIVE LANDFILL COVER DEMONSTRATION

Principal Investigator: Stephen Dwyer, Sandia National Laboratories - Albuquerque,
505-844-0595

Project Objectives:

The Alternative Landfill Cover Demonstration (ALCD) is a large-scale field test at Sandia National Laboratories (SNL), located on Kirtland Air Force Base in Albuquerque, New Mexico. Construction and instrumentation is complete and the ALCD is now in the performance-monitoring phase.

The stated objectives of the ALCD are to:

- demonstrate the construction and cost of cover design alternatives;
- measure the performance of the design alternatives for a minimum five-year post-construction period using water balance and ancillary data as the primary evaluation method;
- validate predictive models for evaluating long-term performance of the cover designs; and
- document the results through presentations, reports, and peer-reviewed publications.

The test covers are constructed side-by-side for comparison based on their performance, cost, and ease of construction. The focus of this project is to provide the necessary tools; i.e., cost, construction and performance data, to the public and regulatory agencies so that design engineers will have better regulatory acceptable alternatives to the conventional cover designs.

Continuous water balance and meteorological data is currently being obtained. It will be actively collected for a minimum five-year post-construction period. In addition, periodic measurements of vegetation cover, biomass, leaf area index, and species composition are being taken.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Mid-Year Status Review	03/15/00	03/15/00
2	Report for Fourth Year of Test Findings	09/30/00	09/30/00

Updates: Report has been mailed out.

Accomplishments and Technical Progress:

- Completed all milestones for Fiscal Year 2000. These milestones were completed in the form of reports that have been mailed out.

Plans for the Next Quarter:

- Continue to collect water balance data at the ALCD site. Begin collection of annual vegetation characteristic data.

HIGH LEVEL WASTE TANKS

WASTE RETRIEVAL

TTP #: FT0-0-C2-11

CENTER OF EXPERTISE FOR TANK SLURRY MONITORING

Principal Investigator: Richard Musgrove, Florida International University, 305-348-6622
 Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project will be a multi-year, collaborative effort with ongoing tasks at Hemispheric Center for Environmental Technology/Florida International University (HCET/FIU), Oak Ridge National Laboratory (ORNL), and Savannah River Site (SRS). This effort will meet the needs of SRS, ORNL, and Hanford to develop effective slurry monitors for retrieval of high-level radioactive tank waste. This project will support finding or developing tank waste slurry monitoring technologies that can be deployed in the near future. Initial scope for this project will focus on development of an in-tank dual Coriolis slurry monitoring system to meet critical SRS needs for deployment in Fiscal Year (FY) 2001. Collaboration with Hanford contractors and the Office of River Protection will continue to identify opportunities for deployment of a dual Coriolis system at Hanford and for other slurry monitors needed.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Submit experimental test and evaluation plan	01/30/00	03/17/00
2	Complete slurry monitor tests to verify applicability for site field testing	06/30/00	08/30/00
<i>Updates:</i> This milestone was completed approximately two months late due to delay in awarding renewal of Florida International University (FIU) Cooperative Agreement.			
3	Issue report on evaluation of the dual Coriolis monitor performance	09/15/00	
<i>Updates:</i> This milestone is behind approximately two months due to delay in awarding renewal of FIU Cooperative Agreement.			

Accomplishments and Technical Progress:

- For the bench scale experiments to validate the conceptual design, the Mott Filter will be used. Previous experiments showed that Mott cross flow filter did not work and no flow

rate was observed on the filtrate side. As a result, an off-the-shelf cartridge filter was re-engineered and used in place of the cross flow filter. The cartridge filter performs admirably.

- During subsequent experiments, the Mott cross flow filter tested again and there was filtrate flow, albeit minimal, as compared to the cartridge filter. The reason that no flow was observed during the earlier stages of the experimental setup was that stainless steel tubing was used initially. The flow rate was being measured using dual coriolis meter. The flow rate was too little (less than 10 cc/min) to completely flood the dual coriolis (horizontal alignment). Hence, the dual coriolis did not register a reading. During later experiments, clear plastic tubing was used that showed filtrate droplets. Also, if the pump is run long enough to allow the dual coriolis (vertical placement) to fill up, the dual coriolis does register a flow reading. To summarize, the 0.5 mm Mott cross flow filter does work except it is under-designed. Hemispheric Center for Environmental Technology (HCET)/Florida International University is in the process of procuring longer (>6 in) Mott cross flow filters. These filters will be 24 in., 36 in., and 48 in. long. According to Mott engineering, the filtrate flow rate quadruples on doubling the length of the filter, provided the diameter of the filter remains the same.
- HCET/FIU will use the Mott cross flow filter for the experiments and in the tank prototype unit as the Mott cross flow filter has been successfully tested and deployed at Oak Ridge.
- HCET/FIU personnel met with the client at SRS for a detailed discussion on the dual coriolis slurry monitoring system being designed for deployment at SRS in FY 2002.
- The current design utilizes a winch to deploy the probe. This provides a means of lowering and raising the probe. Bellows are utilized to protect the winch cable from contamination. The probe is configured with a pump (to be determined) on the bottom with a pickup tube protruding through the bottom of the probe. The slurry flow enters the pump and is discharged from the pump and enters the first coriolis meter where the flow rate and density of the slurry are measured. The slurry flow then enters the filter where some of the flow is filtered. Current design utilizes a 24-inch Mott IGS sampling filter. The filter has two discharge ports; one is the slurry exit where all the remaining slurry exits the filter and is expelled out of the probe. The other discharge port is where the filtrate exits the filter and enters the second coriolis at which place its flow rate and density are measured. Upon exiting the second coriolis, the filtrate is expelled out of the probe. The filtrate pipe is also used to back flush the filter with air and/or water.

Plans for the Next Quarter:

- Cold testing to confirm and refine design concepts using the bench scale setup.
- Detailed design by HCET/FIU and review by SRS are continuing. Electrical and mechanical engineering and design of subassemblies is a current priority. Contributions toward creation of a prototype design report will include selection of components by specification and vendor, schematics, operational flowcharts, revised mechanical layout, and assembly drawings.

TTP #: *ORI-7-C2-31*

COMPARATIVE TESTING OF PIPELINE SLURRY MONITORS

Principal Investigator: Tom Hylton, Oak Ridge National Laboratory, 423-576-2225

Project Objectives:

This project will be a collaborative effort with ongoing tasks at the Oak Ridge National Laboratory (ORNL), the Hemispheric Center for Environmental Technology at Florida International University (HCET/FIU), and the Savannah River Site (SRS). This effort will meet the needs of both ORNL and SRS to monitor the suspended solids concentrations of radioactive slurries via in-line instrumentation. In Fiscal Year (FY) 1999, a test program was performed by ORNL which evaluated a Coriolis meter for in-line density analysis of a radioactive slurry. The results from the testing showed that the Coriolis meter worked well for the in-line measurement of the slurry density. A correlation exists for estimating the concentration of suspended solids based on the slurry density, the carrier fluid density (i.e., supernate), and the solid particle density. The concentration of suspended solids was calculated from the density results with the densities of the carrier fluid and solid particles assumed to be constant. The results showed that the concept was promising; however, the accuracy of the suspended solids concentration determination could be improved if the supernate density was also monitored simultaneously. ORNL will test this concept by installing a Coriolis meter to monitor the density of the supernate in a radioactive process that is currently using a Coriolis meter to monitor the density of the slurry. ORNL will also provide technical support to HCET/FIU which will be testing the dual Coriolis meter concept with non-radioactive slurries.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
A.1-1	Install Coriolis Meter in Radioactive Application	01/30/00	01/13/00
A.1-2	Submit Deployment Plan for Dual Coriolis Monitor	01/30/00	01/28/00
A.1-3	Submit Final Evaluation of Dual Coriolis Monitor	09/19/00	09/08/00

Accomplishments and Technical Progress:

- The final report for the project was completed, published, and distributed. The completion of the report fulfilled the requirements for milestone A.1-3, "Submit final evaluation of dual Coriolis monitor". The report is titled "An Evaluation of a Dual Coriolis Meter System for In-Line Monitoring of Suspended Solids Concentrations in Radioactive Slurries" and is identified as document number ORNL/TM-2000/184.
- Participated in a conference call with representatives from Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP), Tanks Focus Area (TFA), SRS, and FIU. The primary purpose of the conference call was to provide a status update on the

performance of the dual Coriolis meter system at Oak Ridge and to discuss the status of the dual Coriolis meter system that FIU is planning on deploying at SRS. ORNL is providing technical support to FIU on this project.

Plans for the Next Quarter:

- Assistance will be provided to FIU in the form of statistically evaluating experimental data.

WASTE SAMPLING/ANALYSIS

TTP #: NV0-8-C2-31

INTEGRATED RAMAN pOH SENSOR FOR IN-TANK MONITORING

Principal Investigator: Job Bello, EIC Laboratories, Inc., 781-769-9450

Project Objectives:

The objectives of this project are to design, assemble, and deploy an *in situ* monitor for corrosive species in U.S. Department of Energy’s (DOE) large-scale waste tanks. The goal is to develop a combined chemistry and corrosion probe consisting of a fiber-optic Raman probe for sensing nitrate, nitrite, and hydroxide concentration and an Electrochemical Noise (EN) sensor for monitoring in-tank corrosion. In Fiscal Year (FY) 2000, EIC will work with Savannah River Site (SRS) to finalize the design of the deployment platform for the combined Raman/EN sensor that meets SRS specifications. Based on approved platform design by SRS, EIC will then fabricate and deliver the deployment platform along with the probe and associated instrumentation. EIC will also provide technical assistance to SRS in the cold acceptance testing of the corrosion probe at SRS.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Engineering	01/07/00	06/00
<i>Updates:</i> Engineering drawings were completed and sent to SRS for final approval.			
2	Deliver Raman System and Deployment Platform to SRS	05/31/01	
3	Final Contract Closeout Report	09/30/00	
<i>Updates:</i> Report expected be written 06/30/01 after cold acceptance test			

Accomplishments and Technical Progress:

- The deployment platform engineering drawings have been completed, accepted by and sent to the SRS tanks operation customer.
- Subcontracted Raman spectroscopy and EN probe deployment platform fabrication to HiLine Engineering. SRS customer sent the approved deployment platform engineering drawings to HiLine. Fabrication will take about three months.
- A new conduit is being fabricated for the corrosion probe. This conduit will have a larger Internal Diameter (ID), completely sealed, and could withstand higher pressure than the previous conduit. The larger ID will permit us to use a larger size vacuum/pressure tubing with the probe, which is needed to meet SRS vacuum and pressure requirements for sampling and cleaning the sampling chamber, respectively.
- Tested Raman probe in hot cell on untreated waste samples from SRS tanks 43H, 46F, 26F and 32H; concentrations of nitrate, nitrite and hydroxide were comparable to baseline ion chromatography and titration techniques.
- A paper "Determination of Corrosion Species in High-Level Nuclear Waste (HLW) using Raman Spectroscopy," by D. T. Hobbs, J. M. Bello, and R. W. Forney was presented by David Hobbs at the 220th ACS National Meeting August 21, 2000, in Washington, D.C. This paper was an evaluation of a Raman probe for the determination of key corrosion species in HLW. Key corrosion species included nitrate, nitrite, and hydroxide. The evaluation included samples containing low and high activities of gamma-emitting radionuclides from both tank farms at the SRS.

Plans for the Next Quarter:

- Begin fabrication of deployment platform.
- Assemble Raman probe.

TTP #: *RL3-0-C2-11*

SALT CESIUM SEPARATION PROCESS MONITOR

Principal Investigator: Joe Brothers, Pacific Northwest National Laboratory, 509-375-2396

Project Objectives:

The baseline technology for the assay of the decontaminated salt solution is sampling followed by assay at a remote analytical laboratory. To implement an on-line monitor for Cs-137, Sr-90, and total alpha radiation Two existing radiation measurement technology systems will be adapted to meet these needs. Both of these monitors will be non-intrusive to the process flow stream and detect gamma, X-ray, and neutron emissions from the waste stream which pass through the process pipe.

A germanium gamma energy detection system will quantify the Cs-137, Sr-90, and other gamma

emitters identified. A neutron detection system, coupled with process knowledge, will quantify the Transuranic (TRU) present.

Pacific Northwest National Laboratory (PNNL) will:

- Collaborate with Savannah River Site (SRS) to create a concise plan to survey neutron background radiation in the process cell at SRS and implement the plan. SRS will provide engineering support for the test at SRS.
- Create a concise plan to demonstrate the feasibility of measuring Sr-90 in the presence of Cs-137 to the specifications required by SRS. After approval of the plan by SRS; Tanks Focus Area (TFA); and Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP), PNNL will conduct the feasibility demonstration using radiation standards already available to PNNL.
- Provide on-site and off-site technical assistance using appropriate PNNL staff to SRS for completion of the conceptual design as required by SRS.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
A.1-1	Complete Letter Report on Neutron Survey	09/30/00	09/30/00
A.2-1	Complete Final Report on Sr-90 Determination of Feasibility Demo	09/30/00	09/30/00

Accomplishments and Technical Progress:

- Provided technical support to SRS neutron measurement staff.
- Completed Sr-90 feasibility study. The journal submission describing the studies conducted in Fiscal Year (FY) 2000 has been reviewed and the authors are making final changes to the manuscript.
- Provided review comments on SRS system specifications.

MIXED WASTE

WASTE PROCESS MONITORING &

CONTROLS

TTP #: *CHI-7-C2-32*

REAL-TIME PLUTONIUM MONITORING (ALSO FOR AMERICIUM AND CURIUM)

Principal Investigator: John McClelland, Ames Laboratory, 515-294-7948

Project Objectives:

The project has developed and assisted in implementing an on-line, real-time monitor for measuring the concentrations of americium and curium in a molten glass stream produced by the vitrification of tank waste at the Savannah River Site (SRS). The presence of the monitor will reduce the number of hazardous and expensive samplings and off-line analyses that will have to be done during the vitrification.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Provide Curium and Americium Monitor for Deployment at SRS	01/23/00	10/15/99

Accomplishments and Technical Progress:

- Monitor deliver to SRS in October 1999.
- Supporting and explanatory materials delivered to SRS in March 2000.

Plans for the Next Quarter:

- Project is completed. Further assistance to SRS will be provided on an *ad hoc* basis.

OFFGAS & EFFLUENT MONITORING

TTP #: CHI-7-C2-33

DEVELOPMENT OF A MULTI-ELEMENT METAL CONTINUOUS EMISSIONS MONITOR FOR COMPLIANCE MONITORING

Principal Investigator: David Baldwin, Ames Laboratory, 515-294-2069

Project Objectives:

The goal of this project is to provide a system capable of monitoring elemental emissions from thermal waste treatment facilities. The purpose of this monitoring system is to provide documentation of regulatory compliance with regard to toxic metal or radioactive emissions. In order to achieve this goal, we have developed a compact, high-resolution spectrometer based on Acousto-Optic Tunable Filter (AOTF) and high-resolution echelle grating technologies. The spectrometer is combined with an air-plasma Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES) system developed by collaborators at Mississippi State University (MSU). The combined system is capable of compliance monitoring of heavy metal (e.g., Resource Conservation and Recovery Act [RCRA] metals) and actinide (e.g., alpha emitters) contaminants in stack emissions. In Fiscal Year (FY) 2000, innovations include 1) adaptation of the echelle spectrometer system for use as a Hg vapor monitor with simultaneous background and interference monitoring, and 2) application of the existing AOTF-echelle spectrometer system to other emission-based Continuous Emission Monitoring (CEM) techniques. In addition, the reduced-pressure ICP CEM that was developed and tested with Diagnostic Instrumentation and Analysis Laboratory (DIAL) in FY 1999 will be modified and improved based on results of these initial tests. These innovations will improve the speed and reliability for compliance with Environmental Protection Agency (EPA) Maximum Achievable Control Technology (MACT) CEM regulations at thermal waste treatment facilities. The spectrometer has an advanced user interface capable of easy adaptation to atomic or molecular emission spectrometric applications such as hot cell and nuclear fuel analysis and processing, field analyses in complex matrices, or passive remote sensing. Additional applications are being sought.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Bench Testing of Echelle Mercury Monitor	06/30/00	06/30/00
2	Issue Report on CEM Applications	09/30/00	
<i>Updates:</i> Completion of this milestone has been delayed until next quarter due to the addition of a task to field test a mercury monitoring system in September.			
3	Complete Modifications and Testing of Reduced-Pressure ICP	09/30/00	09/21/00

Accomplishments and Technical Progress:

- Designed, assembled and completed laboratory testing of the mercury monitoring system.
- Performed tests of the ability to measure oxidation of mercury in the presence of high levels of HCl at elevated temperatures (~900°C).
- Successfully tested correction for SO₂ spectral interference in laboratory tests.
- Modified reduced-pressure plasma system to minimize the effects of fluctuating sample stack pressure.
- Began testing the Compact High-Resolution Spectrometer (CHRS) for gas-stream Laser-Induced Fluorescence Spectroscopy (LIBS) applications in preparation for tests in conjunction with developers of this type of monitor.
- Met with LIBS developers at Sandia National laboratories - Livermore (SNLL) to discuss collaborative experiments at SNLL next quarter.
- Analyzed noise sources for the CHRS spectrometer system; determined the most significant noise source was shot noise on the dark current in the Charged Coupled Device (CCD) array detector. This may be improved by lowering the temperature of the array. Ordered a new detector with two stages of thermoelectric cooling to provide detection limits a factor of two better than the current single-stage-cooled detector when used as the detection system for the air-ICPAES CEM.
- Performed ray tracing of the echelle spectrometer optics to investigate improvements in detection limits by replacing spherical optics with an off-axis parabolic optics.
- Final report from the CEM test at DIAL was completed and released as Ames Laboratory Technical Report #IS-5138. Comparison of the results from the CEM and from the EPA Reference Method 29 samples collected during field tests at DIAL in September 1999 for the three elements monitored shows very good agreement between the methods.
- The Innovative Technology Summary Report (ITSR) for this project is completed.
- Generated a test plan of the CHRS in the ICPAES multi-metals CEM and the mercury monitoring system; both tests include validation by simultaneous sampling using EPA Reference Method 29; mercury testing includes background (SO₂) and chemical interference (HCl) tests.
- Carried out field tests of both the multi-element CEM and the on-line mercury monitoring system at DIAL in September 2000; simultaneous validation samples were collected using EPA Reference Method 29 (data not yet available from certified lab); field tests utilized stack conditions consistent with planned EPA-ETV mercury monitor tests including elevated HCl and SO₂; tests indicated successful pyrolysis of oxidized mercury (total mercury measurement) and correction for SO₂ interference.

Plans for the Next Quarter:

- Schedule and carry out collaborative experiments with LIBS developers at SNLL.
- Analyze data from September 2000 field test and compare with validation data.
- Complete and issue report on CEM tests.
- Plan improvements in mercury monitor based on test data analysis.

DISPOSITION OF FACILITIES (D&D)

METALS AND PIPES

TTP #: *CHI-5-C2-51*

PORTABLE X-RAY, K-EDGE HEAVY METAL DETECTOR

Principal Investigator: Terry Jensen, Center for Non-Destructive Evaluation/Ames Laboratory,
515-294-6788

Project Objectives:

The purpose of this work is to support Deactivation & Decommissioning (D&D) activities through development of improved X-ray, K-edge nondestructive techniques for detecting and quantifying uranium, plutonium, mercury, and other heavy metals located inside sealed containers or processing equipment. A prototype K-edge instrument was operated in a Large Scale Demonstration and Deployment Project (LSDDP) at the Savannah River Site (SRS). Feedback from this demonstration will be used to upgrade the data acquisition and analysis software.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Data Acquisition and Analysis Software	05/30/00	05/30/00

Accomplishments and Technical Progress:

- Completed project final report.

Plans for the Next Quarter:

- Project has ended.

FACILITY CHARACTERIZATION

TTP #: *FT0-0-C2-51*

TECHNOLOGY ASSESSMENTS AND TECHNOLOGY INTEGRATION

Principal Investigator: Dr. S.K. Dua, Florida International University, 305-348-1640
Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

A full-scale system for rapid, cost-effective, field radiological screening of large quantities of lead bricks and other shaped lead material is needed at Idaho National Engineering and Environmental Laboratory (INEEL) and is the focus of this project. An accelerated real-time volumetric radioassay of lead forms will be carried out to make a cost-effective determination of 1) How much lead has measurable radioactive contamination due to use by U.S. Department of Energy (DOE), and 2) How much lead may be free released for recycling into the scrap metal industry. Florida International University (FIU) will evaluate current technologies for handling and characterizing lead contaminated materials (including suitability, performance, risks/uncertainties) and make recommendations for the design of a system to meet the end-user needs.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Draft Report on Results of Detector Selection and Testing, System Component Testing, and Cost Savings Analysis to Allow Determination for Building Full-Scale System for Deployment at DOE Sites	06/01/00	06/14/00
2	Year-End Report Including Optimal Design of a Full-Scale System Able to Assay Large Quantities of Lead Brick Quickly and Effectively.	09/06/00	09/05/00
<i>Updates:</i> This milestone is behind approximately one to two months due to delay in awarding renewal of FIU Cooperative Agreement.			

Accomplishments and Technical Progress:

- Gamma spectra of 12 inch x 4 inch x 2 inch (thick) lead brick and of 8 inch x 8 inch x 1/4 inch (thick) lead wool were taken with Broad Energy Germanium (BEGe) spectrometer and analyzed using In-Situ Object Counting System (ISOCS) software to determine the presence of radioactive constituents in lead. These lead materials, after procuring from vendors, were

not used in any work where they could acquire radioactive contamination. The gamma spectrum analysis revealed that the main radioactive elements in lead were Ra-226, Pb-214 and Bi-214. Other radionuclides identified were Ac-228, Pb-212 and K-40. A small quantity U-235 could also be present (identified through 186 keV energy line in the spectrum similar to Ra-226). Ac-228, Ra-226, Pb-214 and Bi-214 are radioactive elements in U-238 series, and Pb-212 in Th-232 series. U-235 is present to the extent of about 0.7 % by mass (and 2% by activity) in natural uranium.

- Performance of the gamma spectrometer and ISOCS was tested by making measurements on gamma standards. The activity determined by using ISOCS software was very close to the activity of the standard sources.
- Data from the tests described above (gamma spectroscopy and ISOCS) were attached to the year-end report.
- A draft year-end report on the project was prepared and submitted.
- Prepared project update material and met a second time at INEEL with program managers and others regarding the Lead Assay project. Discussion focused upon the cost analysis for two design options submitted to INEEL in June versus disposal of all the lead at Envirocare. The two designs were developed by Hemispheric Center for Environmental Technology/Florida International University (HCET/FIU). INEEL pledged support for finalizing a quality cost analysis and lead assay design that could be used to recycle clean lead when the current atmosphere of no metal recycling subsidies and clean lead can be recycled among DOE sites.
- Gamma spectrometric systems received from Canberra were set up for checking efficiency and energy calibration. The BEGe is equipped with what can determine counting efficiency for various object geometries.
- Based on discussions with various vendors of technologies for robots and conveyor systems, a conceptual design of the lead assay system was prepared. The system is composed of a robot for lifting lead bricks and placing on a conveyor, a chute for guiding a brick to the detector system, and a BEGe/NaI detector system for measurement of contamination. The lead bricks that meet free release contamination criteria fall into a container, whereas those found to be contaminated, are pushed by a pushing device into a separate container for contaminated materials.
- Discussions were held with various companies to obtain price quotes on disposal of radioactive lead. Price quotes on material handling system (robots) and conveyor system were also obtained. These data were used for comparative assessment of the cost for direct disposal of lead as a waste and cost of characterization of contamination, disposal of lead that does not meet free-release criteria, and recycling (gain) of lead that meets the free-release criteria. Cost comparison was performed.
- Discussions were held with manufacturers/suppliers of material handling and conveyor systems for price quotes on these products. 3-D drawings of the entire system were prepared and sent to the vendors to enable them to assess the effort needed for supplying the system. The price quotes and throughputs will enable HCET/FIU to perform comparative cost-benefit analysis of the proposed system with the existing method of lead assay.
- Analyzed data received from INEEL about lead and instruments used at INEEL for scanning total contamination in lead and for measurement of loose contamination. Information about

quantity of lead in different categories [contaminated and uncontaminated (excess and in use), contaminated (excess and in use), contaminated (excess)], as well as the details of the total quantity of excess contaminated lead in different forms (shot, bricks, chunks/chips, sheet, wool, bulk, cask, other), is available now.

- Prepared presentation of project accomplishments and status for the Deactivation & Decommissioning Focus Area (DDFA) Mid-Year Review.
- From discussion with INEEL representatives, it was ascertained that lead is currently handled manually and that there is a need for technologies that provide easy handling of large quantities of lead in addition to detection of contamination. A search of companies that sell equipment for handling; storing; stacking; and banding materials, including lead, was performed. The vendors were contacted and catalogs of the products from 38 vendors of material handling and conveyor systems were obtained, and a review of technologies was performed.
- HCET/FIU personnel became familiarized with the operation of the gamma spectrometric system for determination of no-DOE-radiation-added for recycling. HCET/FIU has built a system called the "Large-Bore Pipe Radioassay System" consisting of three tractor trailer components costing over \$1M. The system will be deployed initially at nuclear power facilities to clean large-bore pipes and assay them to permit free release for recycling. The radioassay trailer will be useful as a test bed for this project and will be similar to the expected final lead assay system design. Instead of running a large number of large-bore pipes on a conveyor belt through a radioassay trailer to determine if the pipes are clean, the characterization system will convey lead bricks and other lead forms through to determine whether there is any radioactivity added to the lead material. For procuring gamma spectrometer for radioassay of lead suppliers of gamma spectrometers were contacted, and price quotes for their products were obtained. Procurement of final products was completed. System components include BEGe detector with ISOCS software for calculation of counting efficiency for various source geometries and a 3" x 3" sodium iodide (NaI) detector. Both BEGe and NaI detectors can be run using the same electronics.
- Analysis of Site Technology Coordinating Group (STCG) Needs and Project Baseline Summaries by HCET/FIU showed that Los Alamos National Laboratory (LANL) is also in need of "Accelerated Real-Time Volumetric Radioassay of Lead Forms." LANL points of contact have been contacted.
- In December 1999, based upon the preliminary discussions and site materials reviewed, HCET/FIU developed a detailed list of questions to INEEL to obtain information about the quantity of lead in different forms at INEEL and about the method previously used at INEEL for determination of no-DOE-radiation-added for lead bricks. The answers to these questions are necessary for the design on the volumetric lead assay system.
- A kickoff meeting was held at INEEL in October 1999 with 12 technical experts, Idaho STCG Coordinator, engineers and program managers from INEEL to discuss in detail performance requirements for an assay system for volumetrically contaminated lead.

Plans for the Next Quarter:

- Project is complete.

TTP #: FT0-0-C2-52

REAL-TIME BERYLLIUM MONITOR FOR SURFACE AND AIR SAMPLES

Principal Investigator: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project, with the investigator to be selected under a Request for Proposals (RFP) to be issued by the National Energy Technology Laboratory (NETL), aims to develop, certify, and demonstrate a prototype airborne and surface contamination real-time (or near real-time) Beryllium monitor.

Upon delivery and implementation of an instrumentation system, the Industrial Hygiene program at Rocky Flats would be able to provide the Deactivation and Decommissioning (D&D) program accurate, real-time measurements of the airborne beryllium concentrations for both area monitors and personnel monitoring, as well as beryllium contamination assessments of a wide variety of surfaces. The real-time results in these critical monitoring functions will result in reduced risk of exposure for the work force, and increased productivity for those D&D activities involving areas potentially contaminated with beryllium.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Fabricate Prototype Instrument for Surface/Airborne Beryllium.	09/30/00	

Updates: This milestone will not be completed until Fiscal Year (FY) 2001, due to delays in the award of the contract.

Accomplishments and Technical Progress:

- NETL awarded a contract under this solicitation to Science & Engineering Associates, Inc. (SEA) and its subcontractor, Lovelace Respiratory Research Institute (LRRI) on September 29, 2000. SEA proposed the development of a multi-function beryllium monitor based on laser induced breakdown spectroscopy (LIBS). This system will provide the capability to conduct continuous air monitoring for beryllium, analyze swipe or smear samples to detect beryllium contamination on surfaces and equipment, and provide a means of directly interrogating any accessible surface for beryllium contamination. The latter function, the “point and shoot” beryllium analysis, is useful for screening measurements and in those circumstances where it is difficult to obtain swipe samples, such as under painted surfaces.
- The instrumentation concept is expected to provide measurements of airborne beryllium to levels less than 0.2 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), and measurements of surface contamination to less than 0.2 micrograms per 100 square centimeters ($\mu\text{g}/100 \text{ cm}^2$) for swipe samples. The instrument will operate in a fully automated mode for the continuous air monitoring function and the swipe sample analysis mode. The system will provide an alarm

function, with the trigger level set by the operator. This development effort will include design, fabrication, calibration and field-testing of a manufacturing prototype instrument.

Plans for the Next Quarter:

- SEA will submit Management Plan report document to U.S. Department of Energy (DOE) for approval. A project Kickoff Meeting will be held. SEA will submit a Conceptual Design report to DOE for review and approval.

TTP #: NV0-5-C2-53

LASER-INDUCED FLUORESCENCE FOR ENVIRONMENTAL MANAGEMENT

Principal Investigator: John DiBenedetto, Special Technologies Laboratory, 805-681-2240

Project Objectives:

The Fiscal Year (FY) 2000 work scope consists of ensuring that the backpack portable Laser-Induced Fluorescence Imaging (LIFI) unit is ready for implementation to U.S. Department of Energy (DOE) Deactivation & Decommissioning (D&D) sites that have requirements for uranium survey characterization. Needs which may be effectively addressed by the LIFI unit include characterization of interior and exterior surfaces at sites that have been used for uranium processing or storage and of scrap components from such sites.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete LIFI Backpack Unit Documentation	06/30/00	06/30/00

Accomplishments and Technical Progress:

- Presentation of LIFI technology status at DOE/Nevada (NV) on August 28, 2000.
- Database Management System (DBMS) was developed in a collaboration between Special Technologies Laboratory (STL) and the Army Topographical Engineering Center (ATEC). The DBMS formed from a need requirement to store and retrieve field-gathered data quickly and efficiently. The partnership between STL and ATEC will serve to motivate other agencies and laboratories to adopt databasing methods for data storage and retrieval. The DBMS consists of a flexible data-entry and referencing method using ASCII tables; sophisticated search and retrieval methods; metadata storage and cross-referencing capability; and can generate plots and graphs using MatLab or incorporate custom plug-ins such as a Gaussian curve-fit module.
- Field LIFI/LIFS Data Acquisition & Processing Protocol has been documented. Briefly the protocol determines the primary objectives, performs an Off-site preliminary site survey and Off-site pre-deployment check; then On-site instrument preparation; documentation and data acquisition with On-site data storage and database input of acquired data takes place to allow

efficient Off-site data processing and analysis; and Off-site database archiving and reporting of experimental results.

- Image processing graphical user interface programs are being applied to other LIFI and LIFS data acquisitions. As part of the expanding uses for fluorescence detection, the LIFI and LIFS systems will be used in other remote sensing data collections. The data base concept is being applied to a data collection at Edwards Air Force Base for Oak Ridge National Laboratory (ORNL).
- Laboratory spectroscopy continues to be entered into the database as background for data collections which will occur in FY 2001.

Plans for the Next Quarter:

- Project has been successfully completed.
- Technology is ready for implementation.
- Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) developed technology will be used in other applications.
- Principal Investigator will continue to respond to DOE Environmental Management (EM) site needs.

FIELD PROGRAM ACTIVITIES

TTP #: *CHI-0-C2-31*

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY PROGRAM TECHNICAL SUPPORT

Principal Investigator: Williams Haas, Ames Laboratory, 515-294-4986

Project Objectives:

This project provides technical and programmatic support to the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). The Principal Investigator (PI) serves as CMST-CP project facilitator and undertakes other CMST-CP technical support tasks as assigned. The principal areas of emphasis are the TRU/Mixed Waste Focus Area (TMFA), MWFA support provided by the Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU), and the monitoring and control of emissions from mixed waste thermal treatment.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Date Due</i>	<i>Completion Date</i>
1	Prepare Draft Innovative Technology Summary Report (ITSR) on <i>Advanced Tensiometer Technology</i>	07/15/00	07/11/00

Accomplishments and Technical Progress:

- CMST Support to the TMFA:
 - Reviewed the preliminary CMST-CP gap analysis for the TMFA prepared by Stephan Weeks, CMST-CP Liaison to the TMFA; provided written comments on the same to Weeks. July 6, 2000.
 - Continued communication with Stephan Weeks, Special Technologies Laboratory (STL), CMST-CP Liaison to the MWFA, on topics of interest to the TMFA including: 1) Fiscal Year (FY) 2001 and 2002 plans, 2) TMFA needs and gap assessment, 3) U.S. Department of Energy (DOE) incineration operation plans, 4) Environmental Protection Agency (EPA) evaluation of particulate matter and mercury Continuous Emissions Monitors (CEMs), and 5) evaluation of High Efficiency Particulate Air (HEPA) filter performance.
- ITSR on *Compact High Resolution Spectrometer*:
 - Received notice that the ITSR, *Compact High Resolution Spectrometer* (Office of Science and Technology [OST] Tech. ID# 1564), has been officially approved for publication by OST Headquarters (HQ). August 20. Printed copies were received September 30.
- Draft ITSR on *Advanced Tensiometer*:
 - Sent the first draft of this ITSR to CMST-CP management. July 11.
 - Continued communication with Advanced Tensiometer PIs Buck Sisson and Joel Hubbell,

- Idaho National Engineering and Environmental Laboratory (INEEL); seeking additional technical information, cost data, and illustrations for the ITSR.
- With the help of Paul Wang, CMST-CP Liaison to the Subsurface Contaminants Focus Area (SCFA), and Carl Lanigan, DOE-Savannah River (SR), obtained a copy of the Accelerated Site Technology Deployment (ASTD) Plan for the Savannah River Site (SRS) Vadose Zone Monitoring System (VZMS) Project (SR0-9-SS-31). The plan contains considerable information, including cost estimates, related to deployment of Advanced Tensiometers (OST Tech. ID# 2122) as part of the VZMS. The information was crucial for the cost section of the ITSR on the *Advanced Tensiometer*. August 15.
 - Sent a revised (near final) draft of the ITSR on the Advanced Tensiometer (OST Tech. ID# 2122) for review by John Jones, CMST-CP Field Technical Lead, Joel Hubbell and Buck Sisson, the INEEL inventors, and by Heather Holmes Burns, SRS Project Manager, for the principal non-INEEL deployment of the technology (as part of the SRS VZMS at the E-Area Disposal Facility). August 31.
 - Received and began responding to review comments provided by John Jones. September 20.
 - Received and began responding to review comments provided by Joel Hubbell. September 26.
 - CMST-CP Project Facilitation: Reviewed and provided written comments to Tom Hylton on his draft report, "An Evaluation of a Dual Coriolis Meter System for In-line Monitoring of Suspended Solids Concentrations in Radioactive Slurries." July 6.
 - CMST-CP Road Mapping: Participated, by teleconference, in the CMST-CP Critical Technologies Road Mapping effort. July 10-11.
 - CMST-CP Deployable Technology: Per request from Charles Davis, CMST-CP Coordinator, provided information regarding a CMST-CP project, Zero Tension Lysimeters (OST Tech ID# 715), indicating this is a deployable CMST-CP technology. According to the CMST-CP Technology Summary Booklet (April 1994), the technology was deployed at the City of Ames, Iowa, Municipal Waste Facility in 1992-1993 and at the DOE Rocky Flats Site in 1993-1994. The contact persons for the deployments are identified in Technology Management System (TMS). September 15.
 - CMST-CP Highlight: Sent Joyce Curlee, CMST-CP Administrator, the following proposed input for a CMST-CP Highlight on the Dual Coriolis meter (OST Tech ID# 2970 and 2989):
The final report, "An Evaluation of a Dual Coriolis Meter System for In-Line Monitoring of Suspended Solids Concentrations in Radioactive Slurries," was printed September 8 and distribution is expected to begin immediately. Publication of the final report (under Technical Task Plan (TTP) OR17C231, Comparative Testing of Pipeline Slurry Monitors) fulfills the requirements for Milestone A.1-3, "Submit final evaluation of dual Coriolis monitor." The principal investigator is Tom Hylton, Oak Ridge National Laboratory (ORNL). Phone: 865-576-2225; email: hyltontd@ornl.gov. September 15.
 - CMST-CP Conference Calls: Participated in the CMST-CP team conference calls on August 9 and 23, 2000. Topics addressed included Critical Technologies Road Map, the FY 2000 CMST-CP Technology Summary Booklet, and updates on projects and activities.

- Manuscript on Implementing Mercury CEMs at Hazardous Waste Incinerators: Received information that the manuscript, "Implementing Mercury CEMs at Hazardous Waste Incinerators," by Nina Bergan French, Steve Priebe, and William Haas, has been accepted for publication in the October issue of *Pollution Engineering*. Sent three digital image files containing illustration material for the paper to Kathleen Tierney, Associate Editor, per her request. Sent additional references as well. August 7-8. Marked up an edited version of the manuscript provided by Tierney and provided written responses to her questions. Shared the same with the other authors. August 16.
- Manuscript on Status of Multimetal CEM Technologies: A feature article, "Status of Multimetal Continuous Emission Monitoring Technologies," by Nina Bergan French, William Haas, and Stephen Priebe, was published in the July 2000 issue of *Spectroscopy*. Preparation of the article was sponsored by the CMST-CP and the MWFA. Sent the URL, www.spectroscopymag.com/articles/0007_articles/0007_French/0007_French.html to members of the CMST-CP team. August 14.
- CMST-CP Technology Summary Booklet:
 - As requested by Jerry Lorenz, CMST-CP Document Specialist, reviewed five FY 2000 CMST-CP Technology Summary Booklet sections Lorenz sent by email on August 17, 2000. The sections were:
 - 02 TECHNOLOGY DEVELOPMENT FOR EM.DOC;
 - 03 CMST-CP OVERVIEW.DOC
 - 04 A BRIEF HISTORY .DOC
 - F1. APPENDIX A CMST HISTORY.DOC
 - COMPARATIVE MONITORING OF PIPELINE SLURRY MONITORS.
 Transmitted written comments/suggestions on those sections to Lorenz via fax. September 5.
 - As requested by Jerry Lorenz, provided additional information concerning the involvement of Leo Duffy, Clyde Frank, Thomas Grumbly, and others, in DOE Environmental Management (EM) and CMST-CP history. September 23.

Plans for the Next Quarter:

- Incorporate all the review comments into the final draft of the ITSR on the *Advanced Tensiometer* (OST Tech. ID# 2122) prior to CMST-CP Field Office submission of the same to OST HQ for final review and approval.
- Participate in the development of the CMST-CP Critical Technologies Roadmap.

TTP #: CHI-9-C2-11

TECHNICAL SUPPORT AND PROGRAM LIAISON TO TANKS FOCUS AREA

Principal Investigator: Glenn Bastiaans, Ames Laboratory, 515-294-3298

Project Objectives:

This task provides technical support and assistance in field coordination and program support for the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). It involves and contributes to identification of technology needs; assessment of technology requirements, capabilities, and limitations; promotion of technology integration; assessment of technology development opportunities; and program planning and implementation. Glenn Bastiaans works as a member of the combined U.S. Department of Energy (DOE) Headquarters (HQ) and Field CMST-CP management and implementation team, providing technical and other support, as directed, to the CMST-CP HQ Program Manager and the CMST-CP Field Manager.

A primary duty is to provide liaison to the Tanks Focus Area (TFA) for all collaborative technology development and technical oversight activities.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Technical Responses	02/28/00	01/28/00
2	Complete Draft Program Execution Guidance (PEG)	08/15/00	06/16/00
3	Prepare Draft Innovative Technology Summary Report (ITSR) on Topic to be Determined	07/15/00	08/08/00

Updates: First draft of ITSR on Raman probe has been submitted.

Accomplishments and Technical Progress:

- Technical Support to CMST-CP & TFA:
 - Slurry Monitors: Three monthly conference calls were held to review progress on dual Coriolis monitor cold testing and deployment reporting. The final report on an evaluation of the dual Coriolis monitor system deployed at Oak Ridge Reservation (ORR) was reviewed. It was subsequently published by Tom Hylton as an Oak Ridge National Laboratory (ORNL) report (ORNL/TM-2000/184). Preparations were begun, in collaboration with TFA, for an expert panel review of the dual Coriolis sensor bench testing and deployment system design being done at Hemispheric Center for Environmental Technologies/Florida International University (HCET/FIU).
 - Raman Corrosion Probe. Weekly conference calls to facilitate progress in the deployment of the Raman probe were held throughout the quarter. Bastiaans made a site visit to EIC Inc. in Norwood, Massachusetts, on July 28, 2000. In collaboration with TFA and with

- Stephan Weeks, \$53K in additional funding was arranged for the contract with EIC Inc. to complete deployment mechanism fabrication and all cold test activities. Budgets and work schedules were developed that plan for completion of all aspects of this project by June 1, 2001. A subcontract from EIC Inc. to Hiline Engineering for deployment mechanism fabrication was approved by DOE-Nevada (NV).
- Nondestructive Evaluation for Tank Safety: A project kick-off meeting with two personnel from The Center for Nondestructive Evaluation (CNDE) was held in Richland, Washington, August 1-3, 2000. Following conference calls, visits were made to and meetings held with personnel from five DOE sites to discuss needs and current activities in the area of Tank Integrity Assurance. Planning was done to hold a Workshop on Tank Integrity at the end of October.
 - West Valley Tank Characterization: At the request of TFA, a PEG and technology provider recommendations were prepared for the development of technology to determine the amount of residual transuranic elements that remain on the walls and bottoms of two tanks at the West Valley Demonstration Project.
 - Liaison to Diagnostic Instrumentation and Analysis Laboratory (DIAL): Bastiaans and Tom Thomas held a conference call with John Plodinec of DIAL to discuss the development of expectations and decision points for all DIAL projects being undertaken in support of TFA and CMST-CP.
 - Technical Support to CMST-CP:
 - Facilitation of 3M Empore Membrane Project: Bastiaans, in collaboration with Bruce Friedrich, paid a site visit to 3M as facilitator for the 3M Empore Membrane Project. After reviewing technical progress, potential paths forward for further developments and deployments were discussed. Following the visit, Bastiaans and Friedrich held a conference call with Paul Wang, CMST-CP liaison to Subsurface Contaminants Focus Area (SCFA), in order to plan Focus Area (FA) review and a matching of needs to the Empore Membrane technology.
 - CMST-CP Program Support: Bastiaans participated in the CMST-CP conference calls held this quarter and attended a meeting at DOE-NV July 10-11, 2000, to prepare a road map for long-term planning purposes. Written material for the CMST-CP Road Map was prepared and submitted to DOE-NV. Visits were made to DOE-NV on two additional occasions this quarter while in route to Richland, Washington. During these visits, the Technical Program Officer (TPO) and CMST-CP management and staff were briefed on the status of CMST-CP/TFA collaborative work.

Plans for the Next Quarter:

- Weekly conference calls will be held to facilitate deployment of the Raman Tank Corrosion Probe at Savannah River Site (SRS). Periodic conference calls will be held among representatives from TFA, FIU, ORNL, and SRS to facilitate slurry monitor development work.
- Bastiaans will join other CMST-CP liaisons and DOE-NV personnel at a meeting to complete development of the CMST-CP Road Map. The meeting will be held November 2-3, 2000, at DOE-NV.
- Bastiaans will help TFA and CNDE personnel hold a Workshop on Tank Integrity Assessment on October 31 through November 1, 2000, in Atlanta, Georgia.

- Bastiaans will participate with TFA personnel in an expert panel review of slurry monitoring work at the HCET/FIU in Miami, Florida, on October 24, 2000.
- Bastiaans will join Tom Thomas and Betty Carteret of TFA in a site visit to SRS on October 25-26, 2000. During the visit, deployments of two different sensor systems will be discussed as well as plans and needs for in-tank sampling and long-term monitoring.
- Bastiaans will continue to supply CMST-CP management with updated project status, milestone, and spending information for the monthly Business Review, weekly Program Highlights, and other programmatic information.
- Bastiaans will continue to assist in the preparation of the CMST-CP Road Map.
- Bastiaans will revise and enhance the first draft of an ITSR on the Raman Corrosion Probe.

TTP #: CH2-7-C2-61

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY PROGRAM TECHNICAL SUPPORT

Principal Investigator: Bruce Friedrich, University of Iowa, 319-626-7947

Project Objectives:

Provide technical support and assistance in field coordination for the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). Serve as project facilitator for CMST-CP projects assigned by the CMST-CP field program manager. Monitor the technical progress and schedule status, perform an annual on-site review of technical progress, and transmit review reports to the Principal Investigator (PI) and CMST-CP Field Program Manager. Write Innovative Technology Summary Reports (ITSR) for projects assigned by the Field Program Manager.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Prepare Draft Innovative Technology Summary Report (ITSR) on Topic to be Determined	07/15/00	07/15/00

Accomplishments and Technical Progress:

- Completed an ITSR entitled *Real-Time Monitor for Transuranics in Glass* (Technology Management System [TMS] #2004). The draft has been submitted to Headquarters (HQ).
- Participated in a review of CMST-CP project on the 3M Company (DE-AR21-96MC33089).

Plans for the Next Quarter:

- Complete the final draft of the ITSR described above after receiving comments from HQ.

TTP #: FT0-0-C2-61

TECHNICAL AND PROGRAMMATIC SUPPORT TO THE CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM

Principal Investigator: David Roelant, Florida International University, 305-348-6625

Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project provides program support and expert technical assistance in technical integration and field coordination for the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). The activities involve and contribute to identification and assessment of CMST-CP capabilities, limitations, needs, and technology performance requirements; promotion of technology integration, implementation, and commercialization; assessment of technology development opportunities; and program planning and execution. Some specific activities include collecting and inputting data on CMST-CP projects into the Technology Management System (TMS) database and the CMST-CP database, regular updating of technology deployment information, and technical and programmatic support to CMST-CP management. Additionally, Hemispheric Center for Environmental Technologies/Florida International University (HCET/FIU) will support CMST-CP liaisons with analysis of Site Technology Coordination Group (STCG) needs to help identify performance requirements, whether technology exists for the needs, to capture real technology gaps, and document in a gap analysis report.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Submit Needs Gap Analysis Reports	05/15/00	05/08/00

Accomplishments and Technical Progress:

- All tasks for this project have been completed and funding has been spent.

Plans for the Next Quarter:

- None.

TTP #: NV0-6-C2-61

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY MANAGEMENT AND TECHNICAL SUPPORT FOR MIXED WASTE FOCUS AREA

Principal Investigator: Stephan Weeks, Special Technologies Laboratory, 805-681-2262

Project Objectives:

This project provides technical and administrative support for Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) projects associated with the TRU/Mixed Waste Focus Area (TMFA). The Principal Investigator (PI) will provide technical expertise, leadership, and assessments to facilitate various projects under CMST-CP; respond to CMST-CP information requests; conduct technical studies; assist in reports, cost savings, and other designated CMST-CP activities, as directed; develop and administer the public and team World Wide Web (WWW) sites; and champion technologies where applicable. Activities include support the identification of technology needs; assessment of technology requirements, capabilities, and limitations; prioritization of technology development activities according to the impact of cost savings for U.S. Department of Energy (DOE) sites; issuance of solicitations that seek solutions in the identified high-priority technology deficiency areas; technical monitoring of the progress of projects; program planning and implementation; and promotion of technology deployments to meet DOE site cleanup objectives. Major task activities also include helping to coordinate the CMST-CP input to the TMFA Annual Review.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Facilitator Reports on Assigned Projects	03/31/00	
<i>Updates:</i> Delayed in order to coincide with scheduled project demonstrations in September/October.			
2	Prepare Draft Innovative Technology Summary Report (ITSR)	07/15/00	
<i>Updates:</i> Delayed in order to coincide with performance testing scheduled for August/September.			

Accomplishments and Technical Progress:

- Demonstrations of AMES multi-metal Continuous Emissions Monitor (CEM) and mercury (Hg) CEM at Diagnostic Instrumentation and Analysis Laboratory (DIAL) developed under CH17C233, *Development of a Multi-element Metal CEM for Compliance Monitoring - (Technology Management System [TMS] Tech ID# 1564).*
- Presentation "Determination of Corrosion Species in High-Level Nuclear Waste Using Raman Spectroscopy," David Hobbs, Job Bello and R. Forney, Westinghouse Savannah River

- (WSRC)-MS-2000-00292, American Chemical Society National Meeting, August 21, 2000.
- Completed review and submission of CMST-CP related TRU/Mixed Waste Focus Area (TMFA) long-form Technical Task Plans (TTPs).
 - CMST-CP Technical and Programmatic Support:
 - Technical liaison support to TMFA Effluent Monitoring and Waste Characterization.
 - Completed review and submission of CMST-CP related TMFA long-form TTPs. Completed drafts of long-form TTPs for review and approval by CMST-CP Field Office and TMFA Product Line Managers: Compare Mercury CEMs; Continue Dioxin/Furan Formation and Prevention Studies; CMST-CP Technical Execution - DIAL and AOT; reviewed long-form TTP “Demonstrate Acousto-Optic Tunable Filter (AOTF) Multi-element Metal CEM for Compliance Monitoring.”
 - Participated in the Kick-Off meeting via teleconference for the Environmental Protection Agency (EPA) U.S. Department of Energy (DOE) Technical Work Group (TWG) for Memorandum of Understanding (MOU) Project on HEPA Filter Performance and Monitoring, July 25, 2000, at DIAL and in following TWG conference calls.
 - Attended the multi-metal and Hg CEM demonstrations at DIAL and had project discussions with DIAL staff. Submitted Highlight for Multi-metal and Hg CEM field tests at DIAL.
 - Initiated information collection for effluent monitoring technologies for Alternatives to Incineration
 - Attended the Dioxin 2000 Symposium (20th International Symposium on Halogenated Environmental Organic Pollutants and Persistent Organic Pollutants (POPs), August 14-17, 2000, and participated in discussions at SRI on the National Energy Technology Laboratory (NETL) jet-REMPI Dioxin CEM project, as well as in a meeting of the EPA/DOE TWG on Dioxins.
 - Reviewed papers as requested by the TMFA Effluent Monitoring Product Line Manager and proposals submitted in response to DOE Deactivation & Decommissioning (D&D) Request for Proposal (RFP) for the Be monitor.
 - Participated in the CMST-CP Critical Technologies Road Map meeting, July 10-11, 2000. Provided written contributions to draft CMST-CP Road Map. Drafted preliminary CMST-CP Gap Analysis for CMST-CP related TMFA needs.
 - FACILITATED PROJECTS:
 - *Integrated Raman/Electronic Noise probes for in-tank Corrosion Monitoring (TMS Tech ID# 2015):*
 - ★ HiLine Engineering has been selected as the new subcontractor to fabricate the deployment device. EIC has received subcontractor approval from DOE-Nevada (NV) and fabrication of the deployment device is to begin in October 2000; cold acceptance test of deployment and probe system is scheduled in March 2001 at HiLine in Richland, Washington.
 - ★ Job Bello supported customer completion of hot cell test analyzing actual waste using the Raman spectroscopy probe; David Hobbs (WSRC) gave a presentation, “Determination of Corrosion Species in High-Level Nuclear Waste Using Raman Spectroscopy,” at the American Chemical Society National Meeting, August 21, 2000. A report on the hot cell testing of the fiber-optic Raman Spectroscopy probe is being reviewed.

- ★ PI submitted long-form TTP and task plan to NV Operations Office Technical Program Officer (TPO) for project extension into FY 2001; supported approval for new EIC subcontractor for fabrication of deployment device.
- *Development of a Multi-element Metal CEM for Compliance Monitoring - Compact High Resolution Spectrometer (CHRS) project (TMS Tech ID# 1564):*
 - The project field tested a multi-metal CEM and a Hg CEM September 16-26, 2000, at DIAL. EPA Reference Method 29 samples were collected and sent to an outside laboratory for analysis. The field test report will be finalized after EPA Reference Method 29 results are received. The two CEMs are based upon the CHRS. The metals air-Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) uses a multifrequency AOTF to preselect atomic emission lines for detection with a Charged Coupled Device (CCD). The Hg CEM utilizes the echelle CHRS system in the absorption mode.
 - The PI is coordinating tasks with EPA ETV Hg CEM performance testing and TSCA Hg CEM comparison task, as well as facilitating other CHRS applications and commercialization.
 - CHRS ITSR was completed (Haas) and published.
- *Innovative Technology Summary Reports (ITSR):*
 - The PI continues working with CMST, TMFA, EPA, DIAL, Florida International University (FIU), and others on developing an ITSRS for technologies that will be ready for implementation at a DOE sites, including □ *Laser-Induced Breakdown Spectroscopy (LIBS) CEM* (TMS Tech ID# 18), *Ground-based Laser-Induced Fluorescence Imaging (LIFI)* □ (TMS Tech ID# 1999), *Hg CEM* (TMS Tech ID# TBD), and *Particulate Monitoring CEM* (TMS Tech ID# 2973/2932).
- *CMST-CP Internet Pages:*
 - Revisions to the new CMST-CP Field Office web site were posted on the CMST-CP Team site for review and comment.

Plans for the Next Quarter:

- Continue to provide technical and programmatic support for CMST-CP and TMFA.
- Continue liaison tasks with TMFA.
- Continue completion of new CMST-CP Field Office public web site for review.
- Participate in CMST-CP Road Map & Strategic Planning meeting, November 2-3, 2000.
- Attend the EPA/Air & Waste Management Association Information Exchange, December 5-6, 2000, and American Society of Civil Engineers (ASME) Research Committee meeting on December 7, 2000.
- Continue completion of draft of ITSRS assigned.
- Support web page functions as directed by CMST-CP Field Office personnel.

TTP #: NV0-9-C2-41

TECHNICAL AND PROGRAM SUPPORT FOR NUCLEAR MATERIALS FOCUS AREA

Principal Investigator: Paul Hurley, Special Technologies Laboratory, 805-681-2472

Project Objectives:

This task provides technical and program support for future Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) related projects in the Nuclear Materials Focus Area (NMFA). The principal role for this task is to serve as the liaison from CMST-CP to NMFA and provide technical and program support to the NMFA and CMST-CP field and Headquarters (HQ) program managers. Other tasks for this project include facilitation for several other CMST-CP related projects.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	CMST-CP Kick-Off Meeting Presentation	10/31/99	10/05/99
2	NMFA Technology Assessment Report	09/30/00	10/31/00

Accomplishments and Technical Progress:

- Met with Stan Wolf, the new Headquarters (HQ) Program Manager of NMFA.
- Participated in weekly conference calls.

Plans for the Next Quarter:

- Attend NMFA Needs meetings in Richland, Washington; Las Vegas, Nevada; and Savannah River, South Carolina; all in October.

TTP #: NV0-9-C2-61

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM TECHNICAL & PROGRAM SUPPORT FIELD COORDINATION

Principal Investigator: Charles B. Davis, Professional Analysis Inc./Bechtel Nevada, 702-295-0541

Project Objectives:

The primary objective of this project is to provide overall coordination of the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). As part of this coordination, responses to requests from Headquarters (HQ) for information, plans, tables, and other documents will be drafted using information obtained from the CMST-CP Team. Management and planning documents will be created as appropriate to assure good program management and document program performance.

Major Milestones:

No.	Milestone Title	Due Date	Completion Date
1	Deliver CMST-CP Annual Performance Plan (APP)	09/30/00	Cancelled
<p><i>Updates:</i> This milestone has been cancelled; the APP is no longer required from crosscutting programs</p>			
2	Deliver CMST-CP Multi-Year Program Plan (MYPP) Contributions to Focus Areas (FAs)	08/15/00	Cancelled
<p><i>Updates:</i> This milestone has been cancelled; the CMST-CP liaisons to the FAs provide input to the FA gap analyses and needs response analyses, which are reflected in FA planning including the FA MYPPs.</p>			
3	Prepare Draft Innovative Technology Summary Report (ITSR)	07/15/00	
<p><i>Updates:</i> Anticipated completion 10/30/00; topic is TechID 2237, which has been expanded and retitled <i>Induced Fluorescence Sensors for Direct Push Systems</i> to include all similar systems which have been developed, tested, and/or demonstrated under Office of Science and Technology (OST) except for Industry Program's (INDP) (TechID 873).</p>			
4	Prepare CMST-CP Technology Summary-Fiscal Year (FY) 2000	08/31/00	09/26/00
<p><i>Updates:</i> Published on CMST-CP Website and OST Publications Page 09/26/00; currently at printer.</p>			

Accomplishments and Technical Progress:

- Reviewed, edited, and/or submitted to U.S. Department of Energy (DOE) HQ for publication ITSRs: *Subsurface Barrier Validation with the SEAttrace™ Verification and Monitoring System* (TechID 308), *Real-Time Monitor for Transuranics in Glass* (TechID 2004), *Advanced Tensiometer - Integrated Geophysical Characterization* (TechID 2122), and *Adaptive Sampling and Analysis Plans (ASAPs)* (TechID 2946).
- Provided ongoing maintenance of information on CMST-CP technologies in the Technology Management System (TMS) database. Provided impetus for forming/resurrecting TMS Users Group to provide knowledgeable field input to evolution of TMS and related OST data resources.
- Prepared *Characterization, Monitoring, and Sensor Technology-Crosscutting Program Technology Summary Fiscal Year 2000*; posted this on CMST-CP Website and OST Publications Page; delivered to printer.
- Prepared materials for and participated in Third Quarterly Business Review in support of FAs and Technical Program Offices.
- Provided management support to DOE/Nevada (NV) personnel regarding budget,

management, planning, and quarterly business reporting matters.

- Participated in joint DOE/Environmental Protection Agency (EPA) Workshop on emerging regulations which will impact the TRU/Mixed Waste Focus Area (TMFA).
- Provided public docket review comments on U.S. EPA's draft *Handbook of Groundwater Policies for Resource Conservation and Recovery Act (RCRA) Corrective Action* (updated April 20, 2000).
- Participated on review of responses to the Request for Proposal (RFP) for Surface and Airborne Beryllium Monitors, a CMST-CP/INDP/Deactivation & Decommissioning Focus Area (DDFA) collaboration.
- Assisted in the preparation and submission of FY 2001 Program Execution Guidance (PEGs) and Technical Task Plans (TTPs) using the new Work Authorization Module (WAM) software.
- Participated in OST Communications Working Group meeting in Gaithersburg, Maryland, August 9-10, 2000.
- Participated in Fourth International Conference on Environmetrics and Chemometrics in Las Vegas, Nevada, September 18-20, 2000; presented paper "Robust Upper Confidence Limits for Mean Concentrations with Substantial Nondetect Proportions."
- Participated in SPECTRUM 2000, Chattanooga, Tennessee, September 25-28, 2000.

Plans for the Next Quarter:

- Continue to provide program coordination with regard to budget, management, planning, and business reporting matters.
- Take lead role in CMST-CP Road Mapping activities; organize and participate in CMST-CP Road Mapping Meeting in Las Vegas, Nevada, November 2-3, 2000.
- Review, edit, and/or submit several CMST-CP ITSRs to DOE HQ for publication.
- Complete ITR: *Induced Fluorescence Sensors for Direct Push Systems* (TechID 2237).
- Distribute *Characterization, Monitoring, and Sensor Technology-Crosscutting Program Technology Summary: Fiscal Year 2000*.
- Participate in Lawrence Livermore National Laboratory (LLNL) Workshop on Environmental Monitoring, particularly side meetings of DOE Ground Water Protection Work Group.

TTP #: FT50504

TECHNICAL SUPPORT TO CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM

Principal Investigator: Paul Wang, Concurrent Technologies Corporation, 412-577-2648

Project Objectives:

The objective of this effort is to work with the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) managers and field support teams to help implement the CMST-CP multi-year program and to provide a technical lead to address the needs related to groundwater and soil problems.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Assist in Technology Gap Analysis and Documentation of Response to Site Technology Coordination Group (STCG) Needs	04/30/00	03/31/00

Accomplishments and Technical Progress:

- Finalized and delivered the draft Innovative Technology Summary Report (ITSR) on the *Adaptive Sampling and Analysis Programs* (Office of Science & Technology [OST] #2946). After receiving and incorporating the Principal Investigator's (PI) review response, a final, revised draft was sent to U.S. Department of Energy/Nevada (DOE/NV) for management approval on September 13, 2000. Delivery of this report fulfills all of the Fiscal Year (FY) 2000 deliverable requirements of this task.
- As requested by the Subsurface Contaminants Focus Area (SCFA) and CMST-CP management, reviewed and provided comments on the draft "Long-Term Stewardship Needs Assessment and Technology Baseline Inventory 2000" document. The comments address 1) preliminary categories as provided in Attachment 1, 2) technologies and technology needs that have been overlooked, and 3) general concerns.
- In his role as CMST-CP liaison to the SCFA, Mr. Paul Wang of Concurrent Technologies Corporation (CTC), with support from Dr. Bruce Friedrich of CTC, prepared and submitted two draft sections on improved characterization and long-term monitoring for inclusion in the DOE Office of Environmental Management (EM) CMST-CP Road Map report. Comments on the draft Road Map report will be sought in the next few months by the DOE/NV, and the final report is targeted for publication by the end of December 2000.
- As requested, revised the statement of program objectives for the upcoming DOE industry solicitation for applied research and exploratory development of technologies addressing soil and groundwater contamination. The revision includes a table of technology areas with corresponding Needs Management System (NMS) associated needs and Environmental Management Science Program (EMSP) related research references, as well as general references and a statement of research needs.
- Also at the request of the SCFA and CMST-CP management, reviewed four short Technical Task Plans (TTPs): 1) SR-16C2-21, Cone Penetrometer Sensor Testing and Evaluation; 2) SR-17C2-21, Innovative Dense Non-Aqueous Phase Liquids (DNAPLs) Characterization Technologies; 3) RL-35C2-23, Joint Coordinating Committee for Environmental Restoration and Waste Management (JCCEM) Contaminant Transport Modeling; and 4) AL-21SS-01, Cover Performance Verification and Long-Term Monitoring System. In addition, prepared two placeholder short TTPs: 1) NV0-0-C2-21, "Evaluation of Long-Term Monitoring Technologies," and 2) NV0-1-C2-21, "Implementation of Geophysical Techniques for DNAPL Delineation."
- Continued to plan the effort of an independent assessment of the passive magnetic resonance technique to image subsurface contamination, also known as the Geocolog. Mr. Wang attended a panel meeting on July 18-19, 2000, at Fernald. The panel effort was requested by

Lawnie Taylor of DOE Headquarters (HQ). Subsequently, DOE HQ decided to follow an established peer-review process under the auspices of the American Society of Mechanical Engineers (ASME). The work of the original review team assembled was redirected to correlate imaging results of this technique with confirmatory test results at Oak Ridge, Fernald, and Ashtabula in support of the ASME review, which was conducted on September 19, 2000. Major findings of the review panel included the unknown scientific principles on which this technology is based and lack of confirmatory data to corroborate the results of the technology. The review panel report has been sent to the technology providers for comments.

- In his role as CMST-CP liaison to the SCFA, Mr. Wang attended the Long-Term Stewardship Workshop on August 7-9, 2000, in Denver, Colorado. He participated in the Science and Technology session to obtain relevant information for inclusion in the draft CMST-CP Road Map report.
- Mr. Wang also participated in the CMST-CP Road Map Kickoff meeting on July 10-11, 2000, in Las Vegas, Nevada. In his role as CMST-CP liaison to the SCFA, Mr. Wang presented the strategy for addressing long-term stewardship and groundwater and soil contamination. His presentation included information on CMST-CP technology development pathways for environmental restoration.
- Ms. Tiffany Zachry of CTC continued to assist in redesigning the CMST-CP public website. Continued work on the second-tier pages of the website, and posted many of those pages to the draft website for review during the July CMST-CP Road Map Meeting.
- Ms. Zachry presented the paper titled "Publications Management from an Ecological Perspective: Three Documentation Case Studies" during the International Professional Communication Conference/Special Interest Group in Documentation (IPCC/SIGDOC) 2000 Conference held September 24-27, 2000, in Boston, Massachusetts. The conference is jointly sponsored by the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM). The paper was also published in the peer-reviewed conference proceedings.
- Monthly reports regarding work performed for this task in June, July, and August 2000 were prepared and submitted as requested to the National Energy Technology Laboratory (NETL).

Plans for the Next Quarter:

- Activities in support of the SCFA will be coordinated and level-of-support work requested by the CMST-CP management team will be provided.