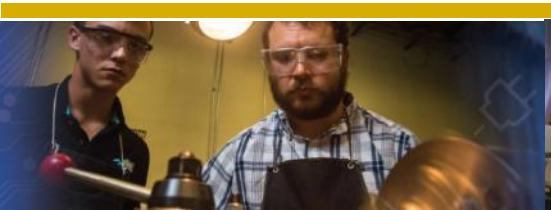
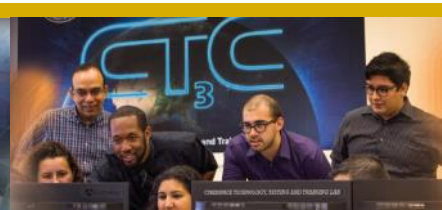



DOE-EM Cooperative Agreement FIU Performance Year 6 Research Review

Presented: April 5 - April 7, 2016
to the U.S. Department of Energy
Dr. Leonel Lagos, PhD, PMP® (Principal Investigator)

Florida International University



FIU-DOE Research Review

Tuesday April 5, 2016	Wednesday April 6, 2016	Thursday April 7, 2016
1:00-2:30 High Level Waste / Waste Processing (FIU Project 1)	10:00-12:00 Workforce Development & Training (FIU Project 4)	**10:00-12:00** **Wrap Up** **(All Projects)**
2:30-4:00 D&D/IT for EM (FIU Project 3)	1:00 - 3:00 Soil/Groundwater (FIU Project 2)	

Presentations available at doeresearch.fiu.edu

Florida International University

FIU is a vibrant, 55,000 student-centered public research university located in Miami, Florida. FIU is worlds ahead in its commitment to learning, research, entrepreneurship, innovation, and creativity so that graduates are prepared to succeed in a global market.

FIU is among the largest Hispanic-serving institutions in the U.S. and is designated a Minority-Serving Institution.

As a top-tier research institution, FIU emphasizes research as a major component in its mission.

FIU averages over $100 million in research annually.

FIU's Applied Research Center Serves as a Portal to FIU

- Founded in 1995, ARC has executed over $94 million in research with DOE, DoD, other Federal and State Agencies as well as private industry.
- ARC's Portal Concept provides ease of access to FIU's Colleges and Centers to facilitate collaborative research.
- ARC's mission is to provide world-class R&D and technology solutions to clients.
- ARC's multicultural, multilingual staff are client service-oriented professionals and include Project Management Professionals (PMP®) and Professional Engineers (PE).
- Successful Workforce Development Programs.

DOE-FIU Cooperative Agreement History

- **Dates**
  - **November 1995** – EM awarded a five-year Grant to FIU to develop expertise in decontamination and decommissioning, high-level waste tank, and characterization innovative technologies to solve EM environmental restoration challenges.
  - **October 2000** – EM awarded FIU another 5-year Grant.
  - **February 2005** – EM awarded a new 5-year Cooperative Agreement Renewal Award for continuation of services with FIU.
  - **April 2007** – EM & FIU established a STEM student workforce development "pipeline" initiative – DOE Fellows Program.
  - **May 2010** – EM renewed FIU's 5-year Cooperative Agreement.
  - **August 2015** – EM renewed FIU's 5-year Cooperative Agreement.
- FIU's expertise and facilities evolution stem from support of T&E under the former large-scale demonstrations initiated by the D&D Focus Area.
- The history between DOE EM and FIU has developed a relationship that allows a unique integration and collaboration of national experts at DOE national labs and sites, FIU faculty and ARC researchers, and FIU minority STEM students to provide technical solutions for DOE's high priorities/high impact environmental challenges.

DOE-FIU Cooperative Agreement Boundaries & Restrictions

- Contractual funding limit of $4M/year.
- Scope vs funding (FIU Performance Year 6 fully scoped at $4M).
- New scope can only be added if existing scope is removed/reduced as long as all stakeholders are in agreement:
  - New scope added during performance year requires PTP modification and stakeholders concurrence. Scope change and impact will be documented, including impact to student graduate studies.
  - New scope added for subsequent performance years. Requires stakeholders concurrence, and inclusion in CA and PTPs.
  - In either case, scope/research has to be consistent with Cooperative Agreement restrictions.
- Basic/fundamental, proof of principle, laboratory, prototyping, experimentation research (TRL 3 & below).
- Requests for new research on top of $4M Agreement must be initiated from DOE and follow their review/approval requirements.
- Research to be performed by/at FIU.

DOE-FIU Continuation Application Development

March and April 2016: FIU discusses potential scope of work with DOE site customers/stakeholders, DOE EM HQ, and experts from the national laboratories. **Scope is determined in a reiterative manner with the HQ mission offices.**

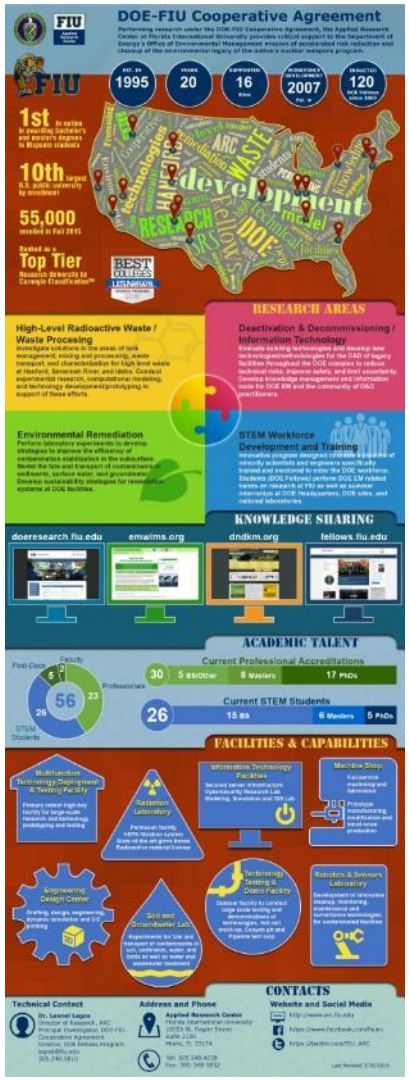
April and May 2016: FIU develops a Continuation Application (Volumes 1, 2, and 3) including accomplishments, the scope of work for the next performance year, and the budget and justification.

May 7, 2016: All recommendations for scope from DOE stakeholders is needed in order to be included in the next performance year. FIU obtains DOE/site concurrence on planned scope.

May 17, 2016: FIU submits the full CA to the FIU Office of Research.

May 27, 2016: FIU Office of Research submits the final CA to DOE.

DOE-FIU Cooperative Agreement



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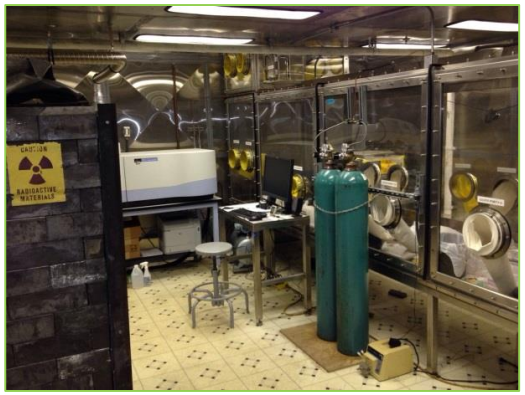
Applied Research Center Facilities

FIU Applied Research Center





Robotics & Sensors Lab - Technology Testing & Demonstration Facility – Radiological Lab – Analytical Chemistry Lab – Soil & GW Lab – Multi-Function High Bay – GIS Lab – Cybersecurity Lab – Secure Server Room – Engineering Design Center – Machine Shop

Cooperative Agreement Research Areas and Impact on DOE EM Environmental Restoration Mission

FIU Applied Research Center

High Level Waste/Waste Processing

Project 1: Chemical Process Alternatives for Radioactive Waste

DOE Technical Challenge: Managing safe and effective retrieval and treatment of high level waste from tanks at Hanford and Savannah River sites.

FIU Research: Modeling and analysis of waste feed mixing processes, instrumentation for in tank applications, and development of robotics/remote systems for inspection of tank bottoms.

Cooperative Agreement Research Areas and Impact on DOE EM Environmental Restoration Mission

FIU Applied Research Center

Soil and Groundwater Research & Modeling

Project 2: Environmental Remediation Science & Technology

DOE Technical Challenge: Managing the environmental restoration of subsurface contamination in soil and groundwater.

FIU Research: Employing laboratory experimentation as well as hydrologic and remediation analytical tools and software to understand the fate and transport of radionuclides and heavy metal contamination in soil and groundwater at DOE sites like Hanford, Savannah River, and WIPP.

Cooperative Agreement Research Areas and Impact on DOE EM Environmental Restoration Mission

FIU Applied Research Center

D&D and Information Technology for DOE EM

Project 3: Waste and D&D Engineering and Technology Development

DOE Technical Challenge:

Waste & Materials Disposition: 1) Managing waste forecast information for planned treatment/disposal across the DOE complex;

D&D: 2) Completing the D&D of active/excess/abandoned facility to a final disposition end state in a timely and safe manner; 3) Preserving and transferring D&D knowledge and information to assist future D&D projects and the future workforce.

FIU Research: 1) Providing a web-based tool to receive, organize, and report DOE waste forecast data from across the complex via a common application which provides efficiency to waste disposition decision making. 2) Providing D&D technology innovation, development, and evaluation results and information needed to complete challenging D&D safely and effectively. 3) Maintains and preserves the D&D knowledge base by enhancing communication, information sharing and distribution, and collaboration within the D&D community of practice.

Cooperative Agreement Research Areas and Impact on DOE EM Environmental Restoration Mission

FIU Applied Research Center

Workforce Development

Project 4: DOE-FIU Science & Technology Workforce Development

DOE Challenge: A significant portion of the EM workforce (DOE & contractors) is nearing retirement age, contributing to a shortage of a well-trained technical workforce to continue EM's mission.

FIU Research: Providing a pipeline of STEM students trained and mentored to enter the DOE workforce in technical areas of need - the DOE Fellows traineeship program.

Graduate Degrees Based on DOE EM Research

DOE EM based research on the Cooperative Agreement projects are the basis of master's degree theses and PhD dissertations completed or currently in progress (DOE Fellows & graduate students).

Graduate Thesis / Dissertations 2014-2016

Name	Degree	Major	Grad
Sandra Herrera	MS	Environmental Engineering	Exp. Spring 2016
Robert Lapierre	MS	Chemistry	Exp. Summer 2016
Natalia Duque	MS	Water Resources Engineering	Exp: Fall 2016
Claudia Cardona	PhD	Environmental Engineering	Exp: Summer 2016
Kavitha Megalageri	MS	Engineering Management	Fall 2015
Santosh Joshi	MS	Engineering Management	Fall 2015
Paola Sepulveda-Medina	MS	Biomedical Engineering	Spring 2014
Revathy Venkataraman	MS	Information Technology	Spring 2014
Sandhya Appunni	MS	Computer Science	Spring 2014

Publications 2015-2016

Peer Reviewed Journals

- Sepulveda-Medina, P., Y. Katsenovich, V. Musaramthota, M. Lee, B. Lee, R. Dua, L. Lagos. 2015. The Effect of Uranium on the Bacterial Viability and Cell Surface Morphology Using Atomic Force Microscopy in the Presence of Bicarbonate Ions. *Research in Microbiology*.
- Sepulveda-Medina, P., Y. Katsenovich, D. Wellman, L. Lagos. 2015. The Effect of Bicarbonate on the Microbial Dissolution of Autunite Mineral in the Presence of Gram-Positive Bacteria. *Environmental Radioactivity*.
- Poppiti, J., R. Sheffield. (2016). Investigation of an accidental radiological release in an underground disposal facility. *Operational Radiation Safety*, 110 (2), S39-S47.
- Cai, Y., Ping Jiang, P., Li, Y., Guangliang Liu, G., Yang, G., Lagos, L., Yin, Y., Gu, B., Jiang, G. (2015). Evaluating the Role of Re-adsorption of Dissolved Hg2+ during Cinnabar Dissolution Using Isotope Tracer Technique. *Journal of Hazardous Materials.*
- Ngachin, M., Galdamez, R.G., Gokaltun, S., Sukop, M.C. (2015). Lattice Boltzmann simulation of rising bubble dynamics using an effective buoyancy method. *International Journal of Modern Physics C*.
- Yelena Katsenovich, Claudia Cardona, Robert Lapierre, Jim Szecsody, Leonel Lagos, 2016. The Effect of Si and Al Concentrations on the Removal of U(VI) in the Alkaline Conditions Created by NH3 Gas (Submitted to Applied Geochemistry Journal).

News Publication

- Sinicrope, J., P. Shoffner, E. Walker, L. Lagos. (2016). The Expanding Nuclear Niche: Meeting the Growing Need for Standardized Testing and Performance Metrics for the Deactivation and Decommissioning of Nuclear Facilities. *ASTM International Standardization News*, March 2016.

Conferences & Workshops

- Waste Management – March 2016: 14 professional presentations and 20 student poster presentations
- Technology Coordination Meeting with National Laboratories hosted by WRPS – June 2015
- International Workshop on the Use of Robotic Technologies at Nuclear Facilities – February 2016
- Tank Closure Forum - March 2016
- American Nuclear Society (ANS) - August 2016
- American Geophysical Union (AGU) Fall Meeting, San Francisco - December 2015
- ACS Conference - August 2016
- Life Sciences South Florida STEM Undergraduate Research Symposium - April 2016

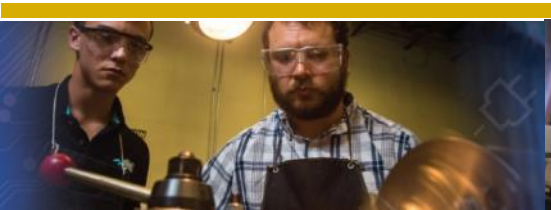
Information Sharing

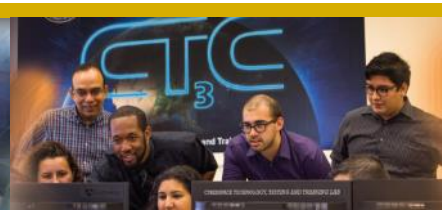
- DOE Research Website (http://doeresearch.fiu.edu)
- Teleconferences
- Progress Reports
- Technical Reports
- OSTI
- Conferences
- Peer Reviewed Journal Publications
- D&D KM-IT
- DOE Fellows Website (http://fellows.fiu.edu)
- DOE Fellows Lecture Series
- Masters & PhD Theses/Dissertations


FIU PROJECT 1:
DR. DWAYNE MCDANIEL

CHEMICAL PROCESS ALTERNATIVES FOR RADIOACTIVE WASTE

FLORIDA INTERNATIONAL UNIVERSITY



Project Tasks and Scope

FIU Applied Research Center

Task 17 Advanced Topics for Mixing Processes

- computational fluid dynamics modeling of HLW processes in waste tanks using Star-CCM+

Task 18 Technology Development and Instrumentation Evaluation

- evaluation of FIU's SLIM for detection of precursors to DSGREs
- development of inspection tools for DST primary tanks
- evaluation of IR sensors for determining tank temperatures

Task 19 Pipeline Integrity and Analysis

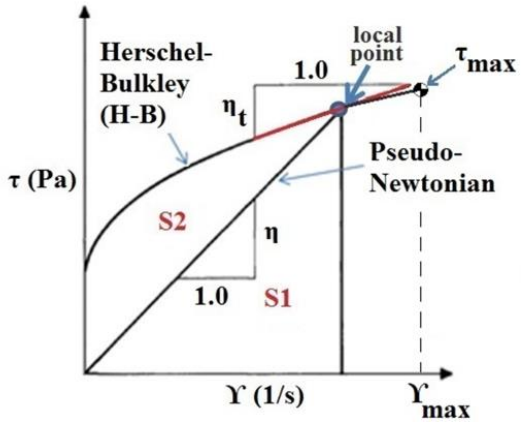
- pipeline corrosion and erosion detection
- nonmetallic materials evaluation

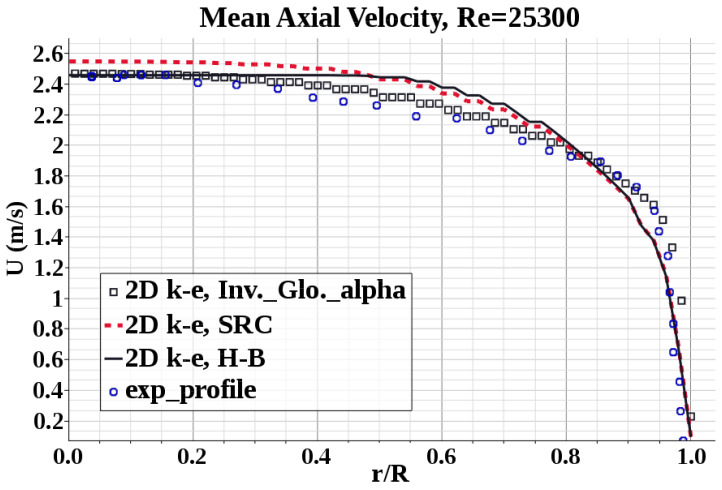
Major Accomplishments

FIU Applied Research Center

Task 17.1 CFD Modeling of HLW Processes in Waste Tanks

- Two methods were created – a direct and indirect method – that provide approximations to viscosity derived from the viscoplastic rheogram.
- Validation of the methods were conducted with single phase non-Newtonian pipe flow using Star-CCM+ RANS modelling.
- Significant improvements by the alpha-methods were observed for all flow regimes over the conventional H-B and SRC methods.



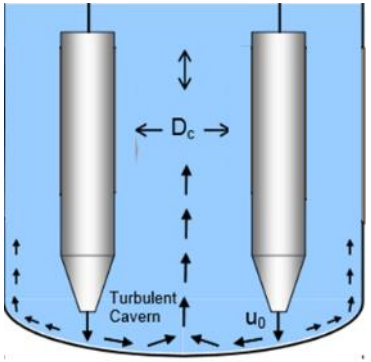


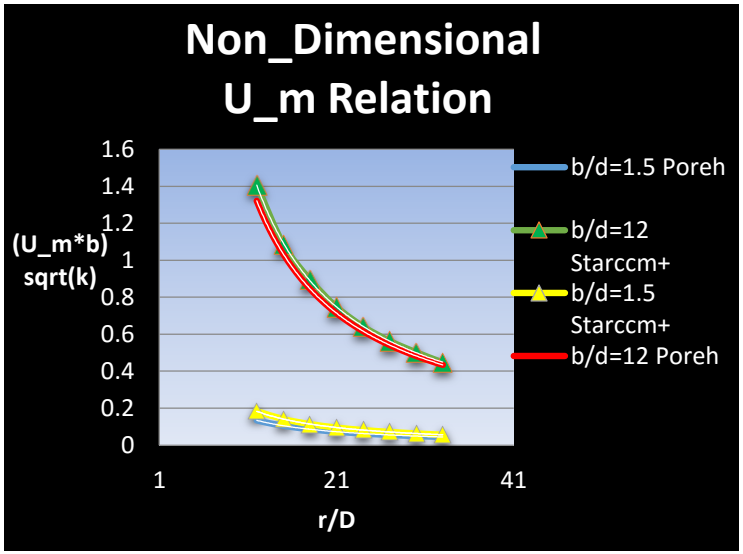
Major Accomplishments

FIU Applied Research Center

Task 17.1 CFD Modeling of HLW Processes in Waste Tanks

- Used Star-CCM+ to validate Poreh's correlations to determine jet thickness and max velocity for various geometric configurations.
- Poreh's formula was fairly accurate for the r/b and b/d ranges of current PJM systems when predicting velocity and jet thickness.
- Currently investigating the effects of tank geometry – specifically curvature - on correlations.





Future Work

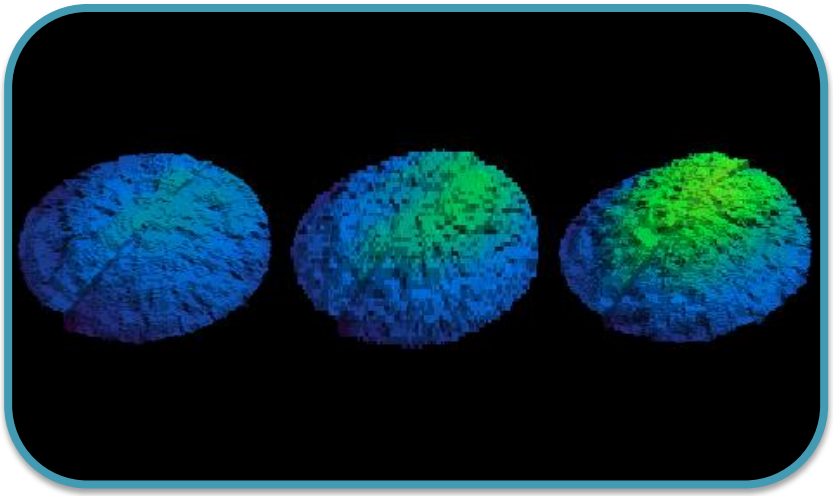
Task 17 - Advanced Topics for Mixing Processes – FIU Performance Year 7

- Collaborate with Chris Gunther (NETL) and Joel Peltier (Bechtel) to support CFD efforts for EM
  - Continue to evaluate Star-CCM+ and its ability to accurately model processes that involve turbulence of non-Newtonian fluids.
    - Modeling of jet impingement on PJM walls.
    - Development of code to augment the DNS and RANS modeling of fluids exhibiting Bingham plastic characteristics.

Major Accomplishments

FIU Applied Research Center

- Task 18.1 Evaluation of FIU's 3D Sonar for Small Changes in Surface Layer of HLW as an Indicator of DSGREs
  - Developed computer code to post process and image scans from a commercial 3D sonar.
  - Developed a lab scale testbed and conducted initial tests in water to validate sonar's ability to detect small variations in surface height.
  - Currently developing code to correlate changes in surface height with gas volume.

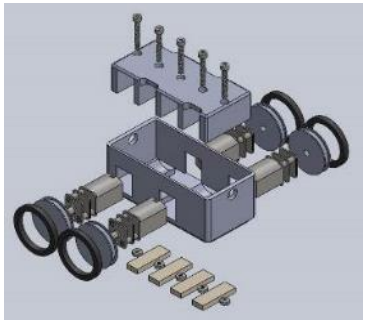


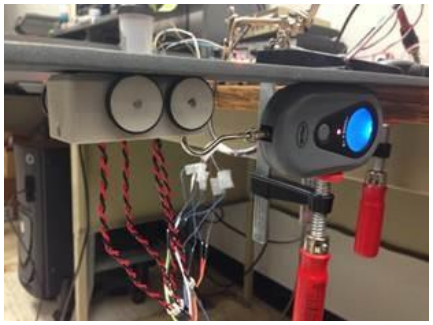
Major Accomplishments

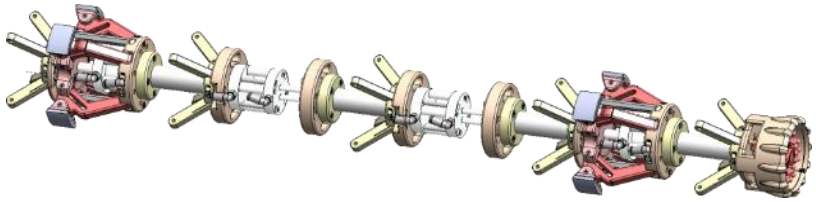
FIU Applied Research Center

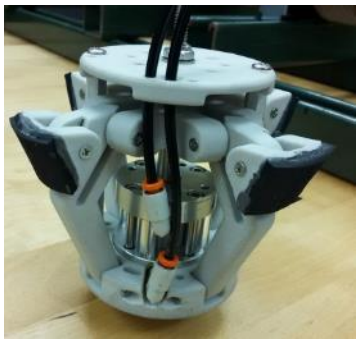
Task 18.2 Development of Inspection Tools for DST Primary Tanks

- Improved design of micro-rover that travels through tank refractory air slots.
  - 4 large wheels independently driven allows use of stronger motors (metal gears) capable of 10x torque.
  - Bracket used to fix motors in place.
  - Housing components and wheels are 3D printed.
- Multiple designs created with peristaltic crawler – travels through 3 and 4 inch pipe systems.
- Gripper designed to have 4 legs with hinged pads – max pull force of 40 lbs.
- Experimental test beds were designed and manufactured to validate designs.









Major Accomplishments

FIU Applied Research Center

Task 18.2 Development of Inspection Tools for DST Primary Tanks

Major Accomplishments

FIU Applied Research Center

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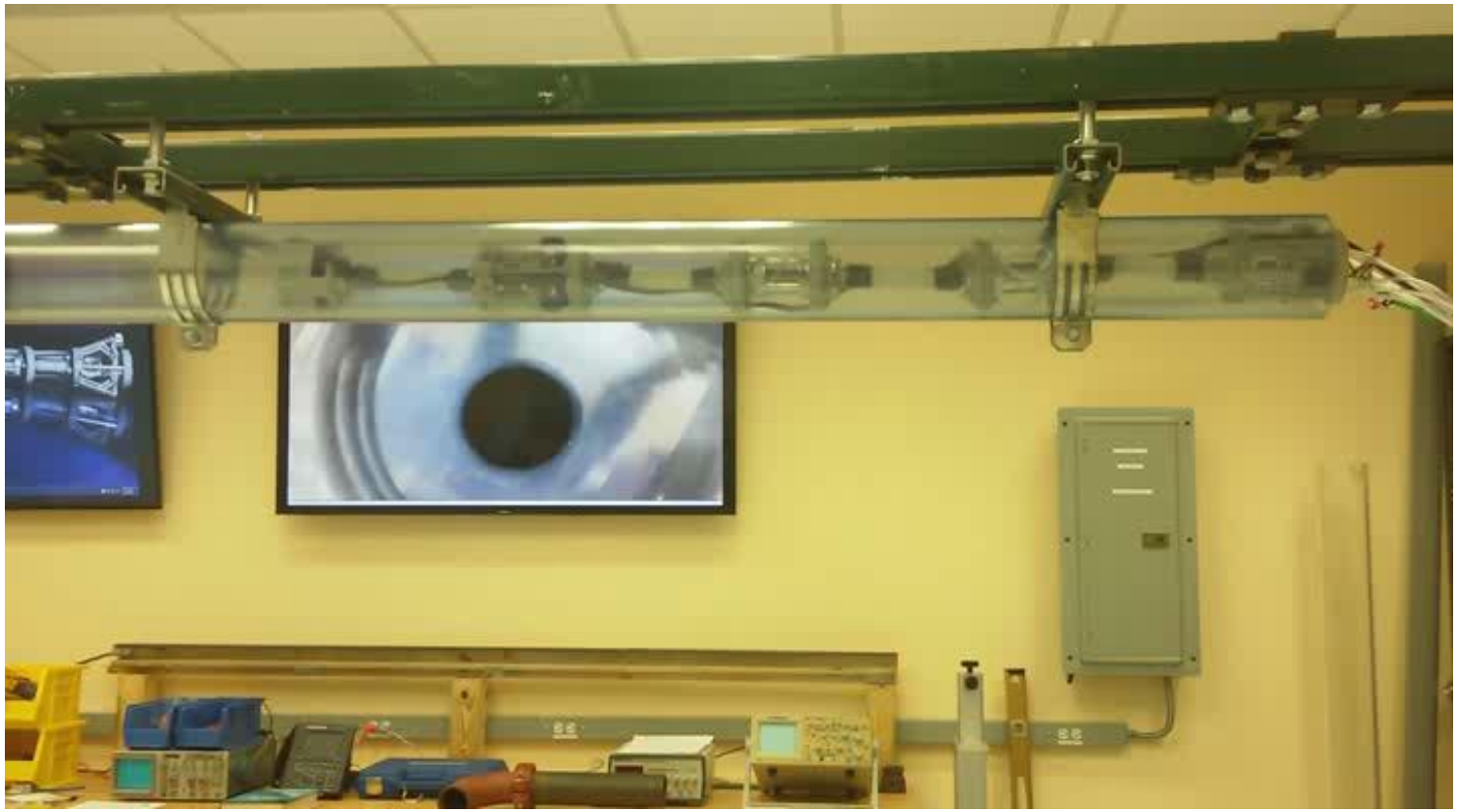
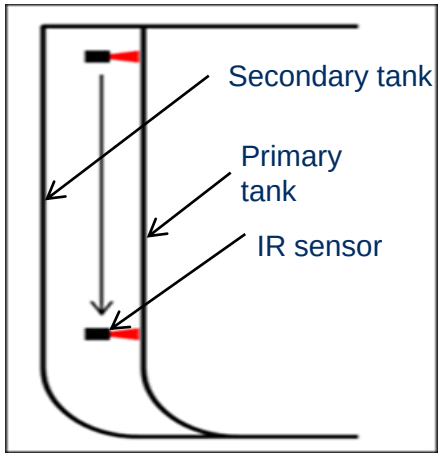


Major Accomplishments

FIU Applied Research Center

Task 18.3 Investigation Using an Infrared Temperature Sensor to Determine the Inside Wall Temperature of DSTs

- Developed test plan
  - Vary plate thickness
  - Water temperature
  - Sensor elevation
  - Distance of sensor to tank wall
- Procured IR Sensor (Raytek MI3)
  - Initial system configuration
- Conducted emissivity tests
  - material calibration (carbon steel)
- Future efforts
  - Completing the construction of the engineering scale test bed
  - Executing the test plan



Future Work

Task 18 - Technology Development and Instrumentation Evaluation – FIU Performance Year 7

- Development of Inspection Tools for DST Primary Tanks
  - Develop an engineering scale tank mock-up for validation of both the crawler and the miniature rover.
  - Design a 2 inch peristaltic crawler based on the current model.
  - Investigate deployment systems for both the inspection tools.
  - Investigate the integration of sensors for providing additional feedback.
- Investigation Using an Infrared Temperature Sensor to Determine the Inside Wall Temperature of DSTs
  - Continue to validate the use of an IR sensor for tank temperature measurements using the engineering scale tank mock-up.
  - Integrate sensor into robotic deployment platform.

Major Accomplishments

Task 19.1 Pipeline Corrosion and Erosion Evaluation

- Evaluated various couplants (gel and dry) for UT sensing using an Olympus dual element sensor
  - Dry couplants provided inconsistent results
  - Vacuum testing was conducted to evaluate removal of air gaps.
- Conducted a review of alternative sensor systems that meet the site requirements (dry couplant, small sizes, accuracy of 0.001 in, semi permanent mounting, rad environment)
- Down selected sensors to two
  - Permasense guided wave sensors – limited to 2 sensors for 2 in diameter pipes
  - Ultran Group – couplant free sensors
- Data acquisition for each is expensive

Ultran WD 25-2 UT sensors

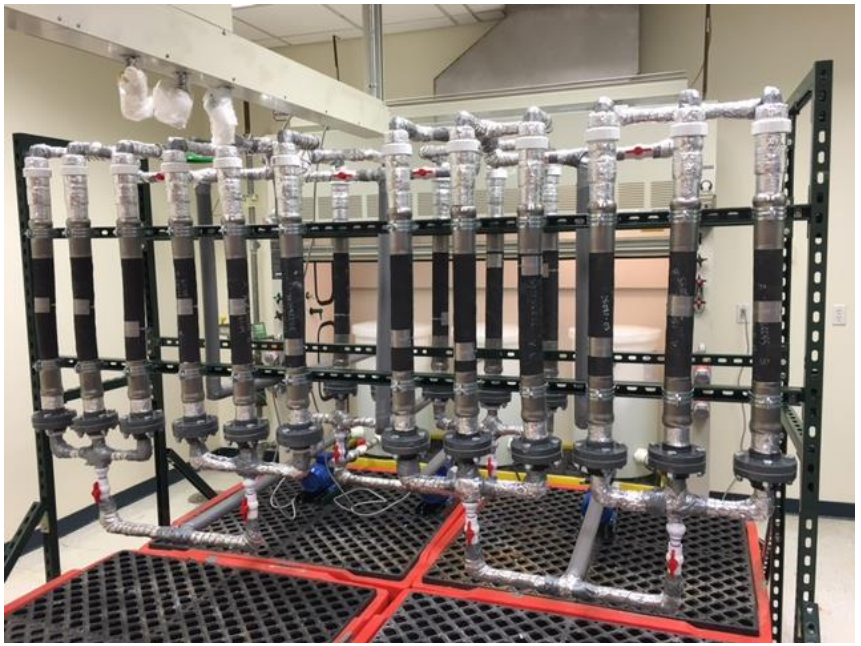
Permasense – guided wave sensors

Major Accomplishments

FIU Applied Research Center

Task 19.2 Evaluation of Nonmetallic Components in the Waste Transfer System

- Obtained 24 coupons with swaged fittings from Riverbend Inc. Also obtained gaskets and O-rings for aging.
- Completed the development of a test loop that will age the specimens at three different temperatures (85, 130 and 180°F) for 180 and 360 days using 25% NAOH solution.
- Obtained sheets of EPDM and Garlock to create specimens for material testing.



Major Accomplishments

FIU Applied Research Center

Task 19.2 Evaluation of Nonmetallic Components in the Waste Transfer System

- Baseline burst pressure tests were conducted
  - 3 hose coupons were tested with an average burst pressure of 2805 psi
- In-configuration leak tests were conducted using 3 flange gaskets and 3 O-rings at 150 psi and 255 psi, respectively.
- Tensile tests were conducted on the Garlock and EPDM coupons.
- Hardness tests were conducted on the Garlock coupons – 4.09 HV (Vickers) and 54.02 (Rockwell).

Burst Pressure Tests

Material Testing

Future Work

Task 19 - Pipeline Integrity and Analysis – Performance Year 7

- Pipeline Corrosion and Erosion Evaluation
  - Investigate the design and development of a mounting system for the selected transducers
  - Validate the use of the transducers to provide real time thickness measurements on straight sections and elbows
- Evaluation of Non-Metallic Components in the HLW Transfer System
  - Continue to age the non-metallic components for the 6 month and year intervals. Based on results of the testing, additional data points may be needed for evaluation.
  - Additional stressors may also be incorporated into the testing.

Future Work

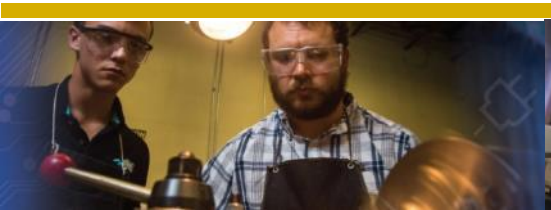
Task 20 – Evaluation of Alternative Methods for Improving Waste Retrieval Processes **(New)** – Performance Year 7

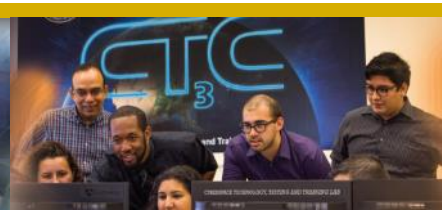
- Evaluate current techniques used in typical retrieval processes and utilize computational methods to suggest options for improvement.
- Validation of the computation methods will be conducted and bench scale testing will be used to demonstrate the approaches.


FIU PROJECT 2:
DR. LEONEL LAGOS

ENVIRONMENTAL REMEDIATION SCIENCE & TECHNOLOGY

FLORIDA INTERNATIONAL UNIVERSITY



Project Tasks

Task 1: Remediation Research and Technical Support for the Hanford Site

Subtask 1.1 Sequestering uranium at the Hanford 200 Area vadose zone by in situ subsurface pH manipulation using NH_3 gas

Subtask 1.2 Investigation of microbial-meta-autunite interactions - effect of bicarbonate and calcium ions

Subtask 1.3 Evaluation of ammonia fate and biological contributions during and after NH_3 injection for uranium treatment

Task 2: Remediation Research and Technical Support for Savannah River Site

Subtask 2.1 FIU's support for groundwater remediation at SRS F/H Area

Subtask 2.2 Monitoring of U(VI) bioreduction after ARCADIS demonstration at the SRS F-Area

Subtask 2.3 Humic acid batch sorption experiments into the SRS soil

Subtask 2.4 The synergetic effect of HA and Si on the removal of U(VI)

Subtask 2.5 Investigation of the migration and distribution of natural organic matter injected into subsurface systems

Task 3: Surface Water Modeling of Tims Branch

Subtask 3.1 Modeling of surface water and sediment transport in the Tims Branch ecosystem

Subtask 3.2 Application of GIS technologies for hydrological modeling support

Subtask 3.3 Biota, biofilm, water and sediment sampling in Tims Branch

Task 4: Sustainability Plan for the A/M Area Groundwater Remediation System

Subtask 4.1 Sustainable Remediation Analysis of the M1 Air Stripper

Subtask 4.2 Sustainable Remediation Support to DOE EM Student Challenge

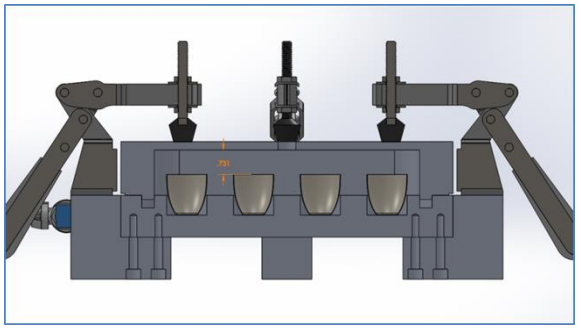
Task 5: Remediation Research and Technical Support for WIPP

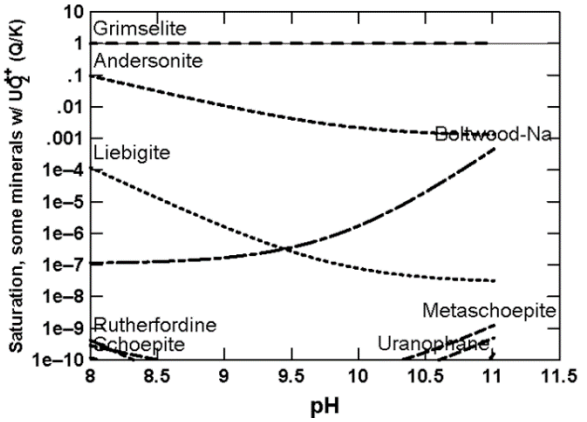
Major Accomplishments

FIU Applied Research Center

Subtask 1.1: Sequestering Uranium at the Hanford 200 Area Vadose Zone by In Situ Subsurface pH Manipulation Using NH_3 Gas

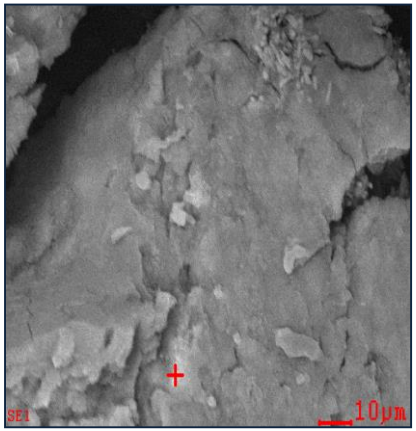
- Conducted isopiestic testing on the deliquescence behavior of multicomponent U-bearing samples
  - The deliquescence point depends on the sample composition.
  - Higher Ca content and low bicarbonate samples were the most stable with respect to solid –liquid transition.
- Updated GWB data base to include thermodynamic data on U-solid phases.
- Predicted the formation of andersonite, grimselite, cejkaite, libegite, sodium-booltwoodite, uranophane and other phases in U-bearing solids composition.





Major Accomplishments

- Conducted SEM/EDS and XRD analysis for samples characterization
  - "hot" spots on "low" bicarbonate samples were high in Si and U that correlated well with speciation modeling.
- Modified sample preparation methods with vacuum filtration to minimize formation of errant phases.
- Completed SEM/EDS analysis, prepared samples for additional analysis of select solid samples via EMPA/TEM.
- Determined that samples high in calcium and low in bicarbonate showed the least uranium retained in solution



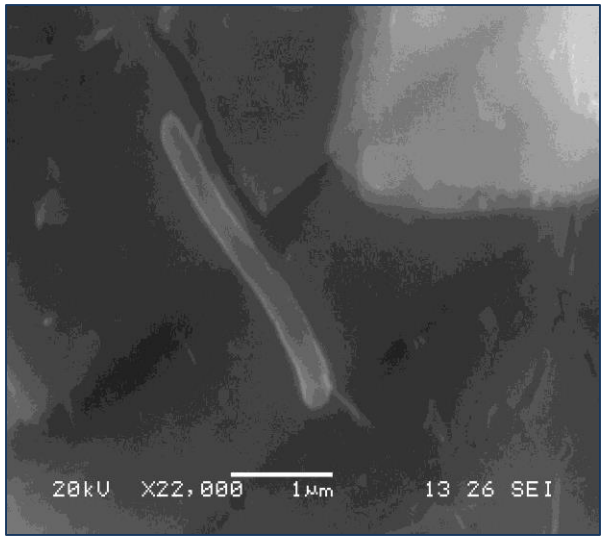
Future Work

- FIU Performance Year 6 (current year)
  - Initiate sequential extraction experiments.
  - Initiate flow through solubility experiments.
  - Finalize deliquescence experiments at 25°C.
  - Complete analysis of select solid samples via EMPA
  - Finalize digestions of solid samples for compositional analysis (KPA/ICP)
- FIU Performance Year 7
  - Complete flow through solubility experiments for various sample compositions.
  - Complete sequential extraction experiments for various sample compositions.

Major Accomplishments

FIU Applied Research Center

Task 1.2 Investigation on Microbial-Meta-Autunite Interactions - Effect of Bicarbonate Ions



- Investigated Ca-autunite biodissolution under anaerobic conditions in the presence of *Shewanella oneidensis MR1* sp and variable bicarbonate concentrations.
- Demonstrated the liability of uranyl phosphates in the presence of bacteria.
  - Determined bioenhanced U(VI) release in bicarbonate-amended conditions
  - Observed no U(VI) release due to bacterial activity in bicarbonate free conditions.
- Determined that no bioreduction of U(VI) was observed in the anaerobic conditions with *Shewanella oneidensis*
- Data from protein analysis and cell viability experiments showed higher cell viability in bicarbonate-amended media solutions.
  - Electrostatic repulsion between negatively charged cell wall and uranyl-carbonate complexes.

Future Work

- FIU Performance Year 6 (current year)
  - Initiate test with the exact conditions (U, Ca and P concentrations along with three different bicarbonate concentrations) in mineral-free experiments
  - Testing the hypothesis of two different antagonistic mechanisms: metal release in the aqueous phase as a result of autunite dissolution and metal removal from the aqueous phase, as a result of secondary mineral precipitation
- FIU Performance Year 7
  - Biodissolution of synthetic autunite in the presence of Shewanella
  - Research the effect of various concentrations of bicarbonate on U(VI) biorelease kinetics in the presence of Shewanella.
  - Test bacteria consortia for the biodissolution studies.

Major Accomplishments

FIU Applied Research Center

Subtask 1.3.1: Investigation of NH_3 and U partitioning in bicarbonate-bearing media

- Demonstrated that NH_4OH removes more U from the aqueous phase than NaOH [in the presence of kaolinite, illite and montmorillonite].
- Observed a change in U partitioning and mineral dissolution for kaolinite between pH 10.5 and 11, which is likely the point when co-precipitation of U begins to occur.
- Determined that initial aqueous ions do not affect mineral dissolution but do significantly change U partitioning.
- Observed that NaOH and NH_4OH affect mineral dissolution very differently based on aqueous Si/Al measurements.

Future Work

- FIU Performance Year 6 (current year)
  - Equivalent batch experiments with Hanford 200 sediments and additional minerals (calcite and muscovite)
  - Sequential extractions to investigate the liability of U following treatments (*ongoing*)
  - Speciation modeling and statistical analysis of batch experiments
- FIU Performance Year 7
  - Batch kinetics experiments and model development.
  - Effect of variable U(VI) and bicarbonate concentrations on the apparent partitioning coefficients.
  - Mineral characterization by XRD, BET, SEM-EDS

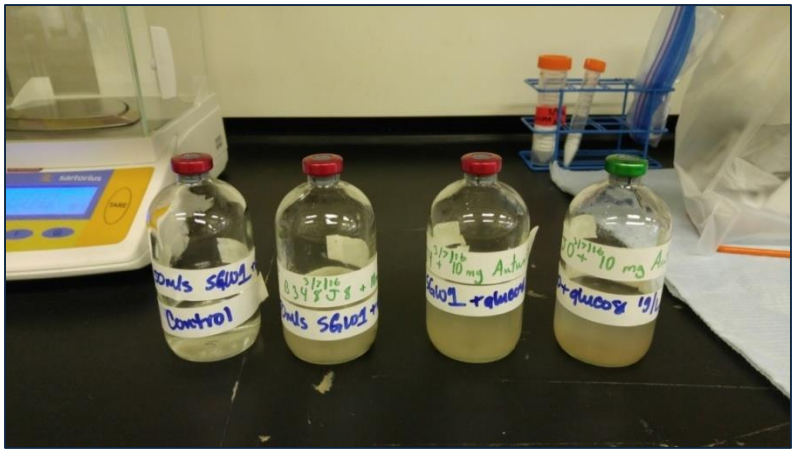
Major Accomplishments

FIU Applied Research Center

Subtask 1.3.3: The influence of microbial activity on the corresponding electrical geophysical response after ammonia injections in the vadose zone

- Started geophysical column experiments at PNNL spring internship
- Built six columns from clear PVC pipe
  - Layer of Hanford sediment mixed with autunite in the center
  - Each column is equipped with coiled Ag/AgCl and 4 potential electrodes on the side in each sample port

- Grew microbial consortia from Hanford sediments mixed with Ca-autunite in culture media solution.



Future Work

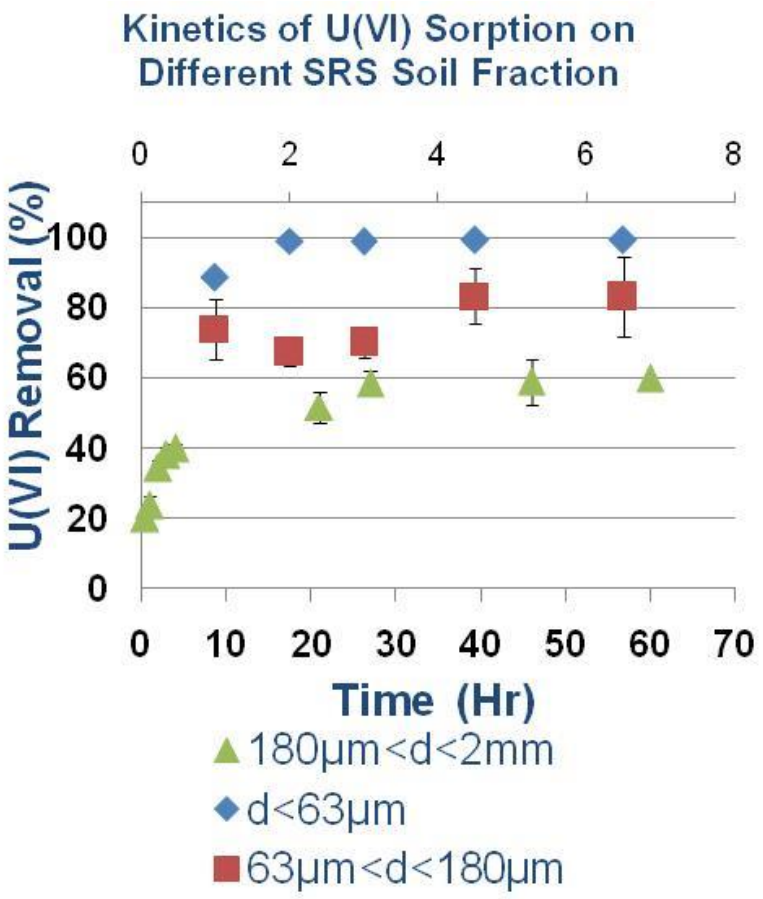
- FIU Performance Year 6 (current year)
  - Attempt some initial measurements.
  - Ship equipment and columns to FIU.
  - Initiate experiments at FIU to understand the Spectral Induced Polarization (SIP) response to biofilm formation.
- FIU Performance Year 7
  - Continue experiments.

Major Accomplishments

FIU Applied Research Center

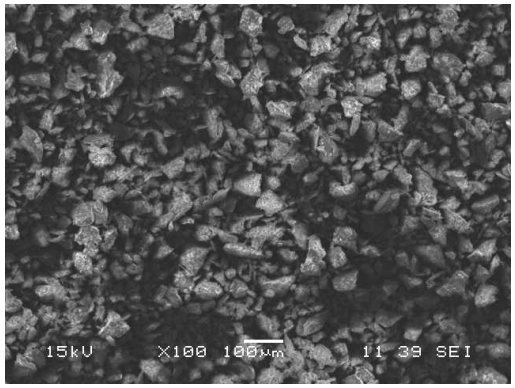
Subtask 2.1: FIU's support for groundwater remediation at SRS F/H Area

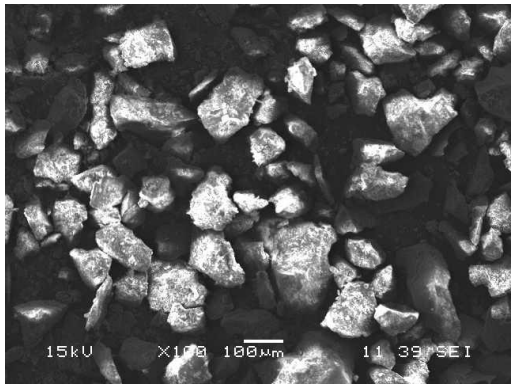
- Modeled the kinetic behavior of U(VI) retention by pure minerals relevant to SRS F/H area (quartz, kaolinite and goethite) and different soil fractions.
- Elucidated mechanisms involved in U(VI) retention by SRS soil by conducting desorption experiments and studying the effect of ionic strength.
- Conducted sequential extraction experiments.
- Determined a dependency of U(VI) removal on the average soil particle size
  - The finer the soil fraction, the higher the U(VI) removal.

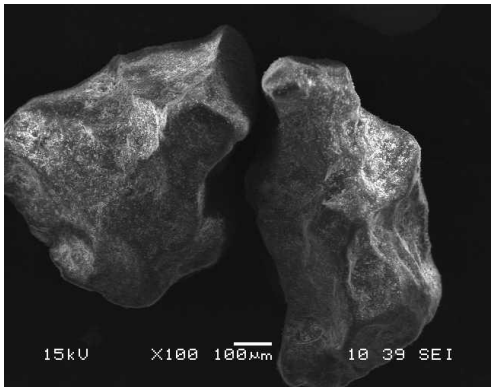


Future Work

- FIU Performance Year 6 (current year)
  - Conduct soil surface analysis to further elucidate U(VI) – soil interactions.
  - Perform desorption experiments for the finer SRS fractions to compliment data on the existing results on desorption using bulk SRS soil fraction, as well as synthetic mineral mixtures
  - Conduct data analysis on sequential extraction experiments.
- FIU Performance Year 7
  - This task will not continue next year.





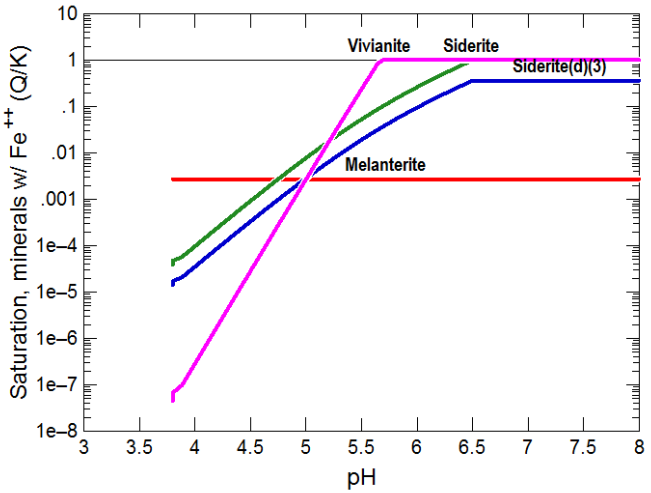


Major Accomplishments

FIU Applied Research Center

Subtask 2.2- Monitoring of U(VI) Bioreduction after ARCADIS Demonstration at the SRS F-Area

- Determined iron and sulfate concentrations in the supernatant solutions.
- No sulfate reduction observed in microcosms.
- Speciation modeling via GWB suggested the formation of siderite at pH ~7.



- The concentration and weight % of siderite is very small.
- No formation of reduced iron solid phases.

Future Work

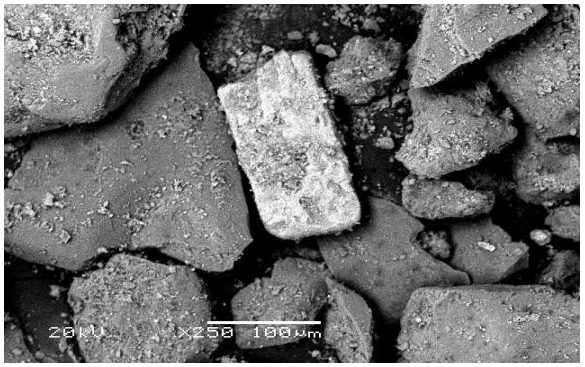
- FIU Performance Year 6 (current year)
  - Initiate a scientific paper on the experimental results.
- FIU Performance Year 7
  - This subtask will not continue next year.

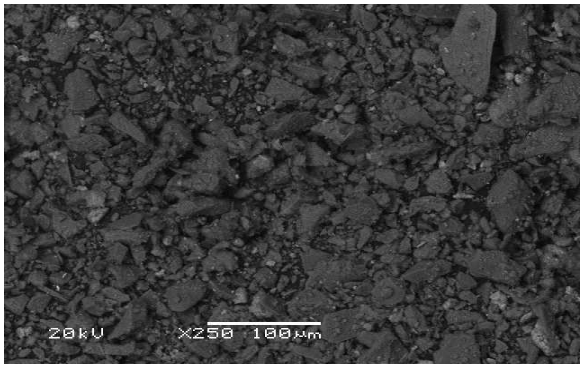
Major Accomplishments

FIU Applied Research Center

Subtask 2.3: The sorption properties of the humate injected into the subsurface system

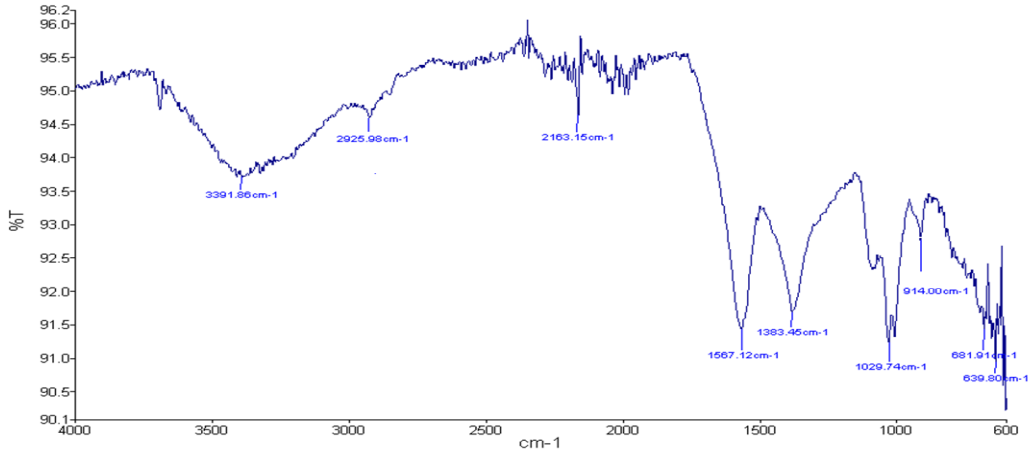
- Completed characterization of Huma-K and SRS sediments.
  - (SEM/EDS) to investigate the surface morphology and elemental composition of Huma-K and SRS sediments from the F-Area.
  - FTIR analysis for the identification of functional groups present in Huma-K and SRS sediments.
  - Potentiometric Titrations of Huma-K and SRS sediments to investigate their acido-basic properties.





Major Accomplishments

- EDS analysis, FTIR, and potentiometric titrations clearly revealed the presence of humic substances in Huma-K.
- Potentiometric titrations indicate that sediments have similar acido-basic properties as quartz mineral.



Future Work

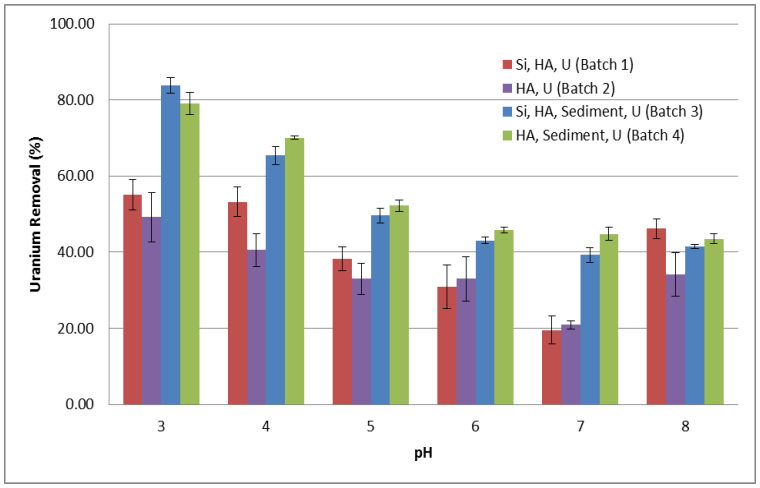
- FIU Performance Year 6 (current year)
  - Kinetic experiments for sorption of Uranium on Savannah River Site sediments.
  - Initiate a manuscript for publication on experimental work done with Huma-K as a low-cost remediation method for acidic groundwater contaminated with uranium.
- FIU Performance Year 7
  - Continue experiments for sorption of U(VI) on SRS sediments with and without Huma-K.

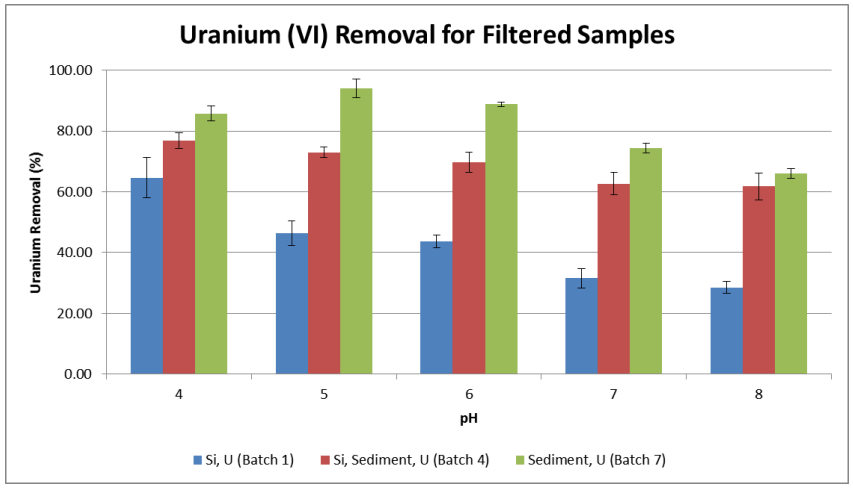
Major Accomplishments

FIU Applied Research Center

Task 2.4: The synergetic effect of HA and Si on the removal of U(VI)

- Prepared multi-component batch systems with a pH from 3-8 to account for the percent removal of U(VI) at various pHs.
- Initiated synergy experiments with 30 ppm of humic acid.
  - Completed two sets of experiments with pH 3 and 4 samples





Future Work

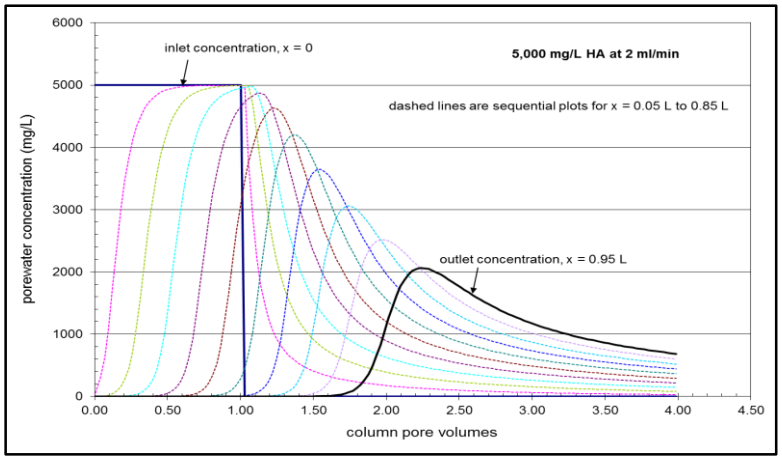
- FIU Performance Year 6 (current year)
  - Complete experiments for pH 5 to 8
  - Compare data with previous experiments
- FIU Performance Year 7
  - Investigate the effect of variable U(VI) concentrations on the removal efficiency of U(VI).

Major Accomplishments

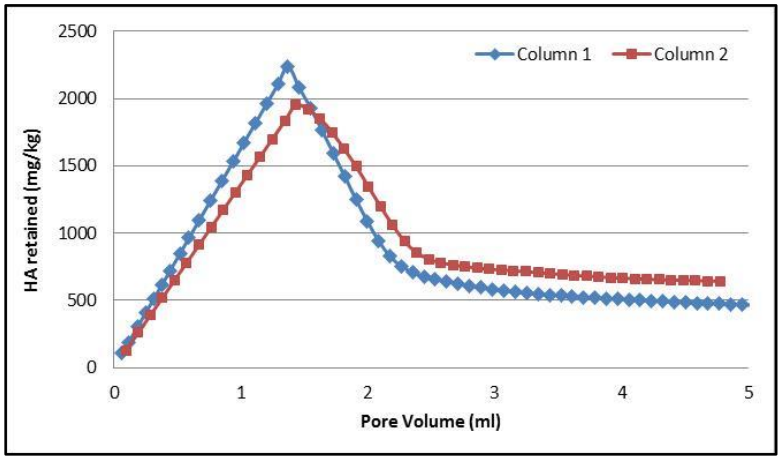
FIU Applied Research Center

Task 2.5: Investigation of the migration and distribution of natural organic matter injected into subsurface systems

- Completed column experiments with pH 3.5 and 5.0 AGW solutions.
- A representative sample from each section was used to perform SEM-EDS analysis.
- Performed TOC analysis with 10 mg of sample, analysis will be repeated with 40 mg to overcome the detection limit.



Simulated Huma-K injection scenario



Huma-K retention during column studies

Future Work

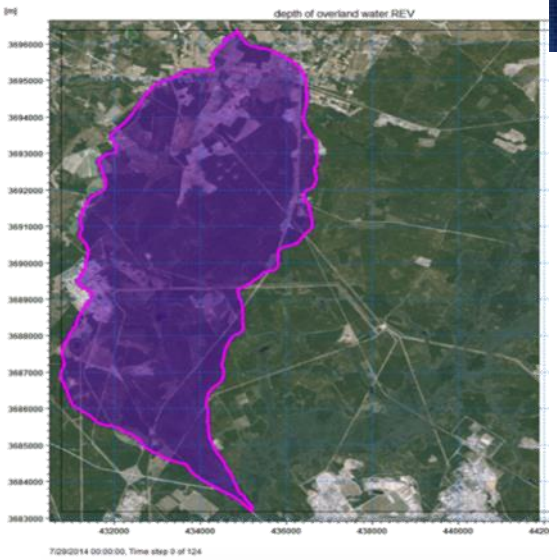
- FIU Performance Year 6 (current year)
  - Complete column experiments by injecting 0.5 PV of humic acid, study the sorption/desorption of humic acid.
  - Inject uranium through the column and study the effect of sorbed humic acid on uranium mobility.
- FIU Performance Year 7
  - Study the migration and distribution of other commercially available HA and obtain sorption and desorption parameters under different pH levels

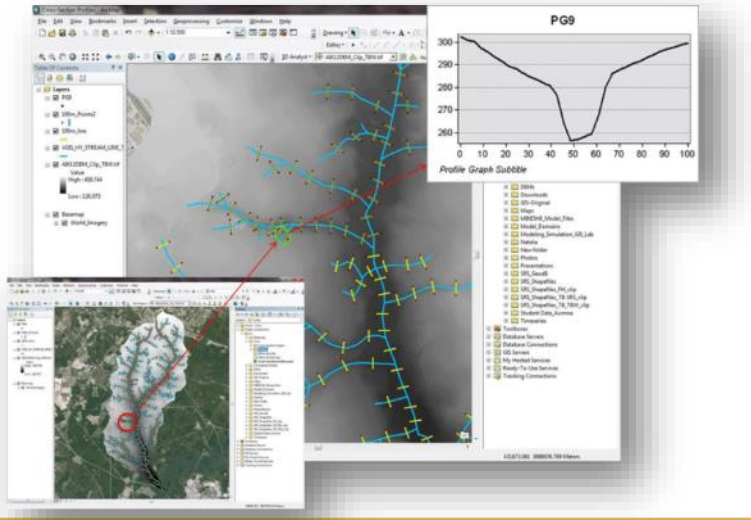
Major Accomplishments

FIU Applied Research Center

Subtask 3.1: Modeling of surface water and sediment transport in the Tims Branch ecosystem

- **Developing an integrated surface/subsurface flow & contaminant transport model of TBW**
- **Overland Flow** module developed:
  - Simulates surface hydrology throughout TBW.
  - Simulates spatiotemporal distribution of flow discharges, flow duration, and water levels in TBW.
- **Land Use** module developed:
  - Includes both uniform and timeseries values of vegetation characteristics such as Leaf Area Index and Root Depth.
  - 15 vegetation classes identified.
  - Maps of Land Cover and Paved Runoff Coefficient developed.
- **Evapotranspiration (ET)** module developed:
  - Richards Equation and Two-Layer Evapotranspiration/ Unsaturated Zone (ET/UZ) methods.
    a) Uniform values of reference ET, Leaf Area Index, and Root Depth
  - Station-based timeseries which requires timeseries of reference ET, and station-based rainfall.
- Began preliminary development of a **1-D stream/river hydrology model** using MIKE 11**:**
  - Network and cross-sections initially developed manually using GIS tools.
  - MIKE HYDRO finally used to create the cross-sections automatically.

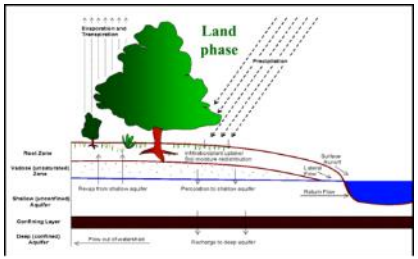


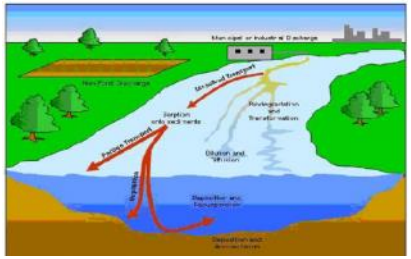


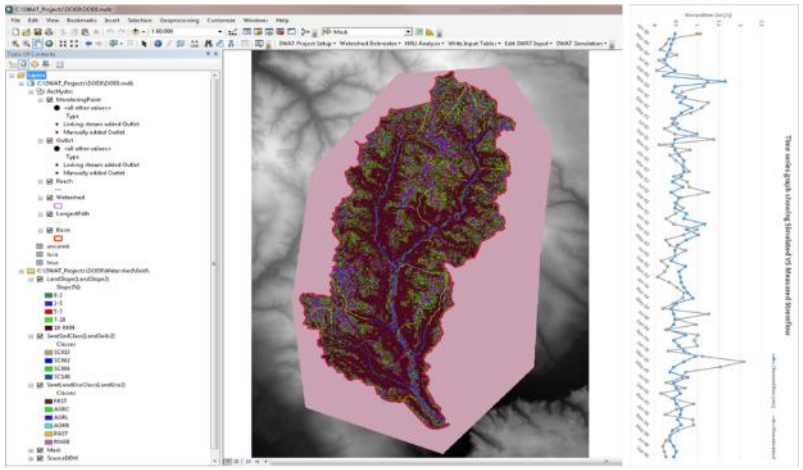
Major Accomplishments

Hydrology Modeling using SWAT

FIU Applied Research Center

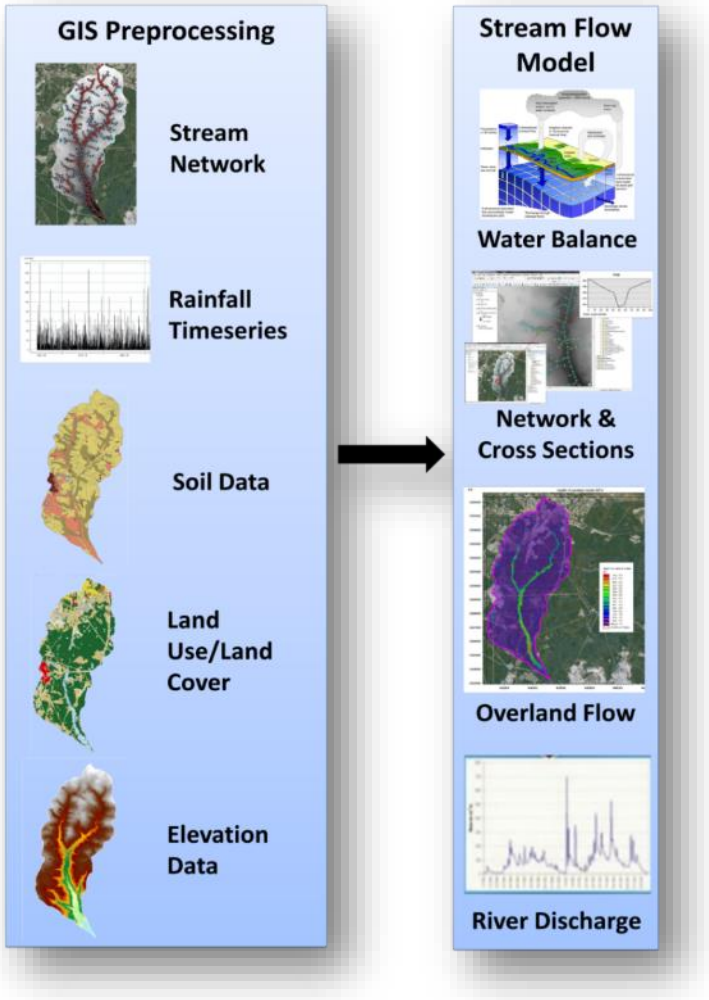






- A comparative model is being developed using the Soil and Water Assessment Tool (SWAT).
- SWAT is a river basin scale model developed to predict the impact of land management practices on water, sediment and agricultural chemical yields.
- SWAT is a public domain model actively supported by the USDA at the Grassland, Soil and Water Research Laboratory in Temple, Texas.
- SWAT is physically based, computationally efficient and capable of simulating very large basins.
- SWAT can be used to study long-term impacts.
- Similar to MIKE SHE/11, the SWAT model also has a user interface that accepts GIS inputs.

Major Accomplishments



Subtask 3.2: Application of GIS technologies for hydrological modeling support

- A geodatabase was developed to store and manage the data used for hydrological model development.
- ArcGIS Diagrammer was used to document the contents of the geodatabase in a simple report format.
- Utilized ArcGIS tools to preprocess data derived from SRS/SRNL and other federal agency online databases such as USGS, & USDA (NRCS/NLCD).
- Downloaded data projected to relevant coordinate system and clipped to model domain.
- ArcGIS ModelBuilder used to automate repetitive tasks and document geoprocessing workflow. Process flow models developed are reusable tools that can be implemented for other DOE sites.

Major Accomplishments

Subtask 3.3: Biota, biofilm, water and sediment sampling in Tims Branch

- This task includes additional sample collection of biota, biofilm, water and sediment in Tims Branch for analysis of total mercury and tin in tissue, biofilm and sediment; and possible speciation analysis on sediment for mercury, tin and other elements (e.g., uranium).
- This will serve to monitor and document any impacts of the innovative stannous chloride air stripping technology and provide additional data to assist with hydrological model calibration and validation.
- The sampling will be initiated by FIU students during their summer 2016 internship at SRNL/SREL and continued if necessary throughout the year by FIU students and/or ARC researchers.
- Collaboration has already been initiated with SRNL and SREL to support this effort.

Future Work

- FIU Performance Year 6 (current year)
  - Complete input of MIKE SHE model configuration parameters for simulation of unsaturated flow.
  - Complete input of MIKE SHE model configuration parameters for simulation of flow in the saturated zone.
  - Sample and data collection and analysis from Tims Branch.
  - Progress Report for Subtask 3.1: Modeling of surface water and sediment transport in the Tims Branch ecosystem.
  - Progress Report for Subtask 3.2: Application of GIS technologies for hydrological modeling support.
- FIU Performance Year 7
  - Model calibration and validation.
  - Couple MIKE SHE and MIKE 11.

Major Accomplishments

FIU Applied Research Center

Task 4: Sustainability Plan for the A/M Area Groundwater Remediation System

- Collected well data and identified and located missing data
- Analyzed results per well
  - Removal rate and cumulative mass removed for TCE and PCE for 1987-2012.
  - 7 of 12 recovery wells have transitioned to more PCE than TCE removed.
  - Rate of recovery in some wells affected by Dynamic Underground Stripping (DUS) process.
  - 7 wells exhibit exponential decay in contaminant removal, 5 exhibit steady concentrations, and 2 exhibit linear decreases.
- Sustainability analyses produced 4 primary recommendations
  - Solar photovoltaic system for powering the A/M Area groundwater remediation system.
  - Further analysis to determine an optimal speed for the blower motor
  - Groundwater modeling analysis to optimize the pumping rate for each recovery well
  - Replacement of groundwater pumps when they fail with lower power pumps.
- Completed five papers on sustainable remediation

Future Work

- Final report was delivered to DOE EM and SRNL on Dec. 15, 2015 completing this task.
- This task will not continue.

Major Accomplishments

FIU Applied Research Center

Task 5: Remediation Research and Technical Support for WIPP

- Gaining understanding of the sorption of trivalent actinides and lanthanides in WIPP-relevant minerals

Initiate Collaboration

- LANL postdoc (Tim Dittrich) and ARC postdoc (Hilary Emerson)
- Fall 2015

Deploy FIU-ARC postdoc

- 8 weeks as a visiting scientist
- Learn to conduct mini columns
- Feb – Apr 2016

Conduct parallel experiments

- Parallel experiments with more basic science focus at FIU
- 2016-2017

Long-term partnership

- Continue WIPP-related research as part of the DOE-EM cooperative agreement
- 2017 and beyond!

Major Accomplishments

- Learned mini column experimental protocols
- Conducted kinetic batch sorption and column saturation experiments in the presence of 20 ppb Neodymium(III) at 0.1 ionic strength (3 mM $NaHCO_3$ + NaCl) at pH ~8.6
- Demonstrated that Nd(III) sorption is strong to dolomite and compared batch and column results.

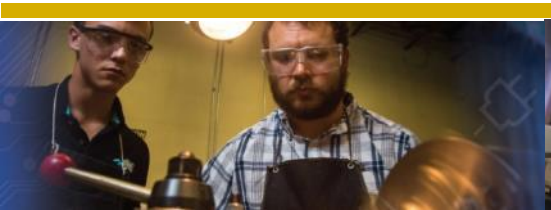
Future Work

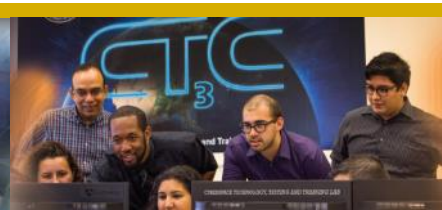
- FIU Performance Year 6 (current year)
  - Conduct parallel experiments at LANL Carlsbad and FIU-ARC
  - Continue variable ionic strength experiments (0.01 – 5 M ionic strength)
- FIU Performance Year 7
  - Further exploration of trivalent actinide and lanthanide (Nd, Am, Pu) sorption to WIPP relevant minerals in the presence of ligands and variable redox conditions

FIU PROJECT 3:
DR. LEONEL E. LAGOS
DR. HIMANSHU UPADHYAY
MR. JOSEPH SINICROPE

WASTE AND D&D ENGINEERING AND TECHNOLOGY DEVELOPMENT

FLORIDA INTERNATIONAL UNIVERSITY





Project Description

This research project focuses on delivering solutions under the deactivation and decommissioning (D&D) and waste areas as well as the management of D&D knowledge (storage, preservation and dissemination) for environmental management.

Project Task Descriptions

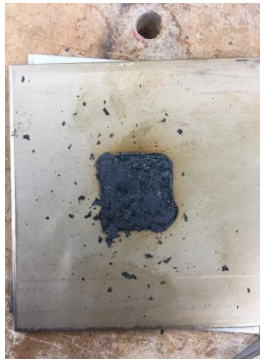
- D&D Support to DOE EM for Technology Innovation, Development, Evaluation and Deployment
  - Provides direct support to assist DOE EM in meeting the D&D needs and technical challenges around the DOE complex. Identifying and evaluating innovative technologies in support of D&D projects.
- D&D Knowledge Management Information Tool (KM-IT)
  - A web-based community-driven system developed to maintain and preserve the D&D knowledge base and tailored to serve the technical issues faced by the D&D workforce across the DOE Complex.
- Waste Information Management System (WIMS)
  - Receives, integrates and organizes the DOE waste forecast data from across the DOE complex on an annual basis and to automatically generate waste forecast data tables, disposition maps, GIS maps, and transportation details.

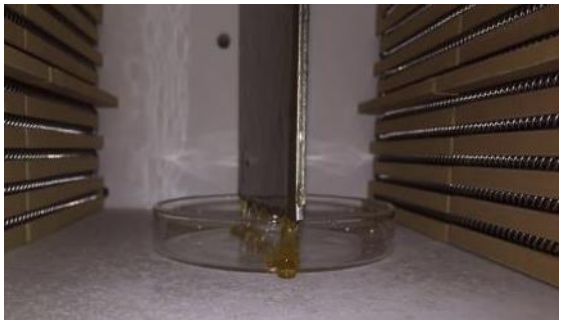
Major Accomplishments

FIU Applied Research Center

Enhancing Fire Resiliency of Fixatives

- Baselined 5 industry fixatives/decon gels on various substrates by exposure to open flame & high heat
- All 5 fixatives ignited almost immediately when exposed to the open flame and burned completely between 1-5 minutes
- Most significant degradation in terms of mass loss, desiccation, and chemical breakdown occurred between 600-800° F





Major Accomplishments

Enhancing Fire Resiliency of Fixatives

- Completed proof of concept testing for layering intumescent coating (IC) over fixatives for added fire resiliency
- All 5 fixatives, when layered with an IC, conclusively displayed enhanced fire resiliency with open flame on all substrates
  - Excellent thermal insulation protection
  - Minimum Flame Spread
  - Long-term thermal protection
- During muffle furnace tests, IC reduced off-gassing and mass loss.

Future Work

Enhancing Fire Resiliency of Fixatives

- Based on initial results from Proof of Concept experiments, SRS 235-F site personnel requested expedited adaptation of intumescent coating to address requirements with hot cells
  - Rad hardened to withstand heat generation of Pu-238
  - Able to fix Pu-238 particle sizes between 10-300 um
  - Capable of being applied via existing devices

- Preference is to pursue adaptation of intumescent coating as a standalone fixative, but need to continue R&D in optimizing the layering process as well
  - Baseline other top rated industry ICs and identify one that matches most closely with requirements – modify from there
  - Enhance intumescent coatings thermal reaction at lower temperatures
  - Improve adhesion and bonding characteristics

- Conduct full scale demo
  - Replicate hot cell at SRS 235-F
  - Schematics approved for release

Future Work

Technology Test and Evaluation in Support of D&D

- Identification of technology for T&E using a collaborative approach with EM-13, sites project teams, national labs, etc.
- Maintain flexibility pending highest priority (functional need vs specific technology)
  - Approach I: Identify technology in a functional area (e.g., Fire Resilient Fixative, Robotics, 3D Modeling, or Unique sensor networks)
  - Approach II: Test and evaluate a specific, designated technology
- Decision brief to EM-13 on recommended technologies that address rqt (June 2016)
- Output from this serves as input for following year (e.g.; PTP Year 7)

Future Work

Technology Test and Evaluation in Support of D&D

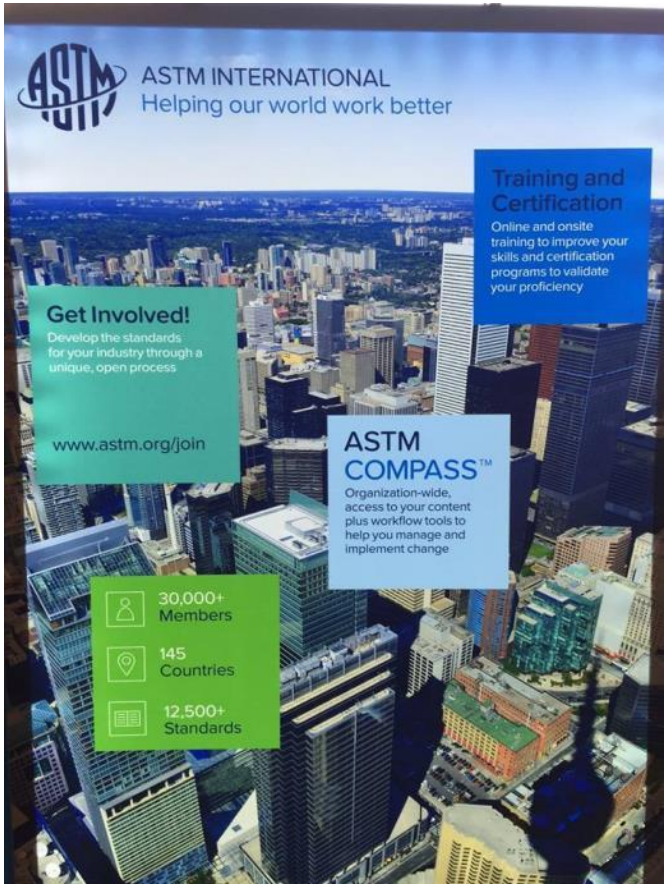
- Task 2: Test and evaluate selected technology at FIU Testing and Evaluation Facility that replicates operating environment and conditions in which technology will be employed to the maximum extent
    - Conduct T&E (Mar 2017)
    - Task incorporated under Cooperative Agreement in PTP Year 7
    - *Output from this T&E could serve as D&D input to larger DOE-EM Test Bed Initiative*

- Possible linkage to DOE-EM Test Bed Initiative**:** Formal operational test and evaluation of technology in a radioactive environment at DOE facilities
    - 2017 - 2018
    - Funded by DOE-EM Test Bed Initiative

Major Accomplishments

ASTM International

- Engaging ASTM International on development and promulgation of testing standards and protocols for D&D technologies
  - Primary Objective is to ensure standardized comparison metrics across the DOE-EM complex for similar technologies (apples to apples)
    - Current testing and evaluation practices afford too much variance within technology categories
  - Joe Sinicrope is incoming ASTM International E10.03 Subcommittee Chair which should assist in expediting standards development



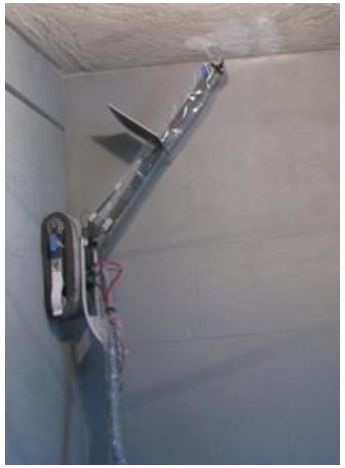
Future Work

Baseline Robotic Technologies

- Initial focus on robotic technologies relevant to SRS-235F problem set
- Coordinating with SRNL to identify specific requirements
- Start with existing database in D&D KM-IT to identify potential robotic technologies to meet the requirements

Phantom (DJI)

Mighty Mouse (Sandia National Lab)



Remote Climber (ICM)

HRP-3 Promet MK-II (Kawada Industries)

Future Work

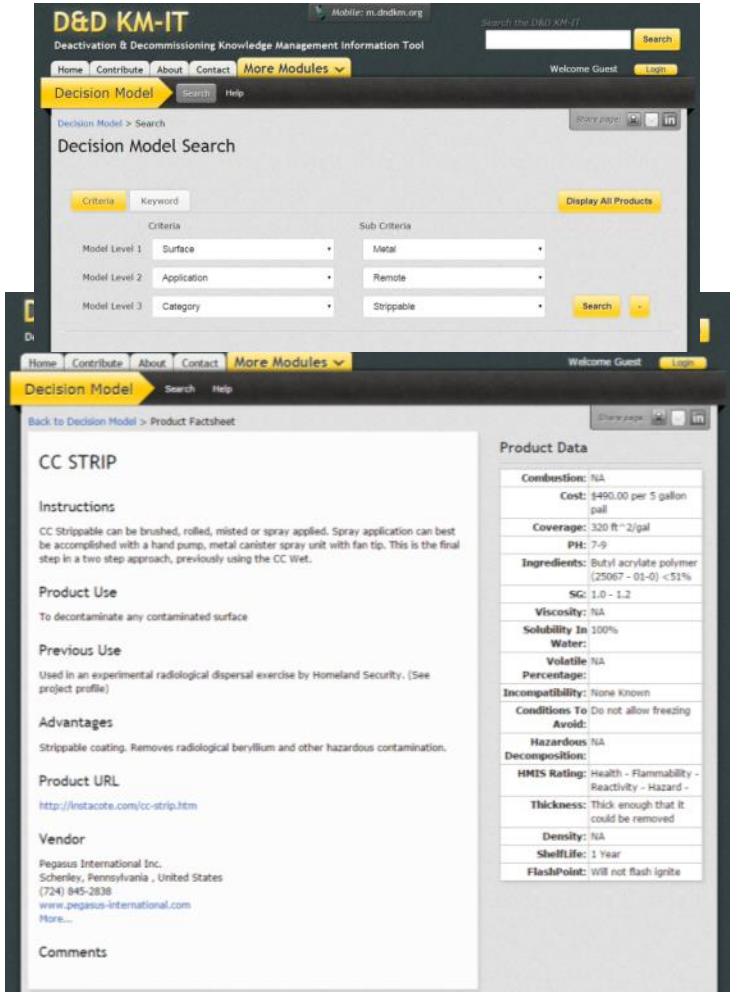
As part of FIU performance year 7, FIU will:

- Terminate/remove Advanced Fogging Research task.
- Continue adaptation / development of intumescent coating as a fire resilient fixative.
- Conduct full-scale test and evaluation of remote application of intumescent coating replicating hot cell at SRS 235-F.
- Assist in T&E of ARC robotics development project for D&D.

Major Accomplishments

D&D Knowledge Management Information Tool

- Deployed pilot **D&D Decision Model for the Selection of Fixatives, Strippable Coatings, and Decontamination Gels**
- Beta testing by field site users to be completed in April 2016
- Active participation by beta testers is key and may need DOE HQ management assistance
- After beta testing, model to be deployed on public server
- **Pilot mobile app** to be completed in May 2016

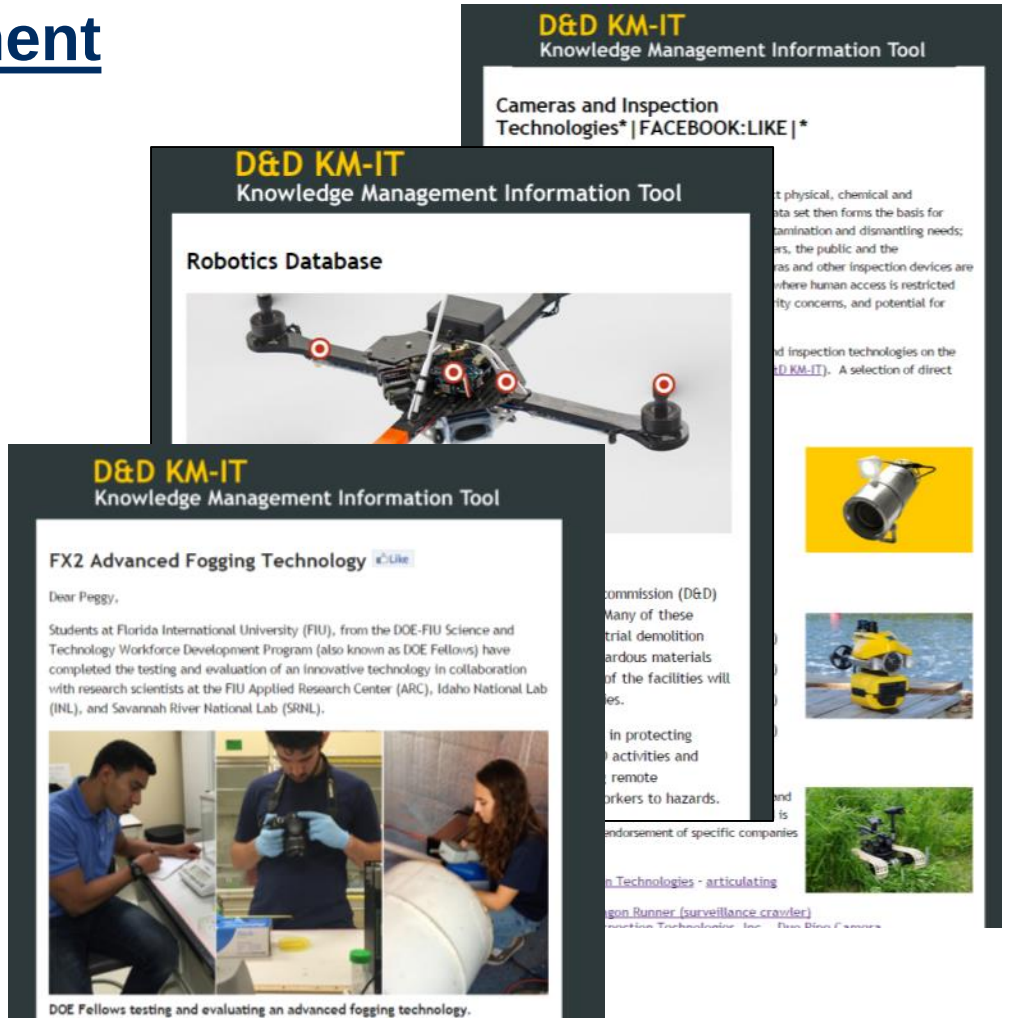


Major Accomplishments

D&D Knowledge Management Information Tool

Developed and distributed newsletters:

- Availability of Robotics Database
- FX2 Advanced Fogging Agent Test/Evaluation
- Inspection Technologies/Cameras

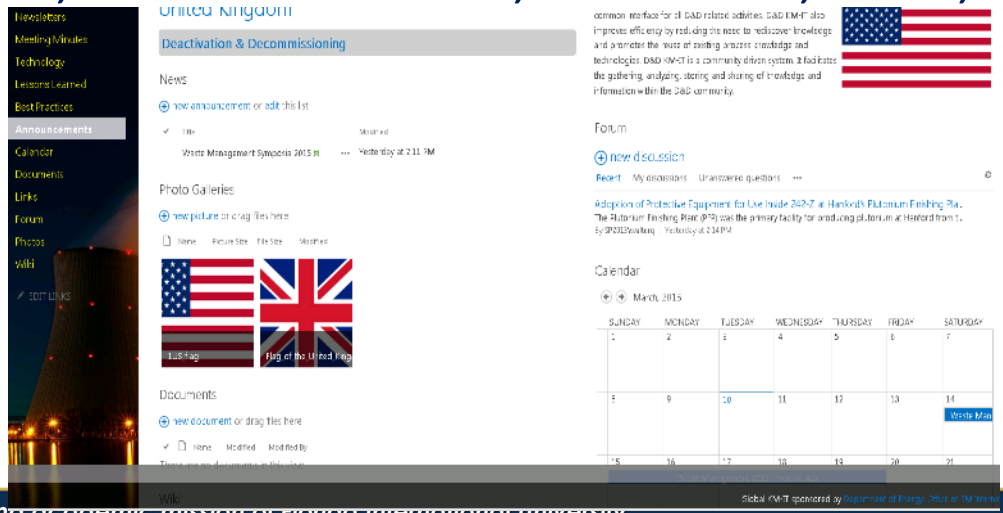


Major Accomplishments

D&D Knowledge Management Information Tool

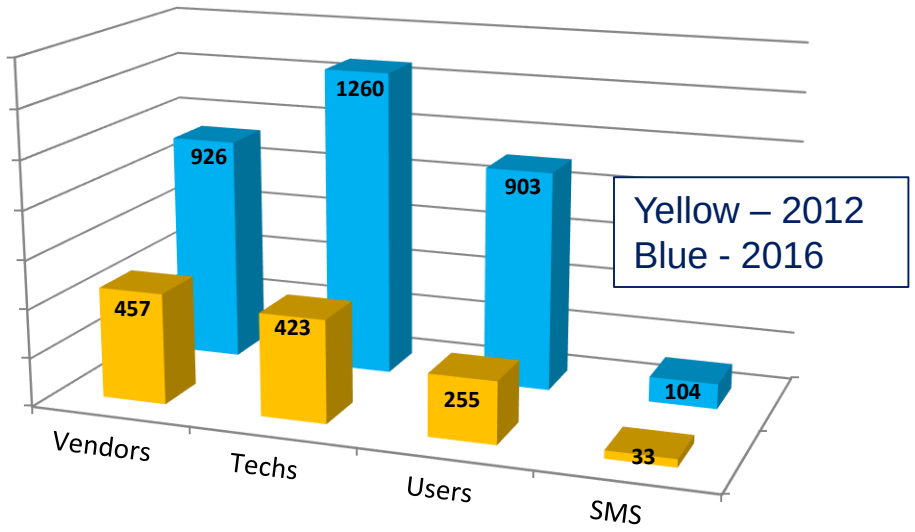
Developed an **Global Knowledge Sharing & Collaboration Platform** for unclassified information.

- Based on the protocols and standards for knowledge sharing with a focus on the U.K.
- Newsletters, Meeting Minutes, Technology, Lessons Learned, Best Practices, Documents, Announcements, Calendars, Links, FAQ, Wikis.



D&D KM-IT: Current Statistics

- 903 registered users
- 104 subject matter specialists
- 926 D&D vendors
- 1260 D&D technologies
- 494 robotic technologies
- 195 questions and solutions in Hotline module
- 169 ALARA Center reports archived
- 231 Innovative Technology Summary Reports archived



Growth from March 2012 to March 2016

Web Analytics – Method & Application

- To measure and optimize web usage
- Provides baseline measurements of critical metrics
- Used to improve weak metrics and enhance strong metrics
- Follow up on feedback from visitors
- Measures the impact of D&D KM-IT on the D&D community

D&D KM-IT – Outreach

- Participation in conferences (e.g., Waste Management Symposium, DD&R, etc.)
- Newsletters to registered D&D KM-IT users & SMS
- Periodical memos from DOE HQ to site managers
- Collaboration with other databases/systems like Decontamination and Decommissioning Science Consortium (DDSC), OSTI and ORAU
- Engage DOE Project Directors
- Engage DOE EM-72
- Engage user involvement via a user advisory group
- Share knowledge by contributing to wiki resources like Wikipedia and DOE's Powerpedia

D&D KM-IT – Future Work

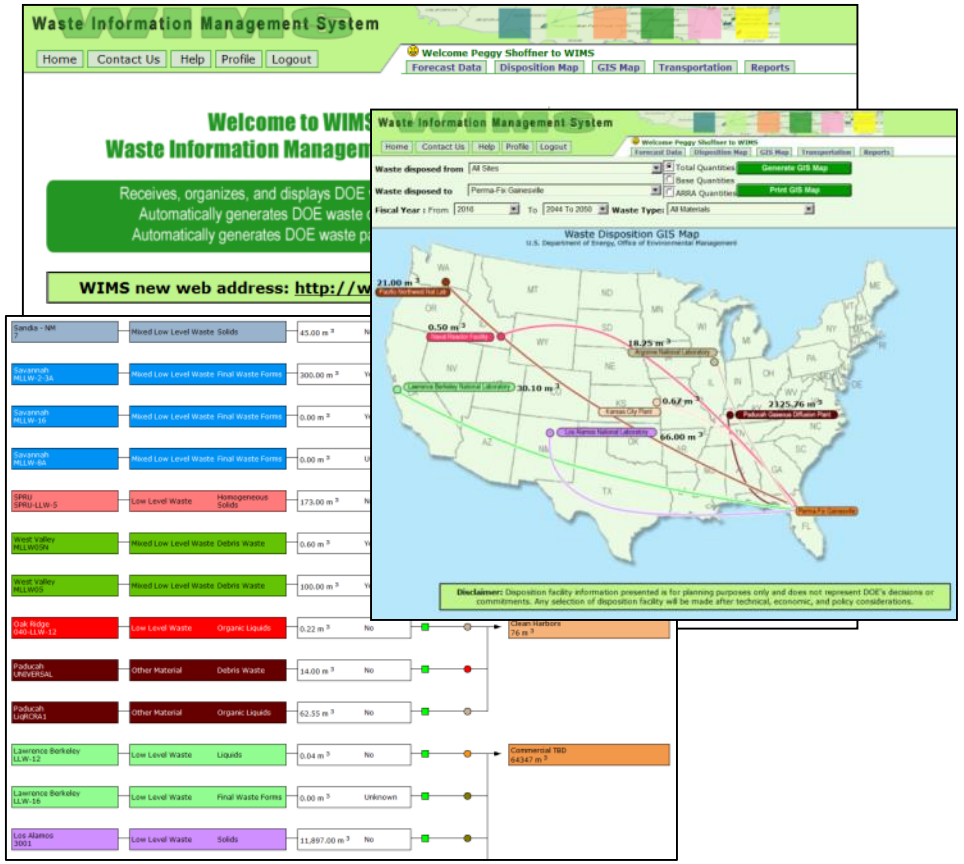
As part of FIU performance year 7, FIU will:

- Outreach to promote KM-IT at DOE sites and national labs, such as Oak Ridge and Savannah River
- Research creating native mobile applications for each of the three major mobile device platforms (Windows, Android and I-OS) using fixatives as a pilot.
- Work with DOE sites to identify additional high priority needs for mobile applications and perform feasibility analysis for design, development and deployment.
- Responsive design of D&D KM-IT User Interface for adaptive rendering on mobile devices.
- Explore social media integration with D&D KM-IT.
- KM-IT Content Management with focus on expanding Robotics Technologies.
- Web Analytics- Monitoring KM-IT platform with Google Analytics, application optimization and reporting / visualization.

Major Accomplishments

Waste Information Management System

- WIMS is successfully deployed **http://www.emwims.org**
- Easy-to-use tool to visualize and understand the forecasted DOE waste streams.
- Completed integration of 2015 waste forecast and transportation data into WIMS.
- New 2016 dataset expected in April 2016, will be integrated and deployed on WIMS.



Future Work

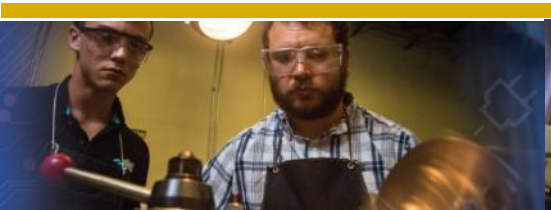
As part of FIU performance year 7, FIU will:

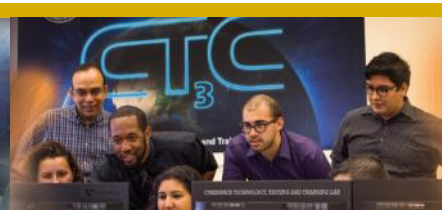
- Maintain WIMS via database management, application maintenance, and performance tuning.
- Integrate annual forecast data update.

FIU PROJECT 4:
DR. LEONEL E. LAGOS

DOE-FIU SCIENCE AND TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

FLORIDA INTERNATIONAL UNIVERSITY





Program Description

FIU's Applied Research Center (ARC) and the US Department of Energy's Office of Environmental Management have established a workforce development program for the training of FIU STEM, minority students in an effort to create a ***pipeline*** of scientists and engineers that will enter DOE's workforce upon completing their degrees and research at FIU.

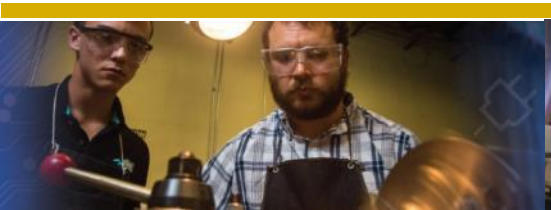
Program's Components

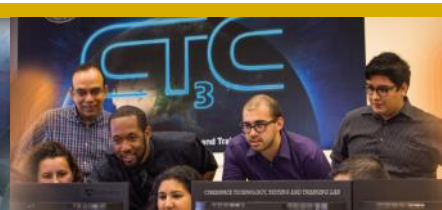
- Paid 10-week summer internships at DOE national laboratories, DOE sites, DOE-HQ or DOE contractors, working under the supervision of DOE scientists (mentors).
- Paid 20 hours/week Student Research Assistantship at ARC during school year.
- Research experience with ARC scientists at FIU during school year: one-on-one mentoring performing **hands-on** DOE-related applied research.
- Tuition waiver for graduate studies (Master, PhDs).
- 2 to 4 years Developmental Training Program (depends on masters or PhD track).
- DOE Lecture Series and technical seminars.
- Participation in conferences/workshops.

DOE-FIU Science & Technology Workforce Development Program

Accomplishments

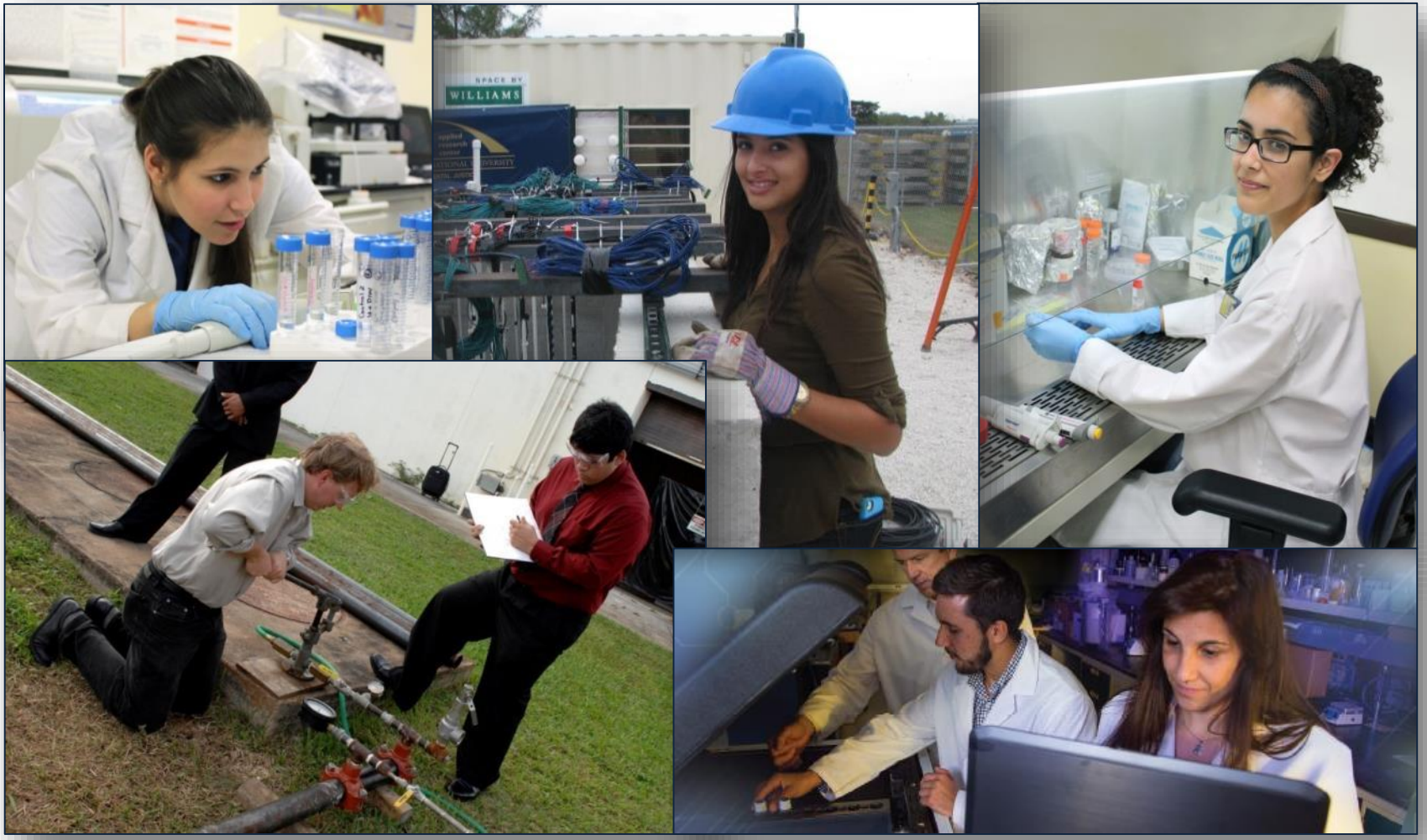
FLORIDA INTERNATIONAL UNIVERSITY





DOE Fellows Hands-On Research at FIU

FIU Applied Research Center



DOE Fellows Induction Ceremony

FIU Applied Research Center

A total of **120 FIU minority STEM students** have been inducted as DOE Fellows.

Conducted a total of 9 Induction Ceremonies since program inception in 2007.

DOE Fellows Induction Events – Robotics Lab Tour

FIU Applied Research Center

DOE Fellows at Conferences

WM Student Poster Session

Won **one (1)** Best Professional Poster and **five (5)** Best Student Posters at Waste Management Symposia since 2008.

Best Student Poster WM15

Presented over **165** papers and posters at Waste Management (2008-2016) and other national/international conferences, including two (**2**) presentations at ICEM13 (Brussels, Belgium), and **5** at ANS conferences.

Entering the Workforce Panel at WM15

DOE Fellows at WM16

DOE Fellow Silvina A. Di Pietro awarded 2016 Roy G. Post Foundation Scholarship

DOE Fellow Internships

95 internships completed at DOE sites, DOE national labs, DOE-HQ, and DOE contractors across the DOE Complex

Summer 2015 Internships

Project	DOE Fellow	DOE Site	Summer Mentor(s)
1	Anthony Fernandez	WRPS	Ruben Mendoza and Gregory Gauck
	Maximiliano Edrei	NETL	Chris Guenther
	Ryan Sheffield	DOE-HQ EM-20	James Poppiti
	John Conley	WRPS	Terry Sams and Dave Shuford
2	Aref Shehadeh	SRNL	Miles Denham
	Christine Wipfli	DOE-HQ EM-12	Skip Chamberlain/Kurt Gerdes
	Kiara Pazan	SRNL	Miles Denham and Margaret Millings
	Claudia Cardona	PNNL	Jim Sczcsody
3	Natalia Duque	SRNL	Ralph Nichols
	Yoel Rotterman	DOE-HQ EM-13	Albes Ganoa/John De Gregory
4	Andrew De La Rosa	ORNL	Joseph Trien
	Janesler Gonzalez	INL	Rick Demmer/Steve Reese
	Jesse Viera	INL	Rick Demmer/Steve Reese
	Jorge Deshon	SRNL	John Bobbitt and Steven Tibrea
	Meilyn Planas	WRPS	Terry Sams

IAEA Internship

Christine Wipfli
March 2016 – March 2017
IAEA Division of Nuclear Fuel Cycle & Waste Technology
Vienna, Austria

DOE Fellow Christine Wipfli awarded a prestigious one-year internship at the International Atomic Energy Agency (IAEA) in the Division of Nuclear Fuel Cycle & Waste Technology in Vienna.

Spring/Summer 2016 Internships

Project	DOE Fellow	Location	Internship Mentor	Comments
1	Erim Gokce	WRPS	Ruben/Dennis	High Level Waste
	Gene Yllanes	PNNL	Bill Glass	Robotics at PNNL
	Max Edrei	NETL	Chris Gunter	High Level Waste CFD
	Sebastian Zanlongo	LANL	David Mascarena	LANL robotics group
2	Alejandro Garcia	PNNL	Brady Lee	**Spring: Task 2 and Masters**
	Alejandro Hernandez	SRNL	Miles Denham	
	Alexis Smooth	DOE HQ	International Programs/Rosa Elmetti	
	Awmna Rana	REU/SREL	John Seaman (SREL)	Applied for MSIPP Internship, Alternative would be SRNL
	Christopher Strand	LANL	TBD	LANL Soil & Groundwater
	Hansel Gonzalez	SRNL	Miles Denham	**Task 2 and PhD**
	Sarah Bird	HQ /EM-12	Skip Chamberlain (EM-12)	SRNL Soil & Groundwater
	Silvina Di Pietro	PNNL	Jim Szecosdy/Nik Qafoku	**Task 2 and PhD**
3	Orlando Gomez	INL	David Chichester	Radiation Detection for D&D

Annual DOE Fellows Poster Exhibition

9 DOE Fellow Poster Exhibitions held at FIU since 2007. 138 research posters presented.

Graduate Degrees Based on DOE EM Research

DOE-EM based research on the Cooperative Agreement projects are the basis of master's degree thesis and PhD dissertations completed or currently in progress (DOE Fellows & graduate research assistants).

45 Fellows started program as undergraduates and continued to obtain a Masters and/or PhD degree at FIU or other institutions (including MIT, Michigan, Purdue, Stanford, Virginia Tech, and others)

FIU Student Chapter
American Nuclear Society

Officially launched on January 28, 2016 with a visit to FIU from ANS president Eugene "Gene" Grecheck for a special ceremony to present the Student Section Charter.

Chapter officers: Ryan Sheffield (President), Maximiliano Edrei (Vice President), Awmna Rana (Secretary), Janesler Gonzalez (Committee Head), and Jesse Viera (Treasurer). Dr. Leonel Lagos from FIU's Applied Research Center is serving as the FIU Chapter Faculty Advisor.

DOE Fellows Lecture Series

- Brady Lee (PNNL)
- Steve Thompson (UK's NNL)
- Anthony Banford (UK's NNL)
- Keith Miller (UK's NNL)
- Don Reed (LANL)
- Karthik Subramanian (WRPS)
- Jim Voss (WM Symposium)
- Costas Tsouris (ORNL)

Getting Them Hired

- **8** Fellows hired by DOE, DOE national labs, and DOE contractors.
- **13** Fellows hired by other federal, state, and local gov't agencies (Dept. of Defense, NASA, Dept. of Commerce, Dept of the Navy (NAVSEA), etc.).
- **58** Fellows hired by private STEM industry (GE, Lockheed Martin, Raytheon, Texas Instruments, Motorola, Florida Power & Light, Boeing, Inter Corporation, MWH Global Inc., and others) .
- Graduation rate of DOE Fellows - 99%
- Retention rate of DOE Fellows in the program - 75%

STEM Minority Students Pipeline

NETL

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

DEPARTMENT OF DEFENSE · UNITED STATES OF AMERICA

OAK RIDGE National Laboratory

FPL

MOTOROLA

GE

WCS COMPACT FACILITY

THE TEXAS SOLUTION

BOEING

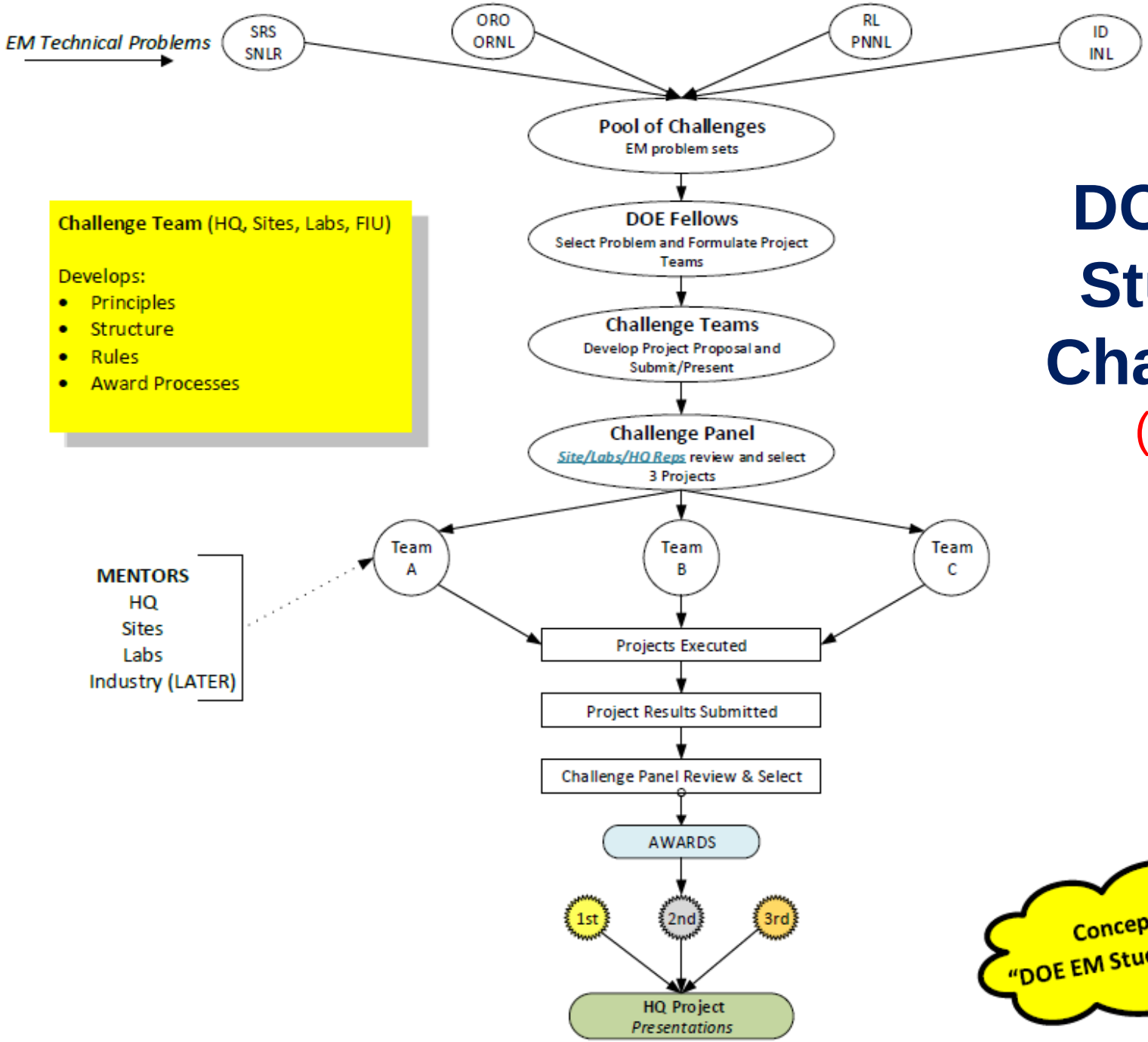
NASA

AREVA

OCKHEED MARTIN

DOE EM Student Challenge

(draft)



Concept for the "DOE EM Student Challenge"

Pilot Launch - Student Challenge

- Engage the six (6) new DOE Fellows recruited and selected during the Spring 2016.
- Formal introduction to the DOE EM organization and their problem sets.
- Challenge the Fellows as a single multi-disciplinary team to research the functional requirements, identify relevant technologies, and develop potential solutions to a single selected challenge/problem.
- Assisted by senior DOE Fellows with DOE EM internship experience.
- Mentored by FIU ARC staff with expertise in the selected problem.
- A proof-of-concept test at the bench-scale will be targeted by the end of the challenge.
- A final presentation to DOE EM management will be developed and delivered by the DOE Fellow student challenge team.

DOE Fellows – The Big Picture

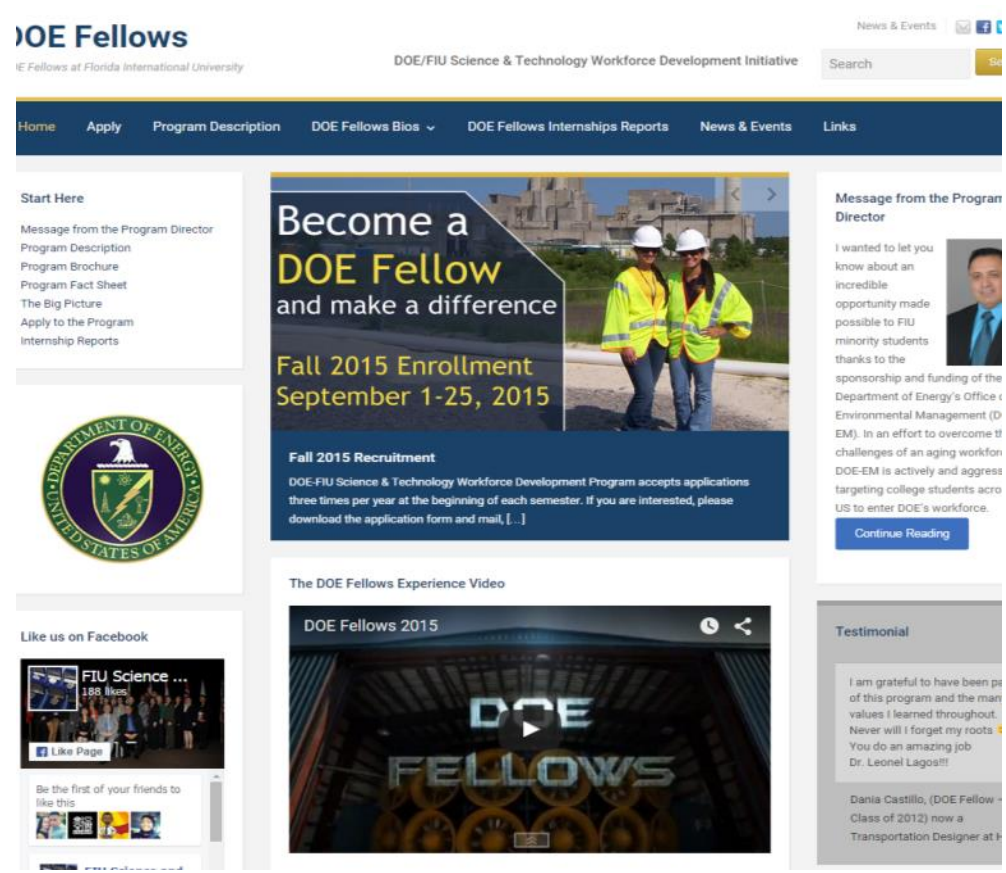
Click image to open file

Program Website and Facebook

FIU Applied Research Center

http://fellows.fiu.edu

Follow us on Facebook at:
FIU Science and Technology Workforce Development Initiative



Future Work

- FIU Performance Year 7
  - Continue selection & recruitment of qualified, talented FIU minority STEM students
  - Engage all DOE Fellows in EM applied research conducted in projects 1-3
  - Conduct summer internships at DOE sites, HQ, nat. laboratories and DOE contractors
  - Conduct DOE Fellows Poster Competition (Oct. 2016)
  - Conduct Induction Ceremony 2016 (Nov. 2016)
  - Participate in WM Symposia 2017
  - Coordinate efforts with EM-70 to identify employment opportunities for DOE Fellows