

## **FINAL TECHNICAL REPORT**

May 7, 2010 to August 28, 2015

# **DOE-FIU Science & Technology Workforce Development Initiative**

<http://fellows.fiu.edu/>

**Date submitted:**

August 28, 2015

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**Prepared for:**

U.S. Department of Energy

Office of Environmental Management

Under Cooperative Agreement No. DE-EM0000598



**Applied Research Center**

FLORIDA INTERNATIONAL UNIVERSITY

Addendum:

This document represents one (1) of five (5) reports that comprise the Final Technical Reports for the period of May 18, 2014 to August 28, 2015 (FIU Year 5) prepared by the Applied Research Center at Florida International University for the U.S. Department of Energy Office of Environmental Management (DOE-EM) under Cooperative Agreement No. DE-EM0000598. A summary of FIU Year 1 to FIU Year 4 (May 7, 2010 to May 17, 2014) is also included.

The complete set of FIU's Final Technical Reports for this reporting period includes the following documents and are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University (<http://doeresearch.fiu.edu>):

Project 1: Chemical Process Alternatives for Radioactive Waste  
Document number: FIU-ARC-2015-800000393-04b-237

Project 2: Rapid Deployment of Engineered Solutions for Environmental Problems  
Document number: FIU-ARC-2015-800000438-04b-228

Project 3: Remediation and Treatment Technology Development and Support  
Document number: FIU-ARC-2015-800000439-04b-232

Project 4: Waste and D&D Engineering and Technology Development  
Document number: FIU-ARC-2015-800000440-04b-229

Project 5: DOE-FIU Science & Technology Workforce Development Initiative  
Document number: FIU-ARC-2015-800000394-04b-090

Each document will be submitted to OSTI separately under the respective project title and document number as shown above.

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## PROJECT 5 OVERVIEW

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There is a national need for more careers in science, technology, engineering and mathematics (STEM). This shortage is felt not only in the private industry sector but also across many federal agencies. Across the U.S. Department of Energy (DOE) and within DOE Environmental Management (EM), there is a similar critical shortage of entry-level STEM personnel. As of 2008, only 1% of DOE-EM's workforce was 30 years old or younger. The effects are already being felt across DOE EM and new ways to stimulate interest in STEM are being initiated by the federal government. If this shortage is not addressed, the risks include knowledge gaps (discontinuity of lessons learned) within the department and a lack of skilled personnel to carry out its cleanup mission effectively.

Florida International University (FIU), the largest Hispanic serving research-extensive institution in the continental United States, is one of the nation's leading producers of scientists and engineers from underrepresented groups. In 1995, DOE created a unique partnership with FIU to support environmental cleanup technology development, testing and deployment at DOE sites. This partnership spawned a research center at FIU dedicated to applied environmental research and development (R&D). The center, now known as the Applied Research Center, has tackled and helped solve problems at many DOE sites.

The DOE-FIU Science and Technology Workforce Development Initiative was established in 2007 to create a pipeline of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need. This innovative program was designed to help address DOE's future workforce needs by partnering with academic, government and DOE contractor organizations to mentor future minority scientists and engineers in the research, development, and deployment of new technologies addressing DOE's environmental cleanup challenges. The main objective of the program is to provide interested students with a unique opportunity to integrate course work, DOE field work, and applied research work at FIU into a well-structured academic program that leads to entry into DOE EM's Pathways Programs. Students selected as DOE Fellows perform research at FIU and at DOE sites, national laboratories, and DOE contractors. Upon graduation and completion of this fellowship, the students will submit an application to join the DOE federal internships programs such as the Pathway Program, apply to DOE contractors, pursue post master or postdoctoral positions at DOE national laboratories, or apply to private industry in their field of study.

Since its inception in 2007, the DOE-FIU Science & Technology Workforce Development Initiative program has inducted 108 minority FIU STEM students. DOE Fellows Induction Ceremonies have been attended by DOE EM officials including Mr. Mark Gilbertson (2007), former Assistant Secretary for Environmental Management, Mr. Jim Rispoli (2008), Ms. Yvette Collazo (2009), former Assistant Secretary for Environmental Management, Ms. Ines Triay (2010), Acting Principal Assistant Secretary for Environmental Management, Ms. Tracy Mustin (2011), Associate Principal Deputy Assistance Secretary for Environmental Management, Mrs. Alice Williams (2012), Senior Advisor to the U.S. Secretary of Energy for Environmental Management, Elizabeth Connell (2013) and Acting Deputy Assistant Secretary for Tank Waste and Nuclear Materials Management, DOE Office of Environmental Management Mr. Kenneth Picha (2014). All of these students have been exposed to DOE EM applied research efforts being conducted at FIU-ARC, DOE sites, DOE national labs, and DOE contractor facilities across the US. Upon graduation and completion of this fellowship, DOE Fellows will join the STEM



workforce by submitting applications to federal internship programs such as the Pathways Program and/or by applying to DOE contractors, other federal agencies, and the STEM industry at large. As of summer 2015, the program has completed 95 summer internships at DOE sites, national laboratories, and DOE contractors. DOE Fellows have presented over 129 posters/oral presentations at national and international conferences. At the WM09, WM10, WM11, WM14 and WM15 Waste Management Symposia, five DOE Fellows have won the Student Poster competitions and one DOE Fellow received the award for the best poster out of all the professional poster sessions presented at WM09. A total of 9 DOE Fellows have applied to the DOE EM Professional Development Program (1 in 2009 and 8 in 2010) with one of our Fellows (Rosa Ramirez - Class of 2008) being selected for the DOE EM Professional Development Corps (EMPCD) program in September 2009. In addition, during the spring of 2011, 6 DOE Fellows applied to DOE EM's Student Career Experience Program (SCEP) program and 3 were selected. A DOE Fellow (Edgard Espinosa - Class of 2007) was selected into the SCEP program and has successfully converted to a full-time federal employee in 2011. A second DOE Fellow (Lee Brady - Class of 2008) was also converted to full-time federal employee in the Spring of 2012. Another Fellow (Charles Castello - Class of 2008) completed the SCEP program but selected to accept a position at Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program. The program has been featured in DOE EM publications such as the EM-20 Final Year Report, US DOE EM Highlights, Diversity @ EM magazine, EM Program Update, and FIU News.

Detailed task descriptions and deliverables and milestones can be found in the Project Technical Plan (Appendix 1). The milestones and deliverables for Project 5 for FIU Year 5 are also shown on the following table.

**Table 1. FIU Year 4 Milestones and Deliverables for Project 5**

<b>Milestone/ Deliverable</b>	<b>Description</b>	<b>Due Date</b>	<b>Status</b>	<b>OSTI</b>
2014-P5-M1	Draft Summer Internships Reports	10/04/14	Complete	
Deliverable	Deliver Summer 2014 interns reports to DOE	10/17/14	Complete	
Deliverable	List of identified/recruited DOE Fellow (Class of 2014)	10/31/14	Complete	
2014-P5-M2	Selection of new DOE Fellows – Fall 2014	10/31/14	Complete	
2014-P5-M3	Conduct Induction Ceremony – Class of 2014	11/13/14	Complete	
2014-P5-M4	Submit student poster abstracts to Waste Management Symposium 2015	01/15/15	Complete	
Deliverable	Update Technical Fact Sheet	30 days after end of project	Complete	

Highlights during FIU Year 5 include:

- Year End Reports for FIU Year 4 were completed for all projects and sent to DOE as well as site points of contact.
- Project Technical Plans for FIU Year 5 were completed for all projects and sent to DOE as well as site points of contact.
- Project progress and accomplishments for FIU Year 5 were presented to DOE-EM during a videoconference held March 31 - April 3, 2015. 12 DOE Fellows presented during the

technical (projects 1-4) and workforce development presentations to highlight the applied research they are performing for DOE EM as part of this Cooperative Agreement.

- 15 DOE Fellows participated in internships at DOE Headquarters, DOE sites, DOE national laboratories, and DOE contractors during summer 2015.

## TECHNICAL PROGRESS FROM FIU YEAR 1 TO FIU YEAR 4

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This innovative program was officially established in March 2007. This project is successfully meeting its objectives by providing research training and mentoring for students from underrepresented groups on environmental problems at DOE sites in addition to providing several formal recruitment and retention mechanisms for qualified students from underrepresented groups to pursue advanced studies, research training, and eventual career placement at DOE, national laboratories, DOE contractors and the general STEM industry. The DOE-FIU Science and Technology Workforce Development Initiative Program was established by FIU ARC based on a direct request by DOE's Office of Environmental Management (DOE-EM). The program was designed to build upon a long relationship between DOE and FIU-ARC by creating a "**pipeline**" of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need. Major key accomplishments to date:

- 36 master degrees and 3 Ph.D. degrees earned (or in progress) based on EM research program
- DOE Fellows program has been featured in national and international newsletters
- Nine (9) DOE Fellows applied to the DOE EMPDC program in 2009 and 2010
- Six (6) DOE Fellows applied to DOE EM SCEP in spring 2011
- DOE Fellows, Edgard Espinosa, Charles Castello, and Lee Brady were selected by DOE EM as part of Student Career Experience Program (SCEP). These Fellows completed SCEP assignments working for EM-2.1, EM-12, and EM-13 respectively
- DOE Fellow (Edgard Espinosa) was hired by DOE-EM and began working for EM-22 (Nuclear Materials Disposition) under the direction of Mr. Gary Deleon
- DOE Fellow (Charles Castello) was hired by DOE's Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program
- DOE Fellow (Lee Brady) was hired by DOE-EM and began work for EM-13 (D&D and Facility Engineering) under the direction of Mr. Andrew Szilagyi
- DOE Fellow (Stephen Wood) joined Oak Ridge National Laboratory's Bredesen Center for Interdisciplinary Research and Graduate Education as an Energy Science & Engineering PhD Fellow
- DOE Fellow (Rosa Ramirez) was hired into the EM Professional Development Corps program
- DOE Fellow (Duriem Calderin) was hired by DOE Contractor Columbia-Energy Environmental Services, Duriem is working in Richland, WA
- DOE Fellow, (Merlin Ngachin) was hired by Waste Control Specialists (WCS) in Texas
- Over forty-one (41) DOE Fellows graduated FIU with bachelor's or master's degrees and obtained employment in private industry and government agencies, including: Columbia-Energy Environmental Services (1 Fellow), Waste Control Specialists (1 Fellow), Boeing Company (3 Fellows), GE (1 Fellow), NASA (1 Fellow), Florida Department of Environmental Protection (1 Fellow), Florida Power & Light (2 Fellows), Mount Sinai Medical Center (2 Fellows), Internal Revenue Service (1 Fellow), Department of

Commerce (1 Fellow), PriceSmart Inc. (1 Fellow), Bouygues Civil Works Florida (1 Fellow), Crane Aerospace and Electronics (1 Fellow), HP Foundation (1 Fellow), Lockheed (1 Fellow), U.S. Department of Health & Human Services (1 Fellow), Beckman Coulter (2 Fellows), Motorola (1 Fellow), Kiewit Power (1 Fellow), CHP Inc. (1 Fellow), Texas Instruments (1 Fellow), CPH Inc. (1 Fellow), and others.

- DOE Fellow (Leydi Velez) won Best Professional Poster at WM09
- DOE Fellow (Denisse Aranda) won Best Student Poster at WM09
- DOE Fellow (Denny Carvajal) won Best Student Poster at WM10
- DOE Fellow (Stephen Wood) won Best Student Poster at WM11
- DOE Fellow (Alexandra Fleitas) won Best Student Poster at WM14
- DOE Fellows (Christine Wipfli) won Best Student Poster at WM15
- Completed 95 internships at DOE sites, DOE national labs, DOE-HQ, and DOE contractors since 2007
- 129 presentations (posters and papers) at Waste Management conferences (2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015)
- DOE Fellows supported the Energy Facility Contractors Group (EFCOG) and contributed to the development of 13 Lessons Learned and Best Practices documents
- Development of DOE Fellows web site <http://fellows.fiu.edu/> and Facebook page
- Two Fellows participated and presented their high level waste DOE EM applied research at ICEM2013 in Brussels, Belgium (details provided in Section 11). The American Society of Mechanical Engineers sponsored their participation in the conference.

## RESULTS AND DISCUSSION (FIU YEAR 5)

### 1.0 DOE FELLOWS ENTERING TO DOE'S PATHWAYS PROGRAMS

The vision of this program is to create a “**pipeline**” of minority FIU students who will be trained and mentored as DOE Fellows and enter DOE's workforce. This vision became a reality when our first DOE Fellow (Rosa (Ramirez) Elmetti) was hired by DOE in September 2009 and entered DOE's Professional Development Corps Program. Rosa is currently working for DOE EM's International Program (EM-1). Rosa continues to be a FIU graduate student and is continuing her work towards completing a master's degree in environmental engineering. The success story of the program continued in summer 2010 when DOE Fellow, Duriem Calderin, was hired by a DOE contractor (Columbia-Energy Environmental Services) in Richland, WA. Since then, Duriem has left Columbia-Energy and joined AREVA. The pipeline continued to work during the spring of 2011 when six DOE Fellows applied to the Student Career Experience Program (SCEP) in February/March 2011. This federal internship program allows our DOE Fellows to work as federal employees during work assignments at DOE-HQ and return to FIU to complete their respective degrees. Once the DOE Fellows graduate from FIU and complete the Pathways Program requirements, they are eligible for full time employment with DOE EM. The following 3 DOE Fellows were selected for the program and started their work assignments at DOE-HQ in Washington, DC during April/May in 2011. Two Fellows (Edgard Espinosa and Lee Brady) completed the SCEP program and joined DOE-EM as fulltime employees. The third Fellow (Charles Castello) completed the SCEP program but obtained an alternative offer from Oak Ridge National Laboratory.

During FIU Year 5, an additional six (6) DOE Fellows in science, technology, engineering, and math (STEM) disciplines were hired by DOE national laboratories and private industry. Table 2 shows the DOE Fellows from classes 2010 through classes 2014 and their employment.

**Table 2. DOE Fellows 2010-2014 - Employment**

<b>Class</b>	<b>DOE Fellow</b>	<b>Employment</b>
Class of 2010	Yulyan Arias	CH2M Hill
	Maite Barroso	Sikorsky Aircraft
	Givens Cherilus	Florida Power & Light
	Eliceck Delgado-Cepero	Motorola
	Janty Ghazi	Kiewit Power Engineers Co
	Heidi Henderson	CPH Engineers Inc.
	Kanchana Iyer	Department of Health & Humans Services
	Alexander Lopez	Florida Department of Transportation
	Sheidyn NG	Regeneron Pharmaceuticals, Inc.
	Shina Rana	Florida Power & Light
	Melissa Sanchez	Florida Department of Environmental Protection
Class of 2011	Claudia Cardona	Ph.D Student/DOE Fellow - FIU
	Nel Ciurdar	Burns & McDonnell
	Eric Inclan	PhD Student – Georgia Tech
	Lilian Marrero	MWH Global
	Joshua Midence	Creativity, Value Logic Inc

<b>Class</b>	<b>DOE Fellow</b>	<b>Employment</b>
Class of 2011	Carol Moreno-Pastor	Student - FIU
	Jaime Mudrich	Bechman Coulter
	Ximena Prugue	BRG Sports
	Paola Sepulveda	Stryker Inc
	Frank Silva	Florida Power & Light
	Bryant Thompson	Grad Student - USC
Class of 2012	Nicole Anderson	National Energy Technology Laboratory
	Jennifer Arniella	Permasteelisa North America
	Francisco Bolanos	Bechman Coulter
	Dania Castillo	HDR
	Dayron Chigin	Florida Power & Light
	Robert Lapierre	Grad Student/DOE Fellow – FIU
	Joel McGill	BND Engineers Inc
	Lucas Nascimento	Raytheon
	Raul Ordonez	Texas Instruments
	Valentina Padilla	Student - FIU
	Mariela Silva	ConocoPhillips
	Gabriela Vazquez	Florida Power & Light
	Revathy Venkataraman	TradeStation Inc
Class of 2013	Michael Abbot	Magic Leap, Inc
	Pedro Cordon	Western Digital Company
	Natalie Duque	Student - FIU
	Michelle Embon	ARCADIS
	Mariana Evora	King Engineering Associates Inc
	Alexandra Fleitas	Student - FIU
	Eduardo Garcia	UTC Aerospace Systems
	Hansell Gonzalez	PhD Student/DOE Fellow - FIU
	Adamandios Manoussakis	Student - FIU
	Deanna Moya	Student - FIU
	Steve Noel	Goldman Sachs
	Sasha Philius	HaikuTech Europe B.V.
	Christian Pino	Student/DOE Fellow - FIU
	Lucas Scott	MWH Global
	Carmela Vallalta	Student - FIU
Class of 2014	Brian Castillo	Student/DOE Fellow - FIU
	John Conley	Student/DOE Fellow - FIU
	Andrew De La Rosa	Student/DOE Fellow - FIU
	Jorge Deshon	Student/DOE Fellow - FIU
	Maria Eugenia Diaz	Nova Consulting
	Maximiliano Edrei	Student/DOE Fellow - FIU
	Anthony Fernandez	Student/DOE Fellow - FIU
	Janesler Gonzalez	Student/DOE Fellow - FIU
	Kiara Pazan	Student/DOE Fellow - FIU
	Meilyn Planas	Student/DOE Fellow - FIU

<b>Class</b>	<b>DOE Fellow</b>	<b>Employment</b>
Class of 2014	Yoel Rotterman	Student/DOE Fellow - FIU
	Ryan Sheffield	Student/DOE Fellow - FIU
	Aref Shehadeh	Student/DOE Fellow - FIU
	Jesse Viera	Student/DOE Fellow - FIU
	Christine Wipfli	Student/DOE Fellow - FIU

## 2.0 INCREASING THE RETENTION OF MINORITY STUDENTS IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH (STEM) DISCIPLINES

### 2.1 DOE Fellows Continuing onto Graduate Degrees at FIU in the Areas of Science, Technology, Engineering, and Math (STEM) Education

A total of **39 DOE Fellows** are currently pursuing or have completed master's or Ph.D. STEM degrees at FIU. Most of these DOE Fellows started the DOE-FIU Science & Technology Workforce Development Program as undergraduates and have been successfully encouraged and prepared to continue onto graduate studies at FIU. The research conducted at ARC, DOE sites, DOE national laboratories, and DOE private contractors serve as the basis for their master's thesis or Ph.D. dissertation topics. Table 3 below shows all the DOE Fellows who are pursuing or have completed graduate level work. In addition, several undergraduate DOE Fellows incorporate their EM applied research into their Senior Design or Capstone Projects at FIU.

**Table 3. DOE Fellows in STEM Graduate Programs**

	<b>DOE Fellow</b>	<b>Discipline</b>	<b>Degree</b>	<b>Research Topic/Work Based on DOE EM projects</b>	<b>Anticipated Date of Graduation</b>
<b>1</b>	Jose Vasquez	Environmental Engr.	Master	Effects of temperature and pH on volatilization of mercury after chemical reduction	<b>Graduated: 08/09</b>
<b>3</b>	Duriem Calderin	Biomedical Engr.	Master	Modeling of Loose Contamination Scenarios to Predict the Amount of Contamination Removed	<b>Graduated: 08/10</b>
<b>2</b>	Leydi Velez	Industrial Engr.	Master	Decision Modeling Tools D&D Surveillance & Maintenance	<b>Graduated: 12/10</b>
<b>4</b>	Serkan Akar	Biomedical Engineering	Master	Design and Development of an Enzyme-Linked Biosensor for Detection and Quantification of Phosphate Species	<b>Graduated: 05/10</b>
<b>5</b>	Amaury Betancourt	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	<b>Graduated: 04/11</b>
<b>6</b>	Charles Castello	Electrical Engr.	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury	<b>Graduated: 08/11</b>
<b>7</b>	Denny Carvajal	Biomedical Engr.	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford	<b>Graduated: 08/11</b>
<b>8</b>	Edgard Espinosa	Mechanical Engr.	Master	Waste Processing - CFD Modeling of NuVison's Power Fluidic Technology/Process	<b>Graduated: 12/11</b>



	<b>DOE Fellow</b>	<b>Discipline</b>	<b>Degree</b>	<b>Research Topic/Work Based on DOE EM projects</b>	<b>Anticipated Date of Graduation</b>
<b>9</b>	Elsa Cabrejo	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	<b>Graduated: 04/11</b>
<b>10</b>	Melina Idarraga	Environmental Engr.	Master	Dissolution rate of natural meta-autunite: effects of aqueous bicarbonate, pH and temperature	<b>Graduated: 12/11</b>
<b>11</b>	Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW	<b>Graduated: 08/11</b>
<b>12</b>	Stephen Wood	Mechanical Engr.	Master	Modeling of Pipeline Transients: Modified Method of Characteristics	<b>Graduated: 05/11</b>
<b>13</b>	William Mendez	Engineering Mngmt.	Master	Development of Remote Stack Characterization System	<b>Graduated: 04/11</b>
<b>14</b>	Lee Brady	Engineering Mngmt.	Master	D&D Best Practices/Lessons Learned Development for EFCOG	<b>Graduated: 04/12</b>
<b>15</b>	Mario Vargas	Mechanical Engr.	Master	Kinematic Control of Remote Stack Characterization System	<b>Graduated: 08/12</b>
<b>16</b>	Melissa Sanchez**	Environ. Engr.	Master	Non-thesis option	<b>Graduated: 05/12</b>
<b>17</b>	Yulyan Arias**	Environmental Engineering	Master	Non-thesis option	<b>Graduated: 05/12</b>
<b>18</b>	Elicek Delgado-Cepero	Electrical Engr.	Master	Structural Health Monitoring Inside Concrete and Grout Using the Wireless Identification Sensing Platform	<b>Graduated: 05/13</b>
<b>19</b>	Eric Inclan	Mechanical Engr.	Master	Development of a Hybrid Optimization Algorithm for the Evaluation and Optimization of the Asynchronous Pulsing Unit	<b>Graduated: 08/13</b>
<b>20</b>	Heidi Henderson	Environmental Engr.	Master	Surface water and contaminant transport within the Oak Ridge National Laboratory	<b>Graduated: 12/13</b>
<b>21</b>	Jaime Mudrich	Mechanical Engr.	Master	Development of a Model for Fluid-Structure Interaction using the Meshfree FEM and the Lattice Boltzmann Method	<b>Graduated: 12/13</b>

	<b>DOE Fellow</b>	<b>Discipline</b>	<b>Degree</b>	<b>Research Topic/Work Based on DOE EM projects</b>	<b>Anticipated Date of Graduation</b>
<b>22</b>	Janty Ghazi	Electrical Engr.	Master	Control, through Sensors and Labview, of the Asynchronous Pulsing Unit	<b>Graduated: 05/13</b>
<b>23</b>	Jose Matos	Mechanical Engr.	Master	Development of Improved Bodies for a Peristaltic Crawler for Unplugging of Hanford Waste Transfer Pipelines	<b>Graduated: 8/13</b>
<b>24</b>	Kanchana Iyer*	Biomedical Engr.	Ph.D.	TBD	<b>Graduated: 08/13</b>
<b>25</b>	Lilian Marrero	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	<b>Graduated: 08/13</b>
<b>26</b>	Mariela Silva	Engr. Management	Master	SharePoint Based Secured Collaboration System	<b>Graduated: 12/13</b>
<b>27</b>	Joel McGill*	Civil Engr.	Master	Non-Thesis Option	<b>Graduated 04/14</b>
<b>28</b>	Paola Sepulveda-Medina*	Biomedical Engr.	Master	Investigating the Role of a Less Uranium Tolerant Strain, Isolated from the Hanford Site Soil, on Uranium Interaction in Polyphosphate Remediation Technology	<b>Graduated 04/14</b>
<b>29</b>	Revathy Venkataraman	Information Technology	Master	Performance Evaluation of Mobile Applications with KMIT Technology Web Services	<b>Graduated: 05/14</b>
<b>30</b>	Valentina Padilla	Environmental Engr.	Master	Non-Thesis Option	<b>Graduated 04/14</b>
<b>31</b>	Rosa Ramirez (Former DOE Fellow hired by DOE EM)*	Environmental Engr.	Master	TBD	TBD
<b>32</b>	Claudia Cardona	Environmental Engr.	Ph.D.	Sequestering Uranium at the Hanford 200 Area Vadose Zone by In Situ Subsurface pH Manipulation Using NH3 Gas	12/15
<b>33</b>	Hansell Gonzalez	Chemistry	PhD	Groundwater Remediation at SRS F/H Area	12/18
<b>34</b>	Andrew De La Rosa	Computer Engr.	Master	TBD	TBD
<b>35</b>	Dayron Chigin	Electrical Engr.	Master	TBD	TBD
<b>36</b>	Maximiliano Edrei	Mechanical Engr.	Master	TBD	TBD

	<b>DOE Fellow</b>	<b>Discipline</b>	<b>Degree</b>	<b>Research Topic/Work Based on DOE EM projects</b>	<b>Anticipated Date of Graduation</b>
<b>37</b>	Natalia Duque	Environmental Engr.	Master	TBD	TBD
<b>38</b>	Orlando Gomez	Physics	Ph.D.	TBD	TBD
<b>39</b>	Silvina Di Pietro	Chemistry	Ph.D.	TBD	TBD
*Left DOE Fellows program before completion of master's degree					
**Left DOE Fellows program but completed graduate degree at FIU					

### 3.0 DOE FELLOWS RECRUITMENT & SELECTION

The DOE Fellows Summer/Fall 2014 recruitment efforts were conducted from July 28 to August 1, 2014, temporarily halted during the semester break between August 4 - August 23, resumed on August 25 and continued until September 26. Figure 1 shows DOE Fellows staffing one of the recruitment information tables. A total of 41 applications were received, a package containing all the applications were sent to Ms. Melody Bell at DOE-HQ for review and input. FIU students' applications were reviewed, and selected candidates were interviewed by the DOE Fellows selection committee during the month of October. The committee included FIU's Arts & Science, ARC and DOE-HR representatives. Fifteen (15) students were selected to start the program (Table 4).

DOE Fellows Spring 2015 recruitment efforts were conducted from April 20 to May 1 and from May 11 to May 22. Recruitment campaigns were conducted by placing recruitment tables at the College of Engineering and at the main FIU campus in the Physics & Chemistry building and Computer Science building. A large number of students showed interest in the program and a signup sheet was used to collect student information. Thirty-three (33) FIU students applied for the DOE Fellows program. The DOE Fellows selection committee, comprised of ARC researchers and staff, recommended 19 FIU students for formal interviews. FIU completed the selection and 6 students were hired as DOE Fellows. The selected students started the DOE Fellowship on July 20, 2015 (Table 5).



**Figure 1. DOE Fellows promoting the DOE Fellows program.**

**Table 4. New DOE Fellows Selected in Summer/Fall 2014**

<b>DOE Fellow</b>	<b>Current Academic Status</b>	<b>Major</b>
Andrew De La Rosa	Undergraduate	Computer Engineering
Anthony Fernandez	Undergraduate	Mechanical Engineering
Aref Shehadeh	Undergraduate	Environmental Engineering
Brian Castillo	Undergraduate	Biomedical Engineering
Christine Wipfli	Undergraduate	Environmental Engineering
Janesler Gonzalez	Undergraduate	Mechanical Engineering
Jesse Viera	Undergraduate	Mechanical Engineering
John Conley	Undergraduate	Mechanical Engineering
Jorge Deshon	Undergraduate	Computer Engineering
Kiara Pazan	Undergraduate	Environmental Engineering
Maria Diaz	Undergraduate	Environmental Engineering
Maximiliano Edrei	Undergraduate	Mechanical Engineering
Meilyn Planas	Undergraduate	Electrical Engineering
Ryan Sheffield	Undergraduate	Mechanical Engineering
Yoel Rotterman	Undergraduate	Mechanical Engineering

**Table 5. New DOE Fellows Selected in Spring/Summer 2015**

<b>DOE Fellow</b>	<b>Current Academic Status</b>	<b>Major</b>
Alejandro Hernandez	Undergraduate	Chemistry
Awmna Rana	Undergraduate	Chemistry
Christopher Strand	Undergraduate	Civil & Env. Eng.
Erim Gokce	Undergraduate	Mechanical Eng.
Orlando Gomez	Graduate (Ph.D.)	Physics
Silvina di Pietro	Graduate (Ph.D.)	Chemistry

Each new DOE Fellow was assigned to an ARC staff member to act as their mentor and supervise their EM research work. Orientation for the new DOE Fellows was conducted and the new Fellows completed the FIU's Environmental Health & Safety courses required by the university and ARC prior to conducting any work in ARC's lab facilities. The new DOE Fellows also created a brief bio to include on the DOE Fellows website.

## 4.0 DOE FELLOWS INTERNSHIPS (SUMMER 2014, SUMMER 2015)

### 4.1 Summer 2014 Internships

The summer 2014 internships were completed in August 2014. Nine (9) DOE Fellows (Figure 2) participated in 10-week internships across the DOE Complex during the summer of 2014 where they were paired with scientists and engineers at DOE Headquarters, DOE facilities and national research laboratories (Table 6).



Figure 2. DOE Fellows summer 2014 interns with program director Dr. Leonel Lagos.

Table 6. DOE Fellows at Summer 2014 Internships

DOE Fellow	Location	Summer Site Mentor
Deanna Moya	DOE-HQ EM-12, Cloverleaf, MD	Justin Marble/Patricia Lee
Natalia Duque	DOE-HQ EM-13, Forrestal, D.C.	Albes Gaona
Carmela Vallalta	WRPS, Hanford, WA	Dennis Washenfelter
Sasha Philius	WTP (Bechtel), Hanford, WA	Brad Eccleston/Joel Peltier
Anthony Fernandez	WRPS, Hanford, WA	Ruben Mendoza
Christian Pino	PNNL, Richland, WA	Amoret Bunn
Robert Lapierre	PNNL, Richland, WA	Dawn Wellman/Jim Szecsody
Hansell Gonzalez	SRNL, Savannah River, SC	Brian Looney/Miles Denham
Steve Noel	SRNL, Savannah River, SC	Mary K. Harris

## **Washington, DC – DOE’s Headquarters**

DOE FELLOW: Deanna Moya

LOCATION: DOE-HQ Cloverleaf, Germantown, Maryland

MENTOR: Dr. Justin Marble and Dr. Patricia Lee

**Deanna Moya (DOE Fellow – Class of 2013)** is working for EM-12’s Office of Soil and Groundwater Remediation at the DOE-HQ Cloverleaf facility in Germantown, Maryland during the summer of 2014. Under the mentorship of Dr. Justin Marble and Dr. Patricia Lee, Deanna’s main role is to learn and test the Advanced Simulation Capability for Environmental Management (ASCEM) toolset. The ASCEM Project’s goal is to provide sustainable and cost effective solutions towards the DOE-EM cleanup mission. It is a tool comprised of advanced simulation capabilities that is used to understand and predict the subsurface flow and contaminant transport behavior in natural and engineered systems. With its modular and open source toolsets, ASCEM can provide standardized assessments of performance and risk analysis for EM activities, which ultimately aids in protecting human health and the environment for current and future generations.

DOE FELLOW: Natalia Duque

LOCATION: DOE-HQ, Washington, D.C.

MENTOR: Mr. Albes Gaona

**Natalia Duque (DOE Fellow – Class of 2013)** has been given the opportunity to intern with the Department of Energy, Office of Environmental Management (DOE-EM) Headquarters located in Washington, D.C. Natalia is assisting Mr. Albes Gaona and EM-13 in the development of its Green and Sustainable Remediation (GSR) and Sustainability Powerpedia pages, as well as in the development of the final GSR Catalog. During her internship, Natalia will also be working on the acquisition and analysis of data from the A/M Area located in Savannah River Site in order to identify opportunities for the incorporation of sustainability metrics in the environmental management decisions.

## **Richland, WA – DOE’s Hanford Site**

DOE FELLOW: Carmela Vallalta

LOCATION: Washington River Protection Solutions, Hanford

MENTOR: Mr. Dennis Washenfelder

**Carmela Vallalta (DOE Fellow – Class of 2013)** is participating in an internship at Washington River Protection Solutions (WRPS), Hanford. Ms. Vallalta is working under the supervision of Mr. Dennis Washenfelder, and will prepare waste mitigation and annulus ventilation operating chronologies for the double shell tanks, beginning with the earliest tanks, AY-101 and AY-102.

DOE FELLOW: Anthony Fernandez

LOCATION: Washington River Protection Solutions, Hanford

MENTOR: Mr. Ruben Mendoza

**Anthony Fernandez (DOE Fellow – Class of 2014)** is at Washington River Protection Solutions (WRPS), Hanford. He is working with two engineering groups, Waste Transfer and Waste Storage, under the supervision of Mr. Ruben Mendoza. Currently Mr. Fernandez is updating the Single Shell Tank’s (Enraf’s) tank level, monitoring reference level documentation and supporting the baseline change requests to Enraf’s levels. Anthony will be verifying and updating the waste transfer Safety

Equipment Compliance Database, which requires review and comparison to various different design drawings and specifications. AutoCAD software will be used to create layout drawings of the waste transfer routes used in all the tank farms. Lastly, he will be tracking the changes necessary to overlay the ground penetrating radar scans onto the updated tank farm route maps.

DOE FELLOW: Sasha Philius

LOCATION: DOE Office of River Protection (ORP), Hanford, WA

MENTOR: Mr. Brad Eccleston

**Sasha Philius (DOE Fellow – Class of 2013)** has been given the opportunity to intern with the Department of Energy's Office of River Protection (ORP) located at the Hanford Site, WA. Sasha is assisting Mr. Brad Eccleston and ORP in their partnership with Bechtel National Inc. to establish a new standard vessel design that would be capable of managing the most challenging waste slurries, with high solids and non-Newtonian fluid characteristics. In addition, he will accompany DOE staff in discussions related to vessel design features, test planning, and facility test readiness.

DOE FELLOW: Robert Lapierre

LOCATION: Pacific Northwest National Laboratory, Richland, WA

MENTOR: Dr. Jim Szecsody

**Robert Lapierre (DOE Fellow – Class of 2012)** is on his second trip to the Tri-Cities. This summer Robert is working at Pacific Northwest National Laboratory with Dr. Jim Szecsody, studying the influence of NH<sub>3</sub> gas treatment on uranium remediation in Hanford vadose zone sediments. During summer 2012, Robert spent his summer as an intern at Pacific Northwest National Laboratory (Richland, WA) under the guidance of Dr. Dawn Wellman of the Environmental Systems Group.

DOE FELLOW: Christian Pino

LOCATION: Pacific Northwest National Laboratory, Richland, WA

MENTOR: Amoret Burnn

**Christian Pino (DOE Fellow – Class of 2013)** is working under the mentorship of Amoret Bunn at Pacific Northwest National Laboratory (PNNL). He is aiding Amoret in completing a pilot study focused on the environmental concentrations of lead in soil. Hanford site, before the land was owned by the government, used to be orchard fields where lead arsenate pesticides were applied. There is still residual lead from this use, and the fields are being surveyed in order to determine whether the lead still poses harm as its concentration may be above EPA's standard. If this is the case as expected, the end goal of the project will be to focus on remediation methods to bring these levels to a safe threshold.

### **Aiken, South Carolina – DOE's Savannah River Site/Savannah River National Lab**

DOE FELLOW: Hansell Gonzalez

LOCATION: Savannah River National Laboratory, Aiken, SC

MENTOR: Dr. Miles Denham

**Hansell Gonzalez (DOE Fellow – Class of 2013)** is working at Savannah River National Laboratory under the mentorship of Dr. Miles Denham. During his internship, Hansell will study the effect of pH on the adsorption of humic substances on different sediments present at Savannah River Site. He will also analyze the ratio of absorbance of humate used during these adsorption experiments, at 465nm and at 665nm (E4/E6 ratio), to better understand the interaction of these heterogeneous humic substances with the sediments.



DOE FELLOW: Steve Noel

LOCATION: Savannah River National Laboratory, Aiken, SC

MENTOR: Mary Harris

**Steve Noel (DOE Fellow – Class of 2013)** is participating in a summer internship at Savannah River National Laboratory (SRNL) under the mentorship of Mary Harris. His focus during the internship is to develop web applications for Savannah River National Laboratory, converting on-site desktop applications into web applications using the “Aptana” program. These web applications will enable employees across the DOE complex and national laboratories to use applications/software that were previously only available through on-site computers.

The nine summer interns were exposed to DOE EM technical challenges by working at DOE-HQ, Savannah River National Laboratory, and the Hanford Site. At the conclusion of their internships, DOE Fellows documented their summer activities and results in a summer internship report (Table 7). These reports are available on the DOE Fellows webpage (<https://fellows.fiu.edu/internships-reports/>). The Fellows also had the opportunity to present their accomplishments during the annual DOE Fellow’s Poster Exhibition held every October at the Applied Research Center (ARC) at FIU (Section 5).

**Table 7. DOE Fellows Summer 2014 Internships Reports**

<b>DOE Fellow</b>	<b>Location</b>	<b>Summer Site Mentor</b>	<b>Report Title</b>
Deanna Moya	DOE-HQ EM-12, Cloverleaf, MD	Justin Marble/ Patricia Lee	<i>Advanced Simulation Capability for Environmental Management (ASCEM)</i>
Natalia Duque	DOE-HQ EM-13, Forrestal, Washington D.C.	Albes Gaona	<i>Sustainable Remediation and Literature Review for Savannah River Site A/M Area Groundwater Remediation System</i>
Carmela Vallalta	WRPS, Hanford, WA	Dennis Washenfelter	<i>Analysis of Tank Chemistry Compliance with Chemistry Specification in Double-Shell Tanks</i>
Sasha Philius	WTP (Bechtel), Hanford, WA	Brad Eccleston/ Joel Peltier	<i>HVAC Design Assessments for the Hanford Waste Treatment and Immobilization Plant</i>
Anthony Fernandez	WRPS, Hanford, WA	Ruben Mendoza	<i>Enraf &amp; Densitometer Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford Site</i>
Christian Pino	PNNL, Richland, WA	Amoret Bunn	<i>Use of XRF to Characterize Pre-Hanford Orchards in the 100-OL-1 Operable Unit</i>
Robert Lapierre	PNNL, Richland, WA	Dawn Wellman/ Jim Szecsody	<i>Studying the NH<sub>3</sub> Injection Methodology Proposed for Remediation of the Hanford Deep Vadose Zone</i>
Hansell Gonzalez	SRNL, Savannah River, SC	Brian Looney/ Miles Denham	<i>Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination</i>
Steve Noel	SRNL, Savannah River, SC	Mary K. Harris	<i>Development of Web Applications for Savannah River Site</i>

## 4.2 Summer 2015 Internships

A total of 15 DOE Fellows participated in internships at DOE Headquarters, DOE sites, DOE national laboratories, and DOE contractors during summer 2015 (Figure 3). Three DOE Fellows have performed internships at DOE-HQ (with EM-12 & EM-20 at Cloverleaf and EM-13 at Forrestal) this summer. Four DOE Fellows worked at the Pacific Northwest National Laboratory, two at Idaho National Laboratory, one at Oak Ridge National Laboratory, four at Savannah River National Laboratory and one with National Energy Technology Lab in West Virginia.



**Figure 3. DOE Fellows summer 2015 interns with Dr. Leonel Lagos (far left) and Dr. Ravi Gudavalli (far right).**

Prior to the start of internships, the DOE Fellows program director and the DOE Fellows organized and conducted teleconferences with most of the summer mentors at the respective facilities. In addition, the DOE Fellows contacted their summer mentors and developed a preliminary scope of work document containing a description of their summer internship assignments at the various locations. Table 8 describes the DOE Fellows participating in internships, the site/national lab, and their assigned mentors.

**Table 8. List of DOE Fellows Participating in Internships during 2015**

<b>Student</b>	<b>DOE Site</b>	<b>Mentor</b>
Andrew De La Rosa	Oak Ridge National Lab – Cyber & Information Security Research	Joseph Trien
Anthony Fernandez	PNNL, Richland, WA	Washington River Protection Solutions (WRPS)
Aref Shehadeh	SRNL, Savannah River, SC	Carol Eddy-Dilek/Brian Looney/Miles Denham
Christine Wipfli	DOE-HQ EM-12, Cloverleaf, Germantown, Maryland	Skip Chamberlain/Patricia Lee
Janesler Gonzalez	Idaho National Lab	Rick Demmer/Steve Reese
Natalia Duque	SRNL, Savannah River, SC	Ralph Nichols/Carol Eddy-Dilek/Brian Looney
Jesse Viera	Idaho National Lab	Rick Demmer/Steve Reese
John Conley	PNNL, Richland, WA	WRPS
Jorge Deshon	SRNL, Savannah River, SC	Miles Denham/Carol Eddy-Dilek/Brian Looney
Kiara Pazan	SRNL, Savannah River, SC	Miles Denham/Carol Eddy-Dilek/Brian Looney
Maximiliano Edrei	National Energy Technology Lab, Morgantown, WV	Chris Guenther
Meilyn Planas	Hanford, Richland	Terry Sams (WRPS)
Ryan Sheffield	DOE-HQ EM-20, Cloverleaf, Germantown, Maryland	Kent Picha
Yoel Rotterman	DOE-HQ EM-13, Forrestal, Washington D.C.	Albes Ganoa/John De Gregory
Claudia Cardona	PNNL, Richland, WA	Nick Qafoku

### **Aiken, South Carolina – DOE’s Savannah River Site/Savannah River National Lab**

DOE FELLOW: Aref Shehadeh – Environmental Engineering Major

MENTOR: Dr. Miles Denham

**Aref Shehadeh (DOE Fellow – Class of 2014)** is currently interning with the Department of Energy Office of Environmental Management (DOE EM) at the Savannah River Site (SRS) located in Aiken, South Carolina. Construction at SRS first began in the 1950’s, with a total of five reactors producing base materials for nuclear weapons on the 310 square mile site. Since then, these reactors have been decommissioned and the site is now involved in an extensive clean-up/remediation initiative. Aref is working on this remediation initiative under the mentorship of Dr. Miles Denham with the Savannah River National Laboratory (SRNL). Dr. Denham received his Ph.D. from Texas A&M in geology and has been with SRNL for over 20 years, with a specialization in geochemistry of natural systems and remediation of metals and radionuclides. The project that Aref is working on involves the remediation of iodine-129 (I-129) in the SRS F-Area caused by a large radionuclide plume stemming from an old seepage basin. Dr. Denham has proposed the use of silver chloride

(AgCl) to react with the I-129 in the sediments to create a binding effect and prevent further spreading of the plume. Aref will be researching the particle size and structure of AgCl, created in a laboratory setting, and will help determine the optimal size to use for future *in-situ* remediation. In addition, he will be observing whether the I-129 can bind to the entire AgCl particle or if it only reacts on the particle's surface.

DOE FELLOW: Jorge Deshon – Computer Engineering Major

MENTOR: Mr. John Bobbitt and Mr. Steven Tibrea

**Jorge Deshon (DOE Fellow – Class of 2014)** is interning at Savannah River National Laboratory in Savannah River, South Carolina, during the summer of 2015. Jorge is helping John Bobbitt with a 3D virtual reality model of Building 235-F, specifically in the texture and lighting of the environment. Building 235-F is a Plutonium Fuel Form (PUFF) facility which was used to produce fuel for NASA's deep space probes. This fuel was produced through the grinding of plutonium-238 to produce a very fine powder and currently poses a risk as it is now airborne in the facility cells. The 3D virtual reality model will help emulate the work and prepare workers for the hazards within the facility by creating an immersive environment that can recreate real-life scenarios.

DOE FELLOW: Kiara Pazan – Environmental Engineering Major

MENTOR: Dr. Miles Denham and Ms. Margaret Millings

**Kiara Pazan (DOE Fellow – Class of 2014)** has been given the opportunity to intern with the Savannah River National Laboratory (SRNL) located in Aiken, SC. Under the mentorship of Miles Denham and Margaret Millings, Kiara will be processing diffusion samplers that were deployed in the F-Area to further test the effects on sorption of uranium by humate-loaded sediments. Diffusion samplers, which were filled with sediment and different humate concentrations, were deployed into a well to equilibrate with the groundwater. This method provides a major advantage as it can be performed in existing monitoring wells, rather than needing to perform additional drilling. She will analyze the groundwater, pore water, and sediment of the samplers for uranium, tritium, iodine (I-129), and total organic carbon (TOC). She will be looking at whether uranium sorption and I-129 vary for different initial concentrations of sorbed humate, as well as how much humate desorbed in actual groundwater conditions.

DOE FELLOW: Natalia Duque – Environmental Engineering Major (Masters)

MENTOR: Mr. Ralph Nichols

**Natalia Duque (DOE Fellow – Class of 2013)** has been given the opportunity to intern with Savannah River National Laboratory (SRNL), Office of Environmental Sciences, located in Aiken, South Carolina. Natalia is assisting Mr. Ralph Nichols with studying the coincidence of solar power generation with peak electrical demand in the southeastern United States. The data to be used in the analysis is from a 3MW solar farm with 40% of the photovoltaic (PV) panels' arrays using single axis tracking and 60% using fixed axis. The electrical generation between these two different arrays will also be compared. This study will ultimately evaluate the capacity value, the ability to reliably meet demand at peak electrical use when power is usually more expensive to generate.

### **Oak Ridge, Tennessee – DOE's Oak Ridge National Lab**

DOE FELLOW: Andrew De La Rosa – Computer Engineering Major (Masters)

MENTOR: Dr. Joseph Trien

**Andrew De La Rosa (DOE Fellow – Class of 2014)** is working for the Computational Sciences and Engineering Division at the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee during the summer of 2015. Under the mentorship of Dr. Joseph Trien, Andrew's main role is to learn and test the Hyperion toolset. The Hyperion Project's goal is to provide a software behavior computational algorithm designed to catch programs that are malicious. It is a tool comprised of programmable semantics and structuring based off the original code, by analyzing binaries and using mathematical precision to uncover the program's intended and unintended behaviors. The next generation of Hyperion is currently under development, where more powerful computational processing is performed as well as up-scaling for larger sized programs, while also implementing customization based on the user's preferences.

### **Washington, DC – DOE's Headquarters**

DOE FELLOW: Christine Wipfli – Environmental Engineering Major

MENTOR: Mr. Skip Chamberlain and Mr. Kurt Gerdes

**Christine Wipfli (DOE Fellow – Class of 2014)** is working at the Department of Energy Headquarters office in Germantown, Maryland, during the summer of 2015. Under the mentorship of Skip Chamberlain (Senior Program Manager) and Kurt Gerdes (Director of the Groundwater and Soil Remediation Department), Christine is learning the operational activities required for managing the Office of Environmental Management's soil and groundwater remediation initiatives. One of her main projects is to develop case studies in conjunction with the Interstate Technology and Regulatory Council (ITRC), a national coalition of state regulators collaborating with federal regulatory agencies, technology institutions, tribes, and industry, that is dedicated to developing guidance for cost-effective and innovative solutions to environmental challenges. The case studies will elaborate on the enhanced attenuation remedial strategies implemented at various Department of Energy facilities including the Savannah River Site, Richland, Paducah, and Lawrence Berkeley National Lab. In addition to her internship activities, Christine is visiting the Hanford Site in Richland, WA, as well as the Savannah River Site in Aiken, South Carolina, to meet with key personnel involved in the soil and groundwater projects. Her objective is to gain insight on the contaminants of concern at each location and the implemented remediation strategies; additionally, to gain a better understanding of the technological developments for monitoring groundwater and soil data, the DOE-EM budget allocation process, and the overall organizational activities carried out to meet the sites' objectives and the DOE EM cleanup mission.

DOE FELLOW: Ryan A. Sheffield – Mechanical Engineering Major

MENTOR: Dr. James Poppiti

**Ryan Sheffield (DOE Fellow – Class of 2014)** is working for EM-23's Office of Waste Treatment Plant and Tank Farm Program at the DOE-HQ Cloverleaf facility in Germantown, Maryland, during the summer of 2015. Under the mentorship of Dr. James Poppiti, Ryan is learning about and analyzing the radiological release that took place at the Waste Isolation Pilot Plant (WIPP) last February in Carlsbad, NM. This site is half a mile underground in a salt bed and is the nation's disposal site for transuranic (TRU) waste. Ryan will be assisting Dr. Poppiti in publishing an article based on the events that took place during this release. Ryan will also be studying the different nuclear reprocessing methods performed at the Hanford Site, including PUREX, REDOX, bismuth phosphate, etc. to assist Dr. Poppiti in producing literature on these methods. Under John Moon,

Ryan will also be assisting in the coordination of an Integrated Project Team (IPT) workshop at the Hanford Site.

DOE FELLOW: Yoel Rotterman – Mechanical Engineering Major

MENTORS: Mr. Albes Gaona, and Mr. John De Gregory

**Yoel Rotterman (DOE Fellow – Class of 2014)** is working for the office of Environmental Management (EM) under the mentorship of Albes Gaona and John De Gregory. One project he is working on relates to sustainable remediation: the analysis of the performance and design of the current M1 air stripper system at the Savannah River Site (SRS) and the metrics for the wells on the system. Another project, under Deactivation and Decommissioning (D&D) and Facility Engineering, consists of the various technology applications that surveillance and maintenance of the facilities require to lower operational costs, improve efficiencies, and increase safety. He is also working on updating and improving Powerpedia (Media Wiki software platform) documents.

### **Idaho Falls, ID – DOE’s Idaho National Laboratory**

DOE FELLOW: Janesler Gonzalez – Mechanical Engineering Major

MENTORS: Mr. Stephen Reese and Mr. Rick Demmer

**Janesler Gonzalez (DOE Fellow – Class of 2014)** is working under the mentorship of Mr. Stephen Reese and Mr. Rick Demmer at Idaho National Laboratory (INL) for 10 weeks, spanning the summer of 2015. INL is at the nation’s forefront of nuclear energy research and development, focusing on topics that range from optimization of advanced nuclear fuel to nuclear nonproliferation. Janesler’s scope of work includes decontamination and decommissioning efforts such as mercury abatement through the use of an advanced strippable fogging technology. Other projects include supporting the development of a scrubber designed for hazardous gas emissions from spent fuel and pyroprocessing for the extraction of useful materials in nuclear waste.

DOE FELLOW: Jesse Viera – Mechanical Engineering Major

MENTORS: Mr. Stephen Reese and Mr. Rick Demmer

**Jesse Viera (DOE Fellow – Class of 2014)** is participating in a 10-week internship program at Idaho National Laboratory (INL), the nation’s leading laboratory for nuclear energy research, testing, and development. Under the mentorship of Mr. Reese (Mechanical Engineer) and Mr. Demmer (Chemist), Jesse is pursuing projects supporting decontamination and decommissioning (D&D) efforts. These include a strippable coating development for fogging applications, a water security test bed, a spent fuel gas purifier, electrometallurgy techniques for treatment of spent fuel, and a mathematical model of decontamination gels. Jesse’s background work includes testing and evaluation of fixative agents.

### **Morgantown, WV – DOE’s National Energy Technology Laboratory**

DOE FELLOW: Maximiliano Edrei – Mechanical Engineering Major (Masters)

MENTOR: Dr. Chris Guenther

**Maximiliano (Max) Edrei (DOE Fellow – Class of 2015)** is interning at the National Energy Technology Laboratory (NETL) in West Virginia during the summer of 2015. His ultimate goal is to help test and study the performance of pulse jet mixers (PJM). This unique opportunity includes two components: experimental and simulation based research. For the experimental component, Max is

working under the mentorship of Dr. Balaji Gopalan and is tasked with verifying the physical properties of granular materials that will be inserted into the PJM's while under operation in order to assess how well the fluid has mixed. This includes particle separation and sizing, density distribution analysis, and verifying viscosity. For the second research component, Max is working under Dr. Rahul Garg and is tasked with using computational fluid dynamics (CFD) to simulate a circular impinging jet on a flat surface. The goal will be to study the effects of varying the ratio of jet orifice diameter to the distance between jet orifice and the flat surface. This research will help verify if the current assumptions for modeling the PJMs is valid. With the culmination of his internship, Maximiliano will have contributed to the efforts of containing and transporting high level waste at the Hanford Site.

### **Richland, WA- Pacific Northwest National Laboratory**

DOE FELLOW: Claudia Cardona – Environmental Engineering Major (Ph.D.)

MENTOR: Dr. Jim Szecsody

**Claudia Cardona (DOE Fellow – Class of 2012)** has been given the opportunity to intern with the Pacific Northwest National Laboratory (PNNL) located in Richland, Washington. Claudia is working with Dr. Szecsody in the Research Technology Laboratory (RTL). She is working on an ammonia ( $\text{NH}_3$ ) gas project where the  $\text{NH}_3$  gas is utilized for uranium remediation in the vadose zone. Laboratory experiments underway include injecting 100% and 5%  $\text{NH}_3$  into deionized water (DIW), Hanford groundwater and sediments to analyze the equilibrium for each condition. Simulations are also being conducted using Geochemist Workbench (GWB/Editions 5.0 and 10.0). The initial simulations performed for the Hanford groundwater conditions with uranium in solution include varying uranium concentrations, ion concentrations, and pH. GWB simulations are also being conducted to understand the  $\text{NH}_3$  gas /liquid equilibrium by varying the  $\text{pCO}_2$  values (-3.5, -2.8 and 2.0).

### **Richland, WA – DOE's Hanford Site**

DOE FELLOW: John Conley – Mechanical Engineering Major

MENTORS: Mr. Terry Sams and Mr. Dave Shuford

**John Conley (DOE Fellow – Class of 2014)** is working for the Mission Analysis Engineering team at the WRPS Sigma IV Facility in Richland, Washington, during the summer of 2015. Under the mentorship of Mr. Terry Sams and Mr. Dave Shuford, John's main role is to provide an engineering assessment of the chemical constituents within the low activity waste (LAW) passing through the stainless steel transfer lines, as well as to research how these chemicals corrode the pipelines.

DOE FELLOW: Meilyn Planas – Electrical Engineering Major

MENTOR: Mr. Terry Sams

**Meilyn Planas (DOE Fellow – Class of 2014)** is working for the Washington River Protection Solutions (WRPS) at the Hanford Site in Richland, Washington, during the summer of 2015. Under the mentorship of Mr. Terry Sams, Meilyn's summer internship will involve using infrared (IR) sensors to measure the temperature inside the double-shell tanks. These tanks must be kept at a certain temperature depending on the contents inside to prevent corrosion on the inside walls. The IR sensors will be placed in the annulus of the tanks and will measure the temperature on the outside of the tank wall. Through some calculations, the inside wall temperature will be determined using the

coefficient of heat transfer, which will vary depending on the thickness of the steel wall. This analysis will extend the equipment lifetime and can be easily implemented into the regularly scheduled tank visits.

DOE FELLOW: Anthony Fernandez – Mechanical Engineering Major

MENTORS: Mr. Ruben Mendoza and Mr. Gregory Gauck

**Anthony Fernandez (DOE Fellow – Class of 2014)** has been given the opportunity to intern for WRPS, a contractor for the Department of Energy whose focus is on managing the Hanford Tank Farms. Under the mentorship of Ruben Mendoza and Gregory Gauck, Anthony's main role is in single shell tank (SST) storage and monitoring at the Hanford Site. During his internship, Anthony will work hand in hand with the SST Design Authority Engineer to update all existing Dome Load Record Summary Sheets for all 149 SST's, update all existing round sheets to ensure accurate equipment calibration dates and update existing Enraf Reference Levels to be consistent with work to be performed. Anthony will also be working with the Tank Monitoring and Engineering Support (TMETS) group in the development of a management control system that will streamline SST monitoring requirements between different engineering groups in the organization.



## 5.0 DOE FELLOWS POSTER EXHIBITION AND COMPETITION

The 8th annual DOE Fellows Poster Exhibition and Competition was conducted on October 16, 2014. The purpose of this event was to showcase the DOE Fellows' research accomplishments for the past year as a result of their participation in various U.S. Department of Energy - Environmental Management (DOE-EM) related applied research projects. A total of 17 posters were exhibited. Some of the projects showcased by the students were a result of their summer internship assignments at DOE Savannah River Site, Pacific Northwest National Laboratory, DOE Hanford Site, and DOE Headquarters (DOE-HQ) in Washington, DC (Figure 4). Also, some of the posters reflected the DOE Fellows' DOE-EM applied research that they conduct at the Applied Research Center (ARC) as part of the DOE-FIU Cooperative Agreement sponsored research.



**Figure 4. Poster Exhibition and Competition participants and judges.**

For some of the graduate students, these projects are also a part of their thesis towards a master's or Ph.D. degree. This year's panel of judges comprised of Dr. Ines Triay (ARC Executive Director), Ms. Connie Young (representing DOE's Savannah River National Laboratory), Dr. Konstantinos Kavallieratos (Associate Professor, FIU Department of Chemistry), and Dr. David Kadko (ARC Associate Director). This year, the poster exhibition and competition was conducted at FIU's Engineering Center's Panther Pit (Figure 5) and was attended by FIU faculty, ARC personnel, and FIU students. The posters presented included:

- **Malware Forensics on Mobile Devices for DOE-EM Applications**  
Andrew De La Rosa (Computer Engineering)
- **Enraf Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford**  
Anthony Fernandez (Mechanical Engineering)

- **Monitoring Mineralogical Changes Occurring in Sediments via the EARP Process**  
Aref Shehadeh (Environmental Engineering)
- **Erosion & Corrosion Analysis from POR104 Valve Box at Hanford**  
Brian Castillo (Mechanical Engineering)
- **Use of XRF to Characterize Pre-Hanford Orchards in the 100-OL-1 Operable Unit**  
Christian Pino (Chemistry)
- **Deliquescence Behavior of Precipitates by the Isopiestic Method**  
Claudia Cardona (Environmental Engineering)
- **Residual Waste Detection in HLW Tanks**  
Dayron Chigin (Mechanical Engineering)
- **Computational Simulation and Evolution of HLW Pipeline Plugs**  
Deanna Moya (Mechanical Engineering)
- **Miniature Motorized Vehicle for Department of Energy Hanford Site Tank Bottoms**  
Gabriela Vazquez (Mechanical Engineering)
- **Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination**  
Hansell Gonzalez (Chemistry)
- **Non-Invasive Pipeline Unplugging Technology for Hanford High-Level Waste Asynchronous Pulsing System**  
John Conley (Mechanical Engineering)
- **Evaluation of Ammonia Gas Partitioning in Aqueous Solutions in the Presence of Bicarbonate Ions**  
Maria Diaz (Environmental Engineering)
- **D&D Decision Model and Mobile Application for Selection of Fixative, Strippable Coating, and Decontamination Gel Products**  
Meilyn Planas (Electrical Engineering)
- **Quantitative Assessment of Sustainable Remediation Options for SRS**  
Natalia Duque (Environmental Engineering)
- **Characterization of the Uranium-Bearing Products of the Ammonia Injection Remediation Method**  
Robert Lapierre (Chemistry)
- **Heating, Ventilation, and Air Conditioning Design Assessments for Hanford Waste Immobilization and Treatment Plant**  
Sasha Philius (Mechanical Engineering)
- **D&D Knowledge Management Information Tool Feasibility Study for Cross-Platform Mobile Applications**  
Steve Noel (Computer Science)



Figure 5. DOE Fellows presenting their research at the 2014 DOE Fellows Poster Exhibition and Competition.

### 5.1 2014 Student Poster Competition Winners

This year, the distinguished panel of judges evaluated the posters presented at the third DOE Fellows Poster Exhibition and Competition and selected 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place winners (Figures 6, 7 & 8). The certificates and cash awards were presented at this year's DOE Fellows Induction Ceremony.

**First place winner:** Mr. Dayron Chigin, DOE Fellows - Class of 2012

**Poster title:** Residual Waste Detection in HLW Tanks



Figure 6. DOE Fellow Dayron Chigin being awarded First place by Dr. Lagos, Dr. Triay and Mr. Tibrea.



**Second place winner:** Ms. Gabriela Vazquez, DOE Fellows - Class of 2012

**Poster title:** Miniature Motorized Vehicle for Department of Energy Hanford Site Tank Bottoms



Figure 7. DOE Fellow Gabriela Vazquez being awarded Second place by Dr. Lagos, Dr. Triay and Mr. Tibrea.

**Third place winner:** Mr. Anthony Fernandez, DOE Fellows – Class of 2014

**Poster title:** Enraf Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford



Figure 8. DOE Fellow Anthony Fernandez being awarded Third place by Dr. Lagos, Dr. Triay and Mr. Tibrea.

## 6.0 DOE FELLOWS 2014 INDUCTION CEREMONY

On November 13, 2014, FIU conducted the eighth annual DOE Fellows' Induction Ceremony to welcome our new DOE Fellows (Class of 2014) and celebrate the continuation of our DOE-FIU-ARC partnership (Figure 9). The ceremony was held at the MARC International Pavilion on the main FIU campus.

Mr. Kenneth Picha (Acting Deputy Assistant Secretary for Tank Waste and Nuclear Materials Management, DOE Office of Environmental Management) was one of the keynote speakers for the ceremony. Mr. Picha remarked on the continuing partnership between DOE and FIU over the last two decades and the DOE EM environmental challenge. He also pointed out that a former DOE Fellow (Mr. Edgard Espinosa - DOE Fellow Class of 2007) currently works in his group at DOE EM-20. Mr. Picha concluded his remarks by welcoming the new class of DOE Fellows.

Other distinguished guests included Mr. Andrew Szilagyi (Director, Office of D&D and Facility Engineering, DOE EM), Mr. Steven Tibrea (Savannah River National Laboratory), Ms. Margie Brown (Minority Serving Institute Outreach Program Manager, Georgia Tech Research Institute), Dr. Elizabeth Fleming and Dr. Carlos Ruiz (Army Corps of Engineers), Mr. Jamey Capers (Indian River State College Regional Center for Nuclear Education and Training), Mr. James Ault (Florida Power & Light), Mr. Lorenzo Cabrera and Chris Wright (Cabrera Services), Dr. Carlos Mallol and former DOE Fellow Lilian Marrero (MWH America Inc.). FIU was represented at the event by Dr. Andrés Gil (Vice President for Research), Dr. Todd Cowl (Director FIU's Southeastern Research Center), Dr. Inés Triay (ARC Executive Director) and Dr. Leonel E. Lagos (ARC Director of Research/DOE Fellows Program Director), as well as FIU faculty, staff, and students.

Mr. Picha and the other distinguished guests had the opportunity to participate in morning tours of the ARC research laboratories and listen to DOE Fellows presenting their research work (Figure 10). Presentations were given by Dr. Lagos and DOE Fellows Anthony Fernandez, Meilyn Planas, and Christian Pino. Dr. Lagos presented an overview of the DOE Fellows program. DOE Fellow Anthony Fernandez presented his summer internship experience and research on updating Enraf reference levels for high-level nuclear waste tanks at the Hanford Site under the supervision of Mr. Ruben Mendoza. DOE Fellow Meilyn Planas presented her DOE EM research on the D&D decision model for the selection of fixatives, strippable coatings, and decontamination gels. DOE Fellow Christian Pino presented his summer internship experience and research on using an XRF to characterize pre-Hanford orchards under the supervision of Mr. Amoret Bunn.

Tours of the ARC facilities included visits to the environmental technology laboratory, the composites laboratory, the cybersecurity research laboratory, the soil & groundwater laboratory, the high bay facility, the radiological laboratory, and the ARC technology demonstration area. Technologies showcased included the peristaltic crawler and asynchronous pulsing unit for pipeline unplugging, the in situ decommissioning sensor network (ISDSN) test cube, the D&D Knowledge Management Information Tool (D&D KM-IT) cross-platform mobile application development and cybersecurity infrastructure, and the SLIM sonar technology for detecting residual waste in high-level waste (HLW) tanks. Additional applied research presented during the facilities tours included computational fluid dynamics for multiphase flow in Hanford tanks, a study of unrefined humate solution as a possible remediation method for groundwater contamination at SRS, and soil and groundwater research being performed for Hanford's uranium contamination. In addition, 17 DOE

Fellows had the opportunity to showcase their research by presenting posters as part of the afternoon events.

During this year's Induction Ceremony, 15 new FIU STEM students were inducted as DOE Fellows:

- Brian Castillo - undergraduate, biomedical engineering
- John Conley - undergraduate, mechanical engineering
- Andrew De La Rosa - undergraduate, computer engineering
- Jorge Deshon - undergraduate, computer engineering
- Maria Eugenia Diaz - undergraduate, environmental engineering
- Maximiliano Edrei - undergraduate, mechanical engineering
- Anthony Fernandez - undergraduate, mechanical engineering
- Janesler Gonzalez - undergraduate, mechanical engineering
- Kiara Pazan - undergraduate, environmental engineering
- Meilyn Planas - undergraduate, electrical engineering
- Yoel Rotterman - undergraduate, mechanical engineering
- Ryan Sheffield - undergraduate, mechanical engineering
- Aref Shehadeh - undergraduate, environmental engineering
- Jesse Viera - undergraduate, mechanical engineering
- Christine Wipfli - undergraduate, environmental engineering



**Figure 9. New DOE Fellows with FIU staff and Induction Ceremony guests.**

In addition, awards were presented to the DOE Fellows that won the DOE Fellows Poster Exhibition and Competition held on October 23, 2014. First place was awarded to Mr. Dayron Chigin for his poster titled, "Residual Waste Detection in HLW Tanks." Second place went to Ms. Gabriela Vazquez for her poster titled, "Miniature Motorized Vehicle for Department of Energy Hanford Site

Tank Bottoms.” Third place was awarded to Mr. Anthony Fernandez for his poster titled “Enraf Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford.”

For the sixth year, the DOE Fellow of the Year Award and the Mentor of the Year Award were presented in the ceremony. DOE Fellows were requested to nominate their ARC mentors and ARC mentors were requested to nominate the DOE Fellows. An ARC committee was established to review and select the winners from the submitted nominations. The 2014 Mentor of the Year Award went to research analyst Mr. Jairo Crespo and the 2014 DOE Fellow of the Year Award was awarded to Mr. Anthony Fernandez (DOE Fellows Class of 2014) and Mr. Hansell Gonzalez Raymat (DOE Fellows Class of 2013).

The new DOE Fellows also received a congratulatory letter from our Congresswoman Ileana Ros-Lehtinen welcoming them into this Fellowship. Ms. Ros-Lehtinen also highlighted the need for students to pursue STEM careers and the DOE Fellows role as future leaders in the practice of keeping our nation’s nuclear weapons facilities in safe condition.





**Figure 10. DOE Fellows presenting their applied research to DOE EM and other visitors.**



## 7.0 WASTE MANAGEMENT CONFERENCE 2015 ACCOMPLISHMENTS

DOE Fellows participated in the Waste Management 2015 Conference (WM14) in Phoenix, AZ, from March 2-6, 2015. The DOE Fellows prepared abstracts, technical posters, presentation materials, written biographies (<https://fellows.fiu.edu/bios/>), and brief videos for the WM conference to introduce themselves and their research. These videos can be viewed on the DOE Fellows website: <https://fellows.fiu.edu/2015-waste-management-symposia-summary/>. A total of twenty (20) DOE Fellows and other FIU students attended WM15 and presented technical posters during Session 33 (Student Poster Competition: The Next Generation – Industry Leaders of Tomorrow). The Fellows presented the hands-on DOE-EM research that they have actively participated in at FIU's ARC and during their summer internships at DOE sites, national laboratories, and site contractors (Figure 13 - Figure 34). **DOE Fellow Christine Wipfli won the student poster competition for her research on Sodium Silicate Treatment for Uranium Bearing Groundwater Systems at the F/H Area of the Savannah River Site** (Figure 11), marking the fifth time a DOE Fellow has won the Waste Management Student Poster Competition.



**Figure 11. WM15 Student Poster Winner – Christine Wipfli (DOE Fellow).**

In addition, 1 Ph.D. level DOE Fellow, Hansell Gonzalez, presented his research during the professional oral session 107 (Deep Vadose Zone Characterization and Remediation Technologies) on Wednesday, March 18, 2015:

- The Influence of Humic Acid and Colloidal Silica on the Sorption of U(VI) onto SRS Sediments Collected from the F/H Area (15499), Yelena Katsenovich, Hansell Gonzalez (DOE Fellow), Miles Denham (SRNL), Ravi Gudavalli, Leo Lagos. **Presenter: Hansell Gonzalez (DOE Fellow)**

**DOE Fellow Robert Lapierre was awarded a graduate level 2015 Roy G. Post Foundation Scholarship.** Also during the conference, DOE Fellow Robert Lapierre participated in a panel during Session 38 titled “Graduating Students and New Engineers - Wants and Needs.” During this panel session, students and industry and government representatives shared their perspectives of the

newer generation entering a workforce primarily occupied by workers nearing retirement age (Figure 32).



**Figure 12. DOE Fellow Robert Lapierre in Graduating STEM Students Entering the Workforce Panel.**



**Figure 13. DOE Fellows, Dr. Lagos and DOE-EM's Mr. Mark Whitney.**



**Figure 14. DOE Fellows with Dr. Triay, Dr. Lagos and DOE-EM's Dr. Monica Regalbuto & Ms. Ana Han.**

The student poster titles and descriptions are included on the following pages.

## Malware Forensics on Mobile Devices for DOE-EM Applications

Andrew De La Rosa (DOE Fellow)

The purpose of malware forensics is to apply forensic investigative techniques on malware infections. While the recovery of damaged files caused by malware is important, the analysis of the execution of the malware is now an area of research and of particular interest to the U.S. Department of Energy's Office of Environmental Management (DOE-EM). According to Kaspersky's analysis for 2014, there are over 6 billion attacks launched worldwide which is an increase from the 5.2 billion attacks catalogued in 2013. Malware, by nature, is designed to disrupt and destroy data and many antiviruses simply quarantine and destroy the dangerous file; however in order to recover certain files, it is sometimes necessary to know the method of execution. Furthermore, many users are now transitioning to the use of mobile devices to perform their day-to-day activities. Unfortunately, any device that has internet connectivity is a potential victim to malware threats. Many mobile devices have a mobile version of an antivirus, but this in no way compares to the power of the desktop version; instead, the malware signatures have a similarity to the desktop version of the malware. The environment the malware is developed on is isolated from any internet access and currently has its signatures viewed and analyzed by virustotal.com, and every known major antivirus. Virtual machines have been created (Windows XP and Windows 7) to test the capture rate at which the malware is detected by the system. Several open-source programs are used to analyze the malware such as Resource Hacker and IDA Pro, which show the assembly code on where the objects are moving in the system. The strings in the code, the calling of the objects, and the size of the file will help the analysis especially when using the Process Explorer, to see the flow of memory and what processes are running.

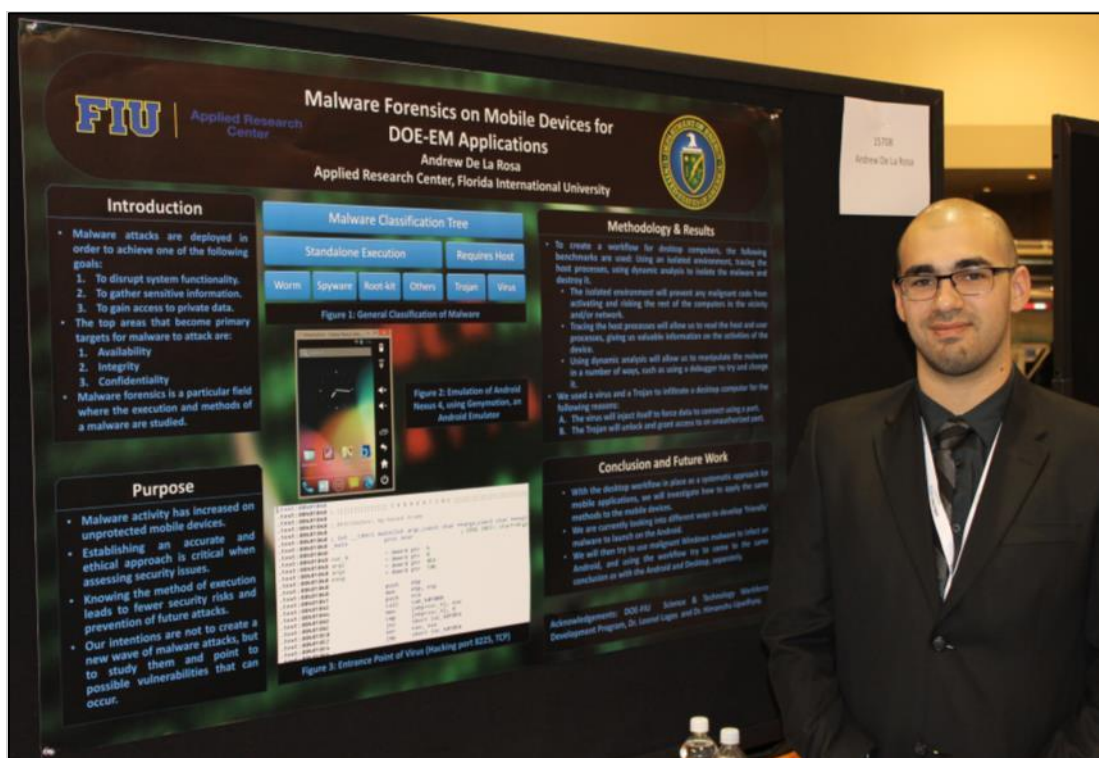


Figure 15. DOE Fellow Andrew De La Rosa presenting student poster at WM15.



## Enraf<sup>(R)</sup> Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford Site

Anthony Fernandez (DOE Fellow)

The U.S. Department of Energy's Hanford Site Tank Farm has implemented a system for monitoring tank waste levels in all single-shell tanks (SST), double-shell tanks (DST) and miscellaneous catch tanks using Enraf Series 854 level gauges and densitometers. To ensure an accurate computation of the tank waste levels, a precise calculation of the tank reference level must be kept up to date.

Due to an outdated document control system for Enraf and densitometer reference levels, inconsistencies were detected between field walk downs of Enraf and densitometer assemblies and the documentation containing reference levels. The development of an updated document control system for Enraf & densitometer reference levels was deemed necessary for the continuation of accurate waste level monitoring in the Hanford Tank Farms. The creation of a digital, easily updatable WHC-SD-WM-CN-078, Revision 1 ("Enraf Gauge Reference Level Summaries") document was the first step in facilitating a method for tank waste reference levels to be kept updated in future revisions.

Using WHC-SD-WM-CN-078, Revision 1, The Enraf and densitometer reference levels were updated in their associated documents and in their PMID's to show consistency with WHC-SD-WM-CN-078, Revision 1 document.

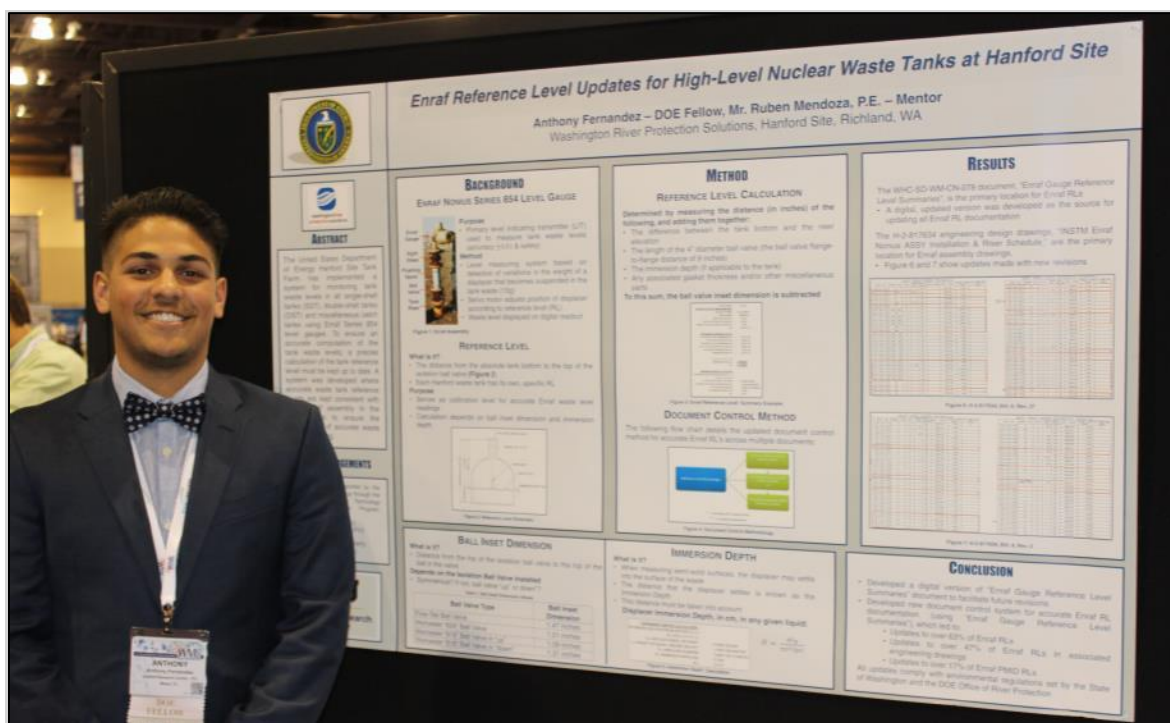


Figure 16. DOE Fellow Anthony Fernandez presenting student poster at WM15.

## Monitoring of U(VI) Bioreduction after ARCADIS Demonstration at Savannah River Site F-Area

Aref Shehadeh (DOE Fellow)

From 1955 to 1989, unlined basins at the Savannah River Site received approximately 1.8 billion gallons of acidic waste solutions, much of which seeped into the surrounding soil and groundwater. The mobilization of metals and radionuclides included soluble uranium (VI) which is now present in the F-Area sediments. In 2010, ARCADIS implemented in-situ injections of a carbohydrate substrate to establish anaerobic reactive zones for metal and radionuclide remediation via the Enhanced Anaerobic Reductive Precipitation (EARP) process at the SRS F-Area. The addition of a molasses substrate solution to groundwater produces anaerobic conditions with redox values in the methanogenic or sulfate-reducing range conducive to the reductive precipitation of uranium. To determine the effectiveness of this process, a microcosm study will be prepared with SRS sediments, augmenting the solution mixture with molasses and sulfate. The sulfate reduction process will lead to an increased pH of the water, often to a near neutral condition. . The study aims to determine whether forms of reduced iron such as siderite and pyrite would arise in the reducing zone and if any mineralogical changes occurred in the sediments during the re-oxidation period. These experiments will also explain the types of reactions that might occur in the anaerobic aquifer.

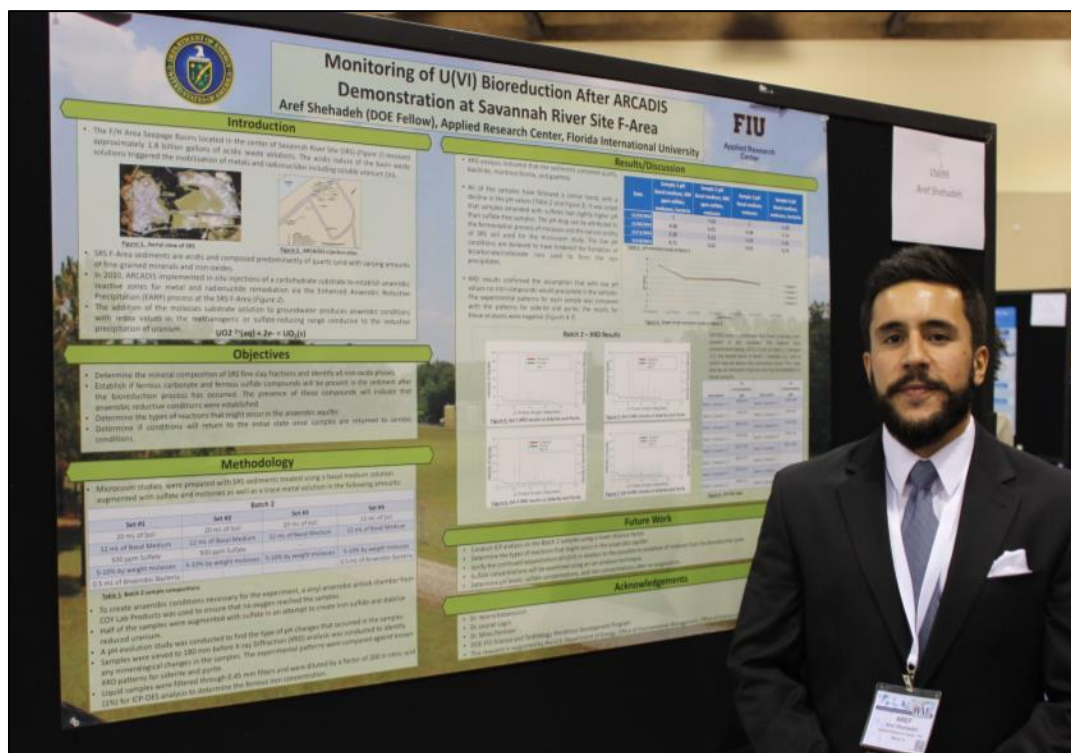


Figure 17. DOE Fellow Aref Shehadeh presenting student poster at WM15.

## Erosion & Corrosion Analysis from POR104 Valve Box at Hanford

*Brian Castillo (DOE Fellow)*

At the United States Department of Energy Hanford Site in Richland, Washington, waste is being transferred to storage tanks in preparation for treatment at the Waste Treatment and Immobilization Plant. Regulatory committees have concerns regarding the structural integrity of the waste transfer components being used. Washington River Protection Solutions (WRPS) has employed a Fitness-for-Service program, which is a multi-disciplinary engineering approach that is used to determine if equipment is fit to remain in operation for a specified projected period. An approach to monitor aging equipment is to take thickness measurements of components when feasible, to evaluate if there is any appreciable degradation in the integrity of the components. The thickness measurements can be used to determine if erosion or corrosion is occurring and predict the remaining lifespan of the components. These predictions can also be used to develop design modifications for new piping and pipe jumpers. Analysis of thickness measurements have been conducted on four floor nozzles in the POR104 valve box located in the C-Tank Farm at Hanford. The data for the floor nozzles of the valve box does not show signs of wear, but there are variations in thicknesses which are likely due to manufacturing processes.

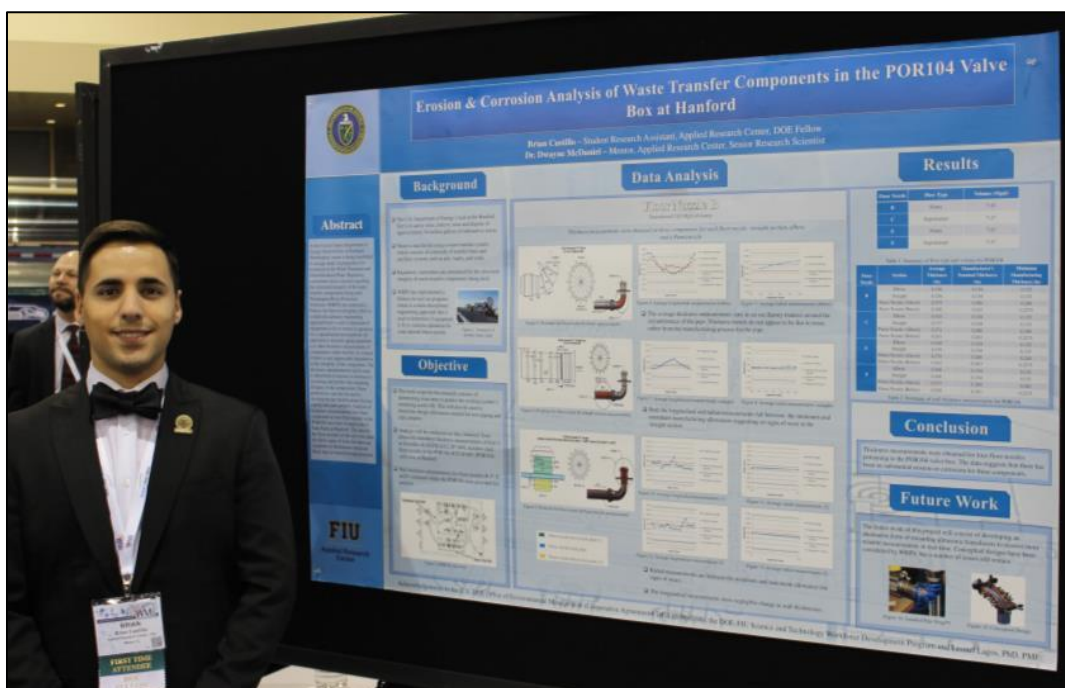


Figure 18. DOE Fellow Brian Castillo presenting student poster at WM15.

## Use of X-ray Fluorescence to Characterize Pre-Hanford Orchards in the 100-OL-1 Operable Unit

*Christian Pino (DOE Fellow)*

Prior to 1943, the Hanford Site included several small towns with approximately 8,000 acres of agricultural development. About 5,000 of those acres were used for orchards, with lead arsenate ( $\text{PbHAsO}_4$ ) being the common pesticide for controlling codling moths in fruit trees. Higher concentrations of lead and arsenic were recorded in the vicinity of the old orchards at the Hanford Site. In year 1980, U.S. Department of Energy's Richland Operating Office, Environmental Protection Agency, and Washington Department of Ecology investigated the lead arsenate residues under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and designated the pre-Hanford orchards 100-OL-1 Operable Unit. Initial characterization activities included a pilot study to evaluate the use of a field portable x-ray fluorescence (XRF) analyzer and determine if the performance of the instrument provides results that meet quality assurance criteria for cleanup decisions. An optimization study was performed to evaluate the counting times and position of the XRF using soil collected from the orchards on the Hanford Site. The optimization study confirmed that the variability in the field was more significant than operator or instrument variability. The surface soil at four Decision Units (DU) OL-14, OL-32, OL-IU6-4 and OL-FR2-1 was evaluated with the XRF. Due to distinct past activities in each site, orchard activity may or may not have been present in every DU; however, all together they provide an adequate representation of the entire 100-OL-1 Operable Unit. Results indicated that there were areas in each DU with concentrations above the screening criteria for both lead (250 mg/kg) and arsenic (20 mg/kg).

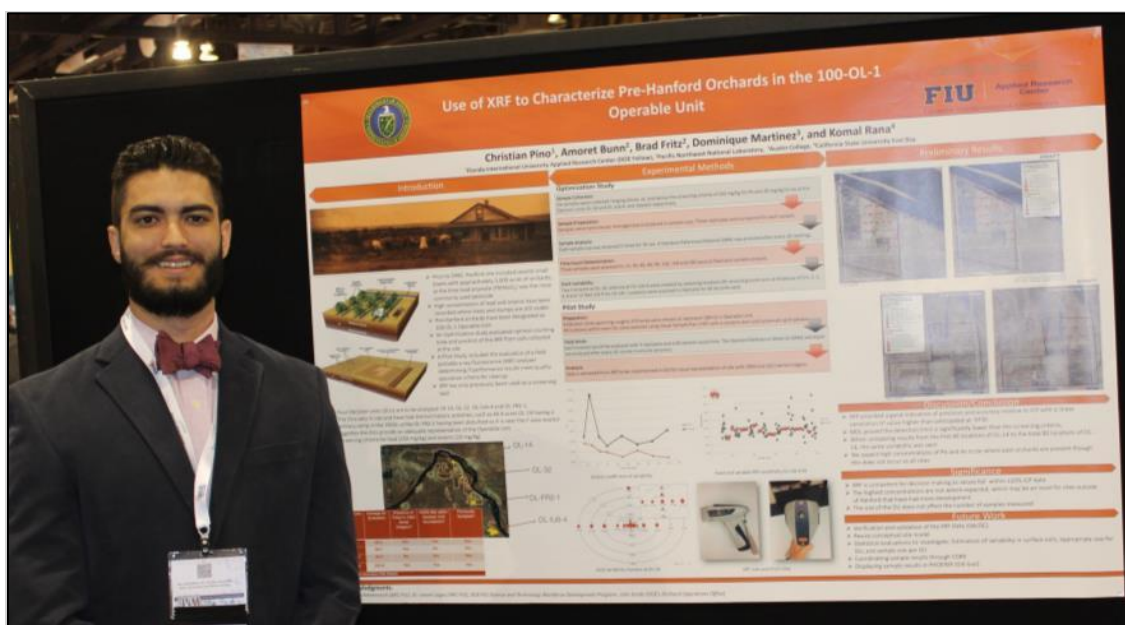


Figure 19. DOE Fellow Christian Pino presenting student poster at WM15.



## Residual Waste Imaging in High Level Waste Mixing Tanks

### Dayron Chigin (DOE Fellow)

This research uses commercial sonar technology to monitor residual waste in the United States Department of Energy's (DOE) Hanford Site high-level-waste (HLW) staging tanks, with primary focus on the detection and imaging of the settled solids at specified areas of interest along the tank surface within a limited amount of time. Pulverized Kaolin will be used in order to simulate the expected behavior of the residual waste within these HLW tanks. The data acquired from the commercial sonar technology will be processed in MatLab through a multiple meshing and filtering algorithm. After the proper algorithms have been applied, the volume of each data set will be derived in order to determine the settling or dynamic movement of the specified areas of interest.

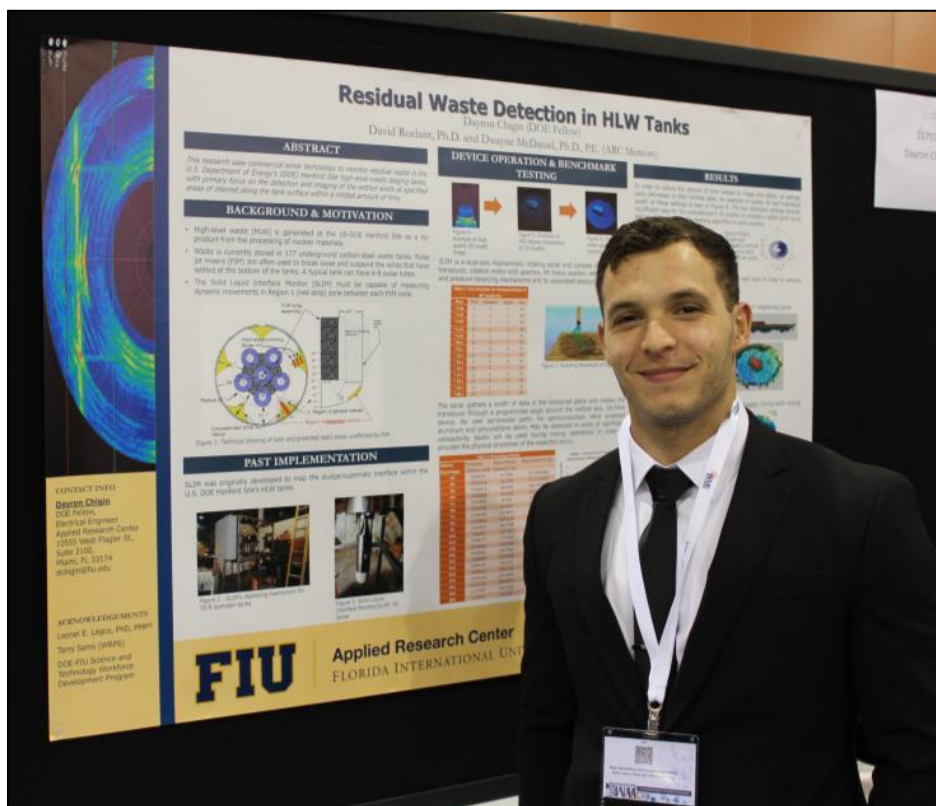


Figure 20. DOE Fellow Dayron Chigin presenting student poster at WM15.

## Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination at Savannah River Site's F/H Area

*Hansell Gonzalez (DOE Fellow)*

Unrefined, low cost humic substances are being tested by Savannah River National Lab as possible amendment for the remediation of groundwater contaminated by an acidic plume. Humic substances can remove contaminants such as Uranium, Sr-90, and I-129 from groundwater. The objective of the ongoing study is to understand the sorption and desorption characteristics of humic substances onto aquifer sediments after injection, the maximum loading capacity of the sediments, and what fraction of humic molecules is retained by the sediments. A UV-vis spectrophotometer was used for the measurement of the concentration. The ratio of absorbances, E4/E6 and EET/EBZ, will provide information about molecular weight and degree of substitution of the humic molecules. This information is useful for planning a strategy for full scale deployment of a groundwater remediation technology at Savannah River Site.

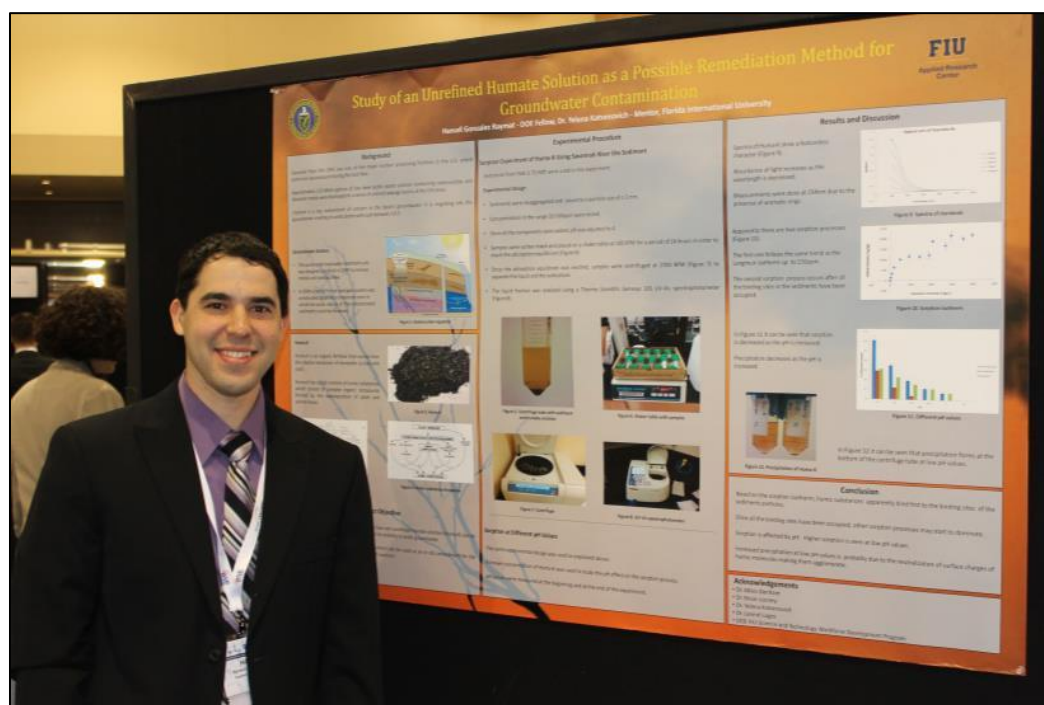
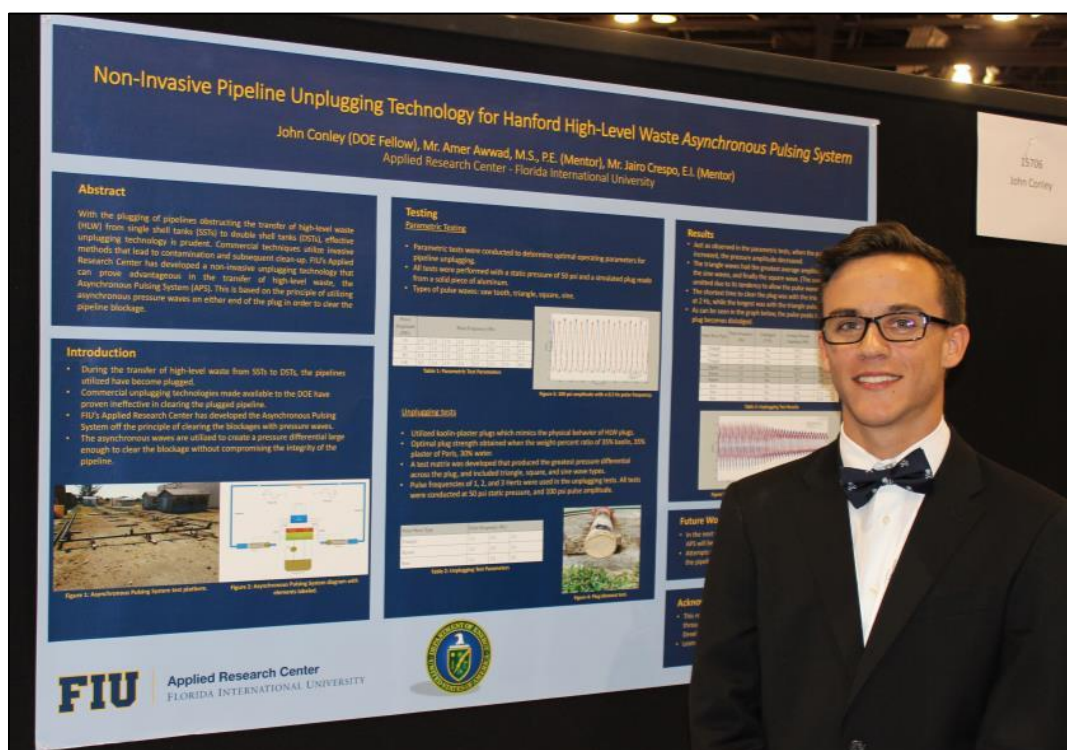


Figure 21. DOE Fellow Hansell Gonzalez presenting student poster at WM15.

## Non-Invasive Pipeline Unplugging Technology for Hanford High-Level Waste Asynchronous Pulsing System

John Conley (DOE Fellow)

With the plugging of pipelines obstructing the transfer of high-level waste (HLW) from single shell tanks to double shell tanks, an effective unplugging technology is prudent. Commercial techniques utilize invasive methods that can lead to contamination and unnecessary clean-up. FIU's Applied Research Center has developed the Asynchronous Pulsing System (APS), a non-invasive unplugging technology that can prove advantageous in the transfer of high-level waste. It is based on the principle of utilizing asynchronous pressure waves on either end of the plug in order to clear the pipeline blockage. This non-invasive technology has proven its ability to clear blockages in previous testing.



## D&D Decision Model and Mobile Application for Selection of Fixative, Strippable Coating, and Decontamination Gel Products

*Meilyn Planas (DOE Fellow)*

In an effort to contribute and accelerate the D&D of Savannah River Site's 235F facility, Florida International University's Applied Research Center is developing a Decision Model that facilitates rapid selection of fixative, strippable coating, and decontamination gel products. These coatings are used to adhere particles to surfaces or absorb particles to be later stripped off and disposed. The vast variety of available products makes it difficult for end users to be aware of their existence and effectiveness. Therefore, a product list containing the effectiveness of all commercially available products in handling most decontamination situations is very appealing to DOE and DOE contractors. FIU has compiled a comprehensive list of these products and their capabilities, including the surfaces they are capable of decontaminating, the radiation they can handle, application instructions, etc. A Decision Model was created using MATLAB to work hand-in-hand with the product list and further assist in the D&D process. This Decision Model allows users to select inputs relative to their situation, such as radiation, surface, and application. The model then searches the database and returns products that fit the criteria selected. Users will have access to information related to all of the products that can possibly treat the type of contamination specified and thus make more informed decisions when selecting a product that best satisfies their needs. This Decision Model will be deployed as a web-based application on the D&D KM-IT platform and will be made available as a mobile application.



Figure 23 DOE. Fellow Meilyn Planas presenting student poster at WM15.



## Quantitative Assessment of Sustainable Remediation Options for SRS

Natalia Duque (DOE Fellow)

The Applied Research Center at Florida International University is working on the development of a set of proposed actions that will help reduce the environmental burden of the A/M Area groundwater remediation system at the Savannah River Site. This remediation system has been in continuous operation for 29 years and is expected to remain in operation for several more years. The outcome of this task is expected to convey improvements in system performance, help increase contaminant recovery, and/or decrease energy consumption.

State-of-the-art modeling tools will be used to determine a baseline that will serve as the basis for identifying system optimization opportunities and evaluating options. The overall system efficiency will be provided along with recommendations on how to optimize the hydraulic loads, pumping rates, contaminant mass flow rates, and well drawdown levels.

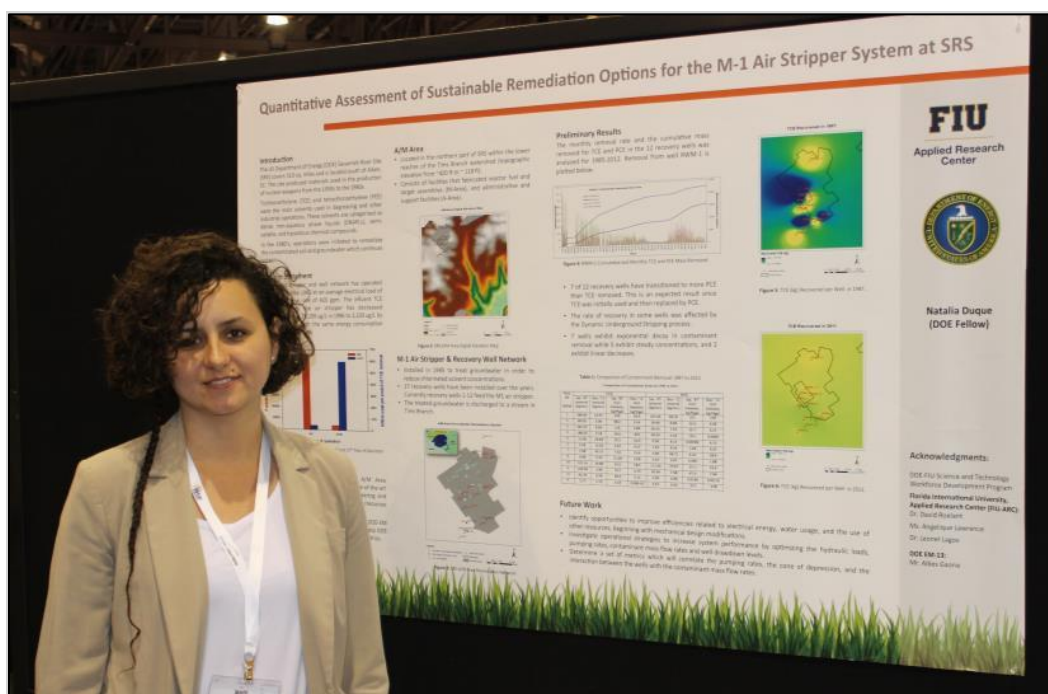
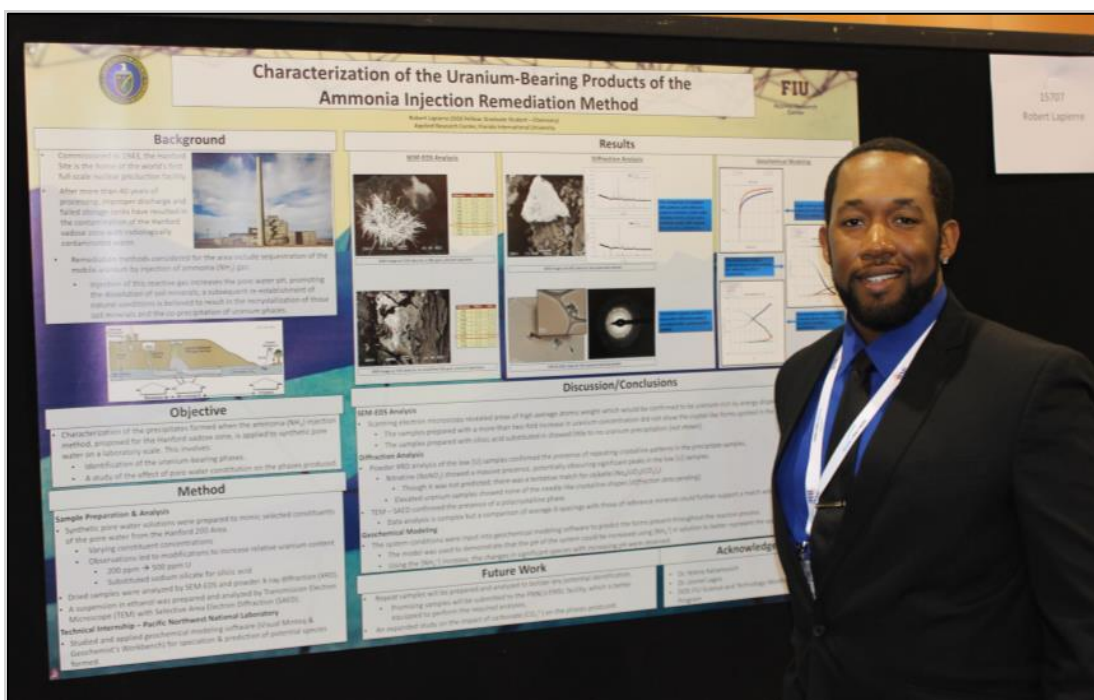


Figure 24. DOE Fellow Natalia Duque presenting student poster at WM15.

## Studying the Ammonia Gas (NH<sub>3</sub>) Injection Methodology Proposed for Remediation of the Hanford Deep Vadose Zone

*Robert Lapierre (DOE Fellow)*

Contamination in the Hanford vadose zone presents a potential future threat to the ecosystem as the toxins slowly move toward the Columbia River. The injection of reactive gases has been studied by Pacific Northwest National Laboratory as a method of remediation for radionuclide contamination in the Hanford vadose zone. More specifically, the injection of ammonia (NH<sub>3</sub>) gas has been proposed as a potential method of reducing the mobility of uranium phases in the subsurface of the Hanford 200 Area vadose zone. In support of the ongoing research, a laboratory scale evaluation of the method was performed using the gas injection of a synthetic porewater prepared to represent aqueous phase present in the 200 Area subsurface. In order to develop a careful identification of the uranium-bearing products, a variety of analytical methods were used, including SEM/EDS, X-Ray diffraction, KPA, and TEM analysis. Additionally, geochemical modeling software was utilized to predict the changes in speciation associated with the system.



**Figure 25. DOE Fellow Robert Lapierre presenting student poster at WM15.**

## D&D Knowledge Management Information Tool Feasibility Study for Cross-Platform Mobile Applications

Steve Noel (DOE Fellow)

To increase the accessibility of the Department of Energy's (DOE) Deactivation & Decommissioning Knowledge Management Information Tool (D&D KM-IT), a native cross-platform mobile application is needed. A cost/benefit analysis is therefore currently being conducted to determine the feasibility of using cross-platform mobile development software for the D&D KM-IT platform.

Cross-platform development allows developers to code one application and deploy it on multiple devices with little effort. Xamarin is a native cross-platform development framework that allows developers to create native mobile applications.

The feasibility study will test the overhead of a Xamarin application in terms of its memory usage and responsiveness to determine if it is a viable solution for D&D KM-IT needs. Device memory is an important factor in device and application performance. A large application takes time to launch which may affect the device's responsiveness. Another important metric being tested is performance. Can Xamarin be used for quick real-time applications that require intensive computational power from the device, or is it more efficient to create device-specific applications? The study will also test whether the code reusability purported by Xamarin is more time saving than using other frameworks, or if it is similar to individual platform development.



Figure 26. DOE Fellow Steve Noel presenting student poster at WM15.

## Deactivation and Decommissioning Web Log Analysis Using Big Data Technology

*Santosh Joshi (Graduate Research Assistant)*

The D&D KM-IT is a web-based knowledge management information tool custom built for the deactivation and decommissioning (D&D) user community. D&D KM-IT allows project managers around the DOE complex to share innovative ideas, lessons learned, past experiences, and practices; and to collaborate virtually on the implementation of proven processes and practices. The system allows interested users to post questions/problems related to specific areas of interest. D&D KM-IT provides secured user registration, role management, custom work flow, basic/advanced search, problem/solution fact sheets, and link/document management.

A feasibility study has been conducted to effectively analyze web-logs generated from D&D KM-IT and to extract useful information such as user behavior, user location, keywords and security breaches using the Apache Hadoop Framework. The Apache Hadoop software library allows distributed processing of large data sets across clusters of computers using a simple programming model called MapReduce. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. The Hadoop Distributed File System (HDFS) splits files into large blocks and distributes the blocks amongst the nodes in the cluster.

The MapReduce programming framework is used to write programs that process massive amounts of unstructured data in parallel across a distributed cluster of processors to extract the required data.



Figure 27. Graduate Student Santosh Joshi presenting student poster at WM15.



## Best Practices Mobile Application for D&D KM-IT

*Jorge Deshon (DOE Fellow)*

The Best Practices module for the Deactivation and Decommissioning Knowledge Management Information Tool (D&D KM-IT) shares the knowledge that gave the suitable/appropriate results for past projects through a community-based database. This would help the D&D community with safeguarding success for future projects and preventing previous mistakes. The database includes best practice documents that are contributed by D&D community members while working with DOE fellows at ARC-FIU. There is a formal approval process on KM-IT for publishing the best practices documents. Once approved, the document is accessible in multiple formats and available for download.

The mobile application for the Best Practices module of the D&D KM-IT uses the jQuery mobile framework which has a “mobile-first” approach in mind based on HTML5 and CSS3. The application is designed to be responsive to fit on any sized screen as well as cross-browser and cross-platform. Using Ajax, the module becomes more bandwidth efficient by refreshing the data in a page instead of reloading the entire page. This function allows multiple parts of a page to have different tasks going on while still running smoothly and efficiently.



Figure 28. DOE Fellow Jorge Deshon presenting student poster at WM15.

## Sodium Silicate Treatment for U(VI) Bearing Groundwater Systems at F/H Area at Savannah River Site

Christine Wipfli (DOE Fellow)

The Savannah River Site (SRS) was one of the most significant manufacturing facilities during the Cold War era for producing nuclear materials. At the end of the Cold War, the Site's mission changed to support the environmental restoration of the Site due to over six decades of research, development, and production of nuclear weapons. Currently SRS is a major hazardous waste management facility responsible for nuclear materials storage and remediation of contaminated soil and groundwater from radionuclides.

This research focuses on controlling the mobilization of the contaminants, specifically uranium (VI) located in groundwater plumes at the Sites' F/H Area Seepage Basin, where approximately 1.8 billion gallons of hazardous waste were deposited. The objective is to evaluate the potential use of sodium silicate for uranium removal from the aqueous phase, as well as to restore the pH of the treatment zone. Adding silicates increases the pH of the treatment zone and uranium precipitation is achieved, therefore immobilizing the contamination. Through a series of experiments the optimal concentration of silicates was investigated.

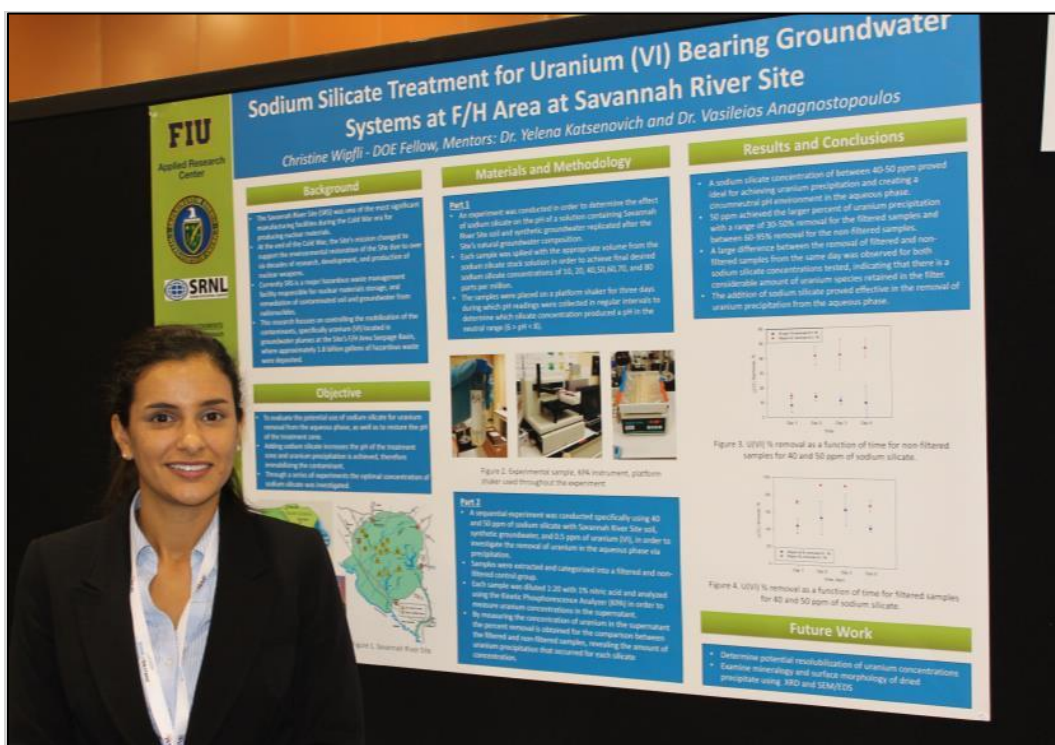


Figure 29. DOE Fellow Christine Wipfli presenting student poster at WM15.

## Miniature Motorized Inspection Tool for Department of Energy Hanford Site Tank Bottoms

*Ryan Sheffield (DOE Fellow)*

Traces of waste have been discovered in the annulus of tank AY-102 at the Hanford DOE site, prompting a need to investigate the source of leakage via a miniature motorized inspection tool. There are environmental constraints which the tool will have to adhere to, such as being able to withstand elevated temperatures and levels of radiation that are present. The method of entry will be via a 42 inch diameter riser, which will in turn gain the tool access to the refractory slot openings. To accomplish the task delegated, the tool must successfully be able to navigate up to 38 feet to the tank center, maneuver through four 90°-turns, and provide visual feedback, in slots with a width as small as 1.5 inches. This is to be accomplished while inflicting minimal damage to the refractory pad. A small, wheeled, remotely-controlled device is being developed to meet these objectives. The device will utilize a magnet to allow inverted travel along the tank bottom. This presentation describes the development of a prototype of this inspection device.

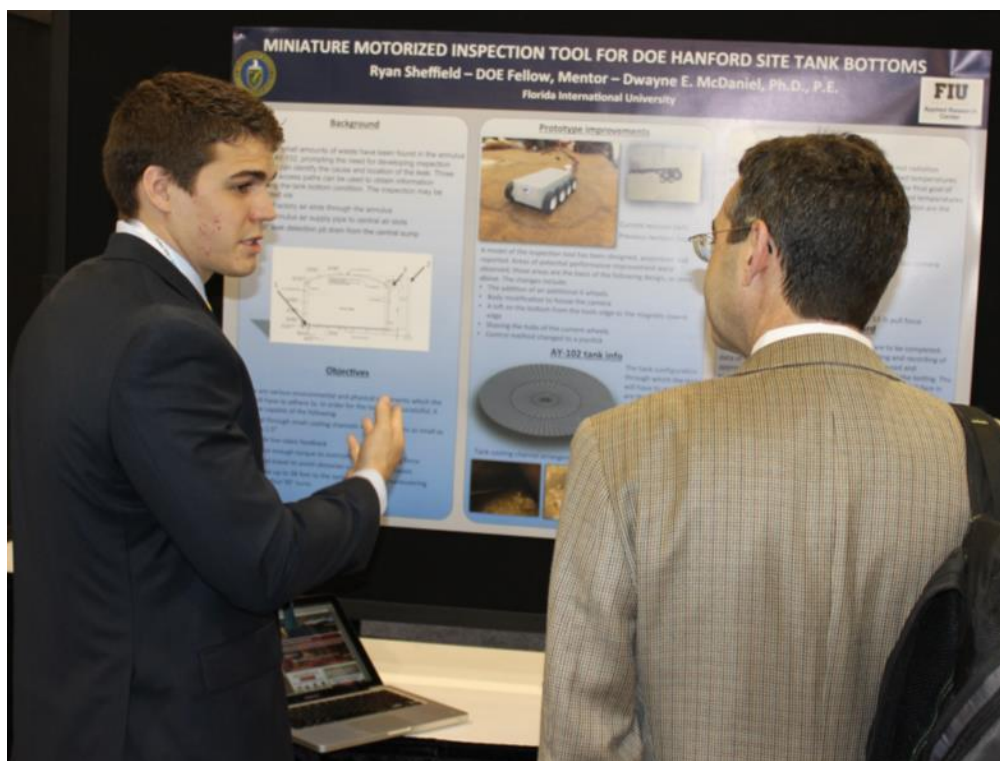


Figure 30. DOE Fellow Ryan Sheffield presenting student poster at WM15.



## Column Testing of the Migration and Distribution of Humate Injected into Subsurface Systems at Savannah River Site's F/H Area

Kiara Pazan (DOE Fellow)

The F-Area seepage basins at Savannah River Site (SRS) have received approximately 1.8 billion gallons of low-level waste solutions, containing nitric acid, radionuclides and dissolved metals due to plutonium separation operations from 1955 to 1988. The waste solutions became a source of contamination for groundwater and soil at the site, with U(VI) and other radionuclides above their maximum contaminant levels (MCLs). For remediation, humic acid (HA) technology has shown to be a potential approach for controlling mobility of radionuclides. Because sorbed HA and uranium develop a strong bond at slightly acidic pH, the mobility of the contaminant molecules should decrease with flushing of SRS groundwater. Column experiments are planned using SRS soil from the F/H Area to examine the sorption and desorption properties of HA in SRS soil. The data from these experiments will then be used to perform modeling of the migration and distribution of HA injected into the subsurface.

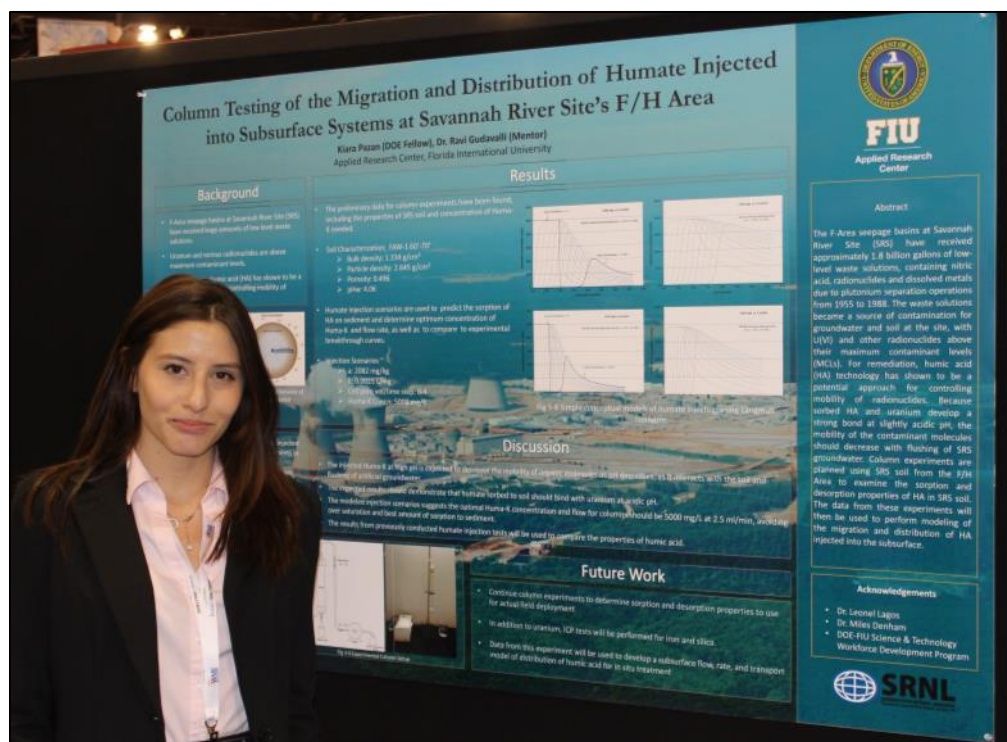


Figure 31. DOE Fellow Kiara Pazan presenting student poster at WM15.

## Innovative Applications and Demonstration of Advanced Fogging Technologies to Address Loose Contamination at Savannah River Site's 235F Facility

Jesse Viera (DOE Fellow)

In decommissioned radioactive facilities nationwide, the need for prevention of radioactive contamination is crucial. Currently, workers at the U.S Department of Energy (DOE) are required to enter these facilities and cover the walls with a fixative layering to trap the contamination. In the process, they are exposed to dangerous airborne contamination that could give way to acute and chronic damage.

Through an enterprise collaboration between the U.S. DOE, Savannah River Site, Savannah River National Lab, Idaho National Lab, and the Applied Research Center at Florida International University, advanced testing is underway to better trap and fix this airborne contamination through the FX2 advanced fogging technique. This is an integrated method to mitigate the airborne contamination hazards with minimal to no personnel entry. Optimization of the coverage in the facility plays a significant role in this endeavor. This will be done by experimenting with airflow manipulation, multiple nozzle techniques, and robotic devices. In addition, the flammability properties of the FX2 fogging agent will be tested to ensure the safety of the product upon application, as well as its shielding properties against radiation.

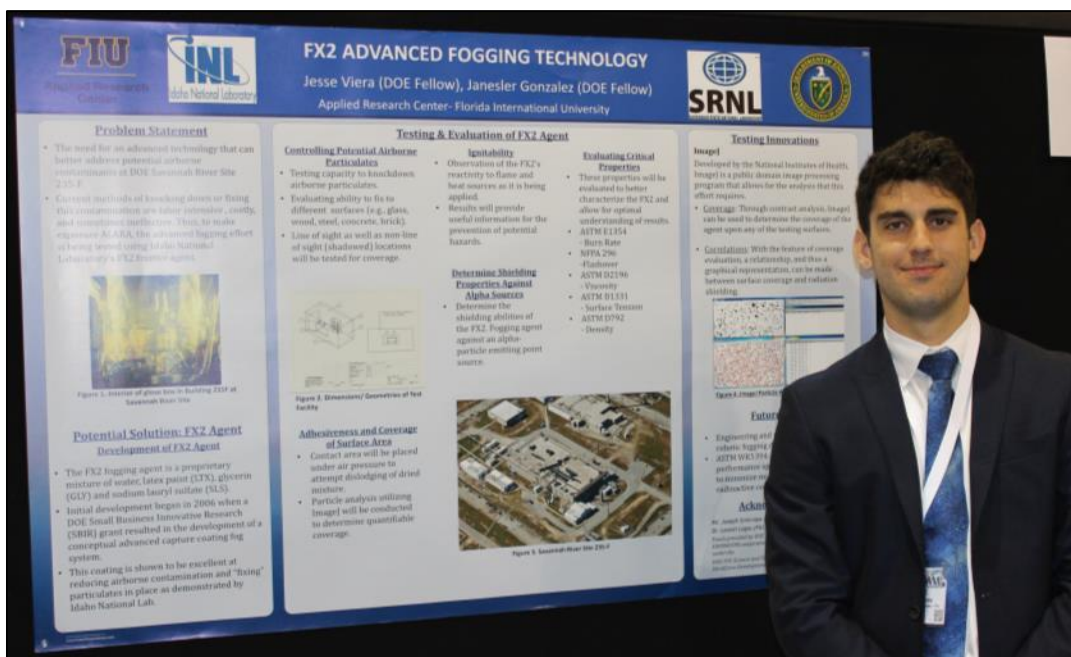
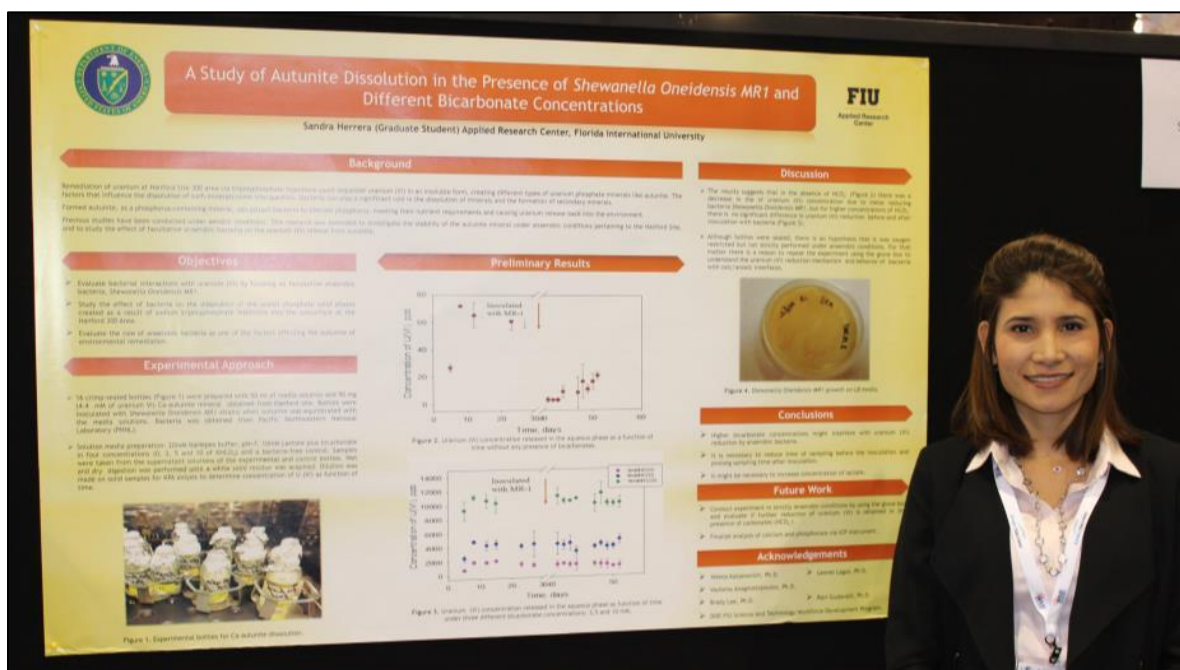


Figure 32. DOE Fellow Jesse Viera presenting student poster at WM15.

## A study of Ca-Autunite dissolution in the presence of *Shewanella Oneidensis* MR1 and different bicarbonate concentrations

*Sandra Herrera (Graduate Student Assistant)*

The research evaluates bacterial interactions with uranium (VI) by focusing on facultative anaerobic bacteria, *Shewanella oneidensis* MR1; the goal of the research is to study their effect on the dissolution of the uranyl phosphate solid phases created as a result of sodium tripolyphosphate injections into the subsurface at the Hanford 300 Area. The Columbia River at the site exhibits water table fluctuations, which create an oxic-anoxic interface that in turn, due to activates of facultative anaerobic bacteria, can affect the stability of uranium-bearing soil minerals. Understanding the effect of anaerobic bacteria as a factor affecting the outcome of remedial actions is very important and the protection of water resources from contaminated groundwater is a key role of the overall Hanford cleanup.



**Figure 33. Graduate Student Sandra Herrera presenting student poster at WM15.**

## Knowledge Management Information Tool Analytics with Distributed Database Engine

Kavitha Megalageri (Graduate Student Assistant)

The D&D KM-IT is a web-based knowledge management information tool custom built for the deactivation and decommissioning (D&D) user community. D&D KM-IT allows project managers around the DOE complex to share innovative ideas, lessons learned, past experiences, and practices; and to collaborate virtually on the implementation of proven processes and practices. The system allows interested users to post questions/problems related to specific areas of interest. D&D KM-IT provides secured user registration, role management, custom work flow, basic/advanced search, problem/solution fact sheets, and link / document management.

An analysis of D&D KM-IT server logs has been conducted to assess the feasibility of using a distributed database engine, MongoDB, as a viable analytic tool. MongoDB is a document database that provides high performance, high availability, and easy scalability. MongoDB stores data using a flexible document data model. It provides auto-sharding for horizontal scale out, native replication and automatic leader election to support high availability across racks and data centers. Comprehensive secondary indexes, including geospatial and text search, as well as extensive security and aggregation capabilities make it more reliable for analyzing D&D KM-IT server logs

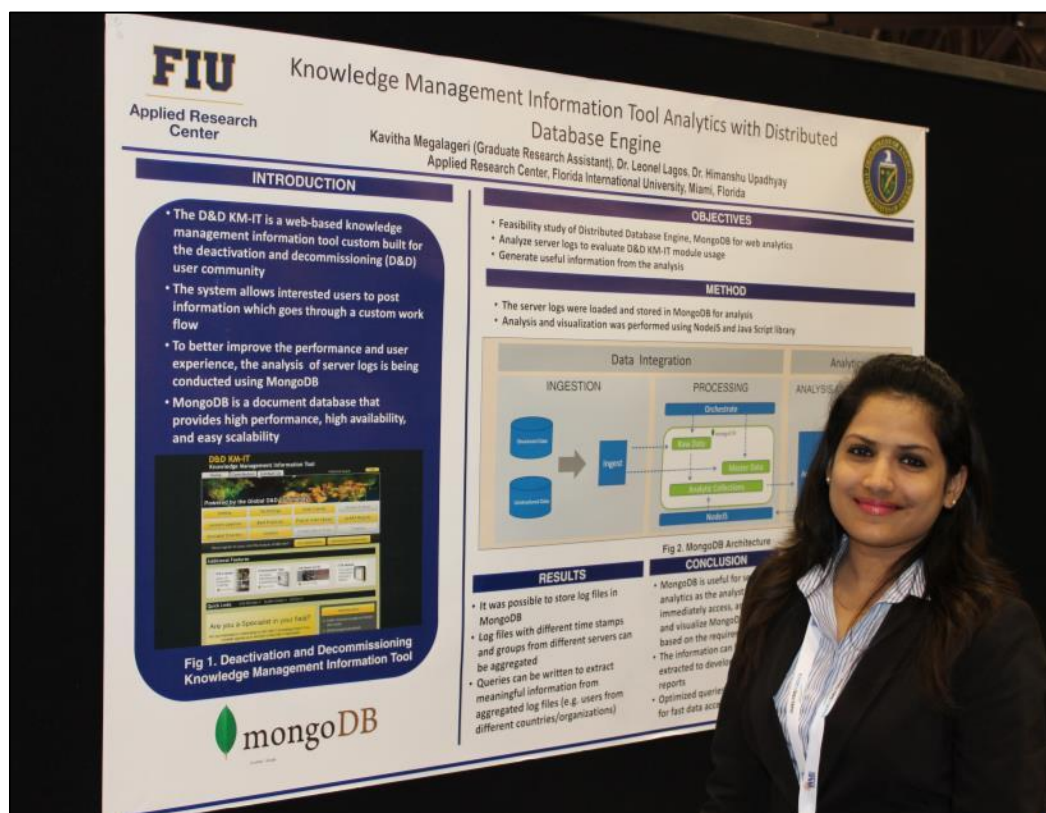


Figure 34. Graduate Student Kavitha Megalageri presenting student poster at WM15.



## 8.0 DOE FELLOWS DIRECTLY SUPPORTING DOE EM PROJECTS

DOE Fellows provide direct support to DOE EM projects around the complex. Details of the applied research performed at ARC in support of DOE EM is reported in the FIU Year 5 Final Technical Reports for Project 1, 2, 3, and 4. A summary of the project tasks that received direct support from the DOE Fellows is provided below.

### DOE's Hanford Site Support for HLW

**DOE Fellows: Anthony Fernandez, John Conley**

Mentors: Amer Awwad, Dwayne McDaniel

Project Task: Development of Alternative Unplugging Technologies

**DOE Fellows: John Conley, Anthony Fernandez**

Mentors: Amer Awwad, Dwayne McDaniel

Project Task: Evaluation of Nonmetallic Components in the Waste Transfer System

**DOE Fellow: Dayron Chigin**

Mentors: David Roelant, Dwayne McDaniel

Project Task: Evaluation of FIU's SLIM for Rapid Measurement of HLW Solids on Tank Bottoms

**DOE Fellow: Deanna Moya**

Mentor: Romani Patel

Project Task: Computational Simulation and Evolution of HLW Pipeline Plugs

**DOE Fellow: Brian Castillo**

Mentors: Dwayne McDaniel, Aparna Aravalli

Project Task: Pipeline Corrosion and Erosion Evaluation

**DOE Fellow: Ryan Sheffield**

Mentors: Dwayne McDaniel, Hadi Fekrmandi

Project Task: Development of Inspection Tools for DST Primary Tanks

**DOE Fellows: Michael Abbott, Sasha Philius, Maximiliano Edrei**

Mentor: Seckin Gokaltun

Project Task: Computational Fluid Dynamics Modeling of HLW Processes in Waste Tanks

### DOE's Hanford Site Support for Soil & Groundwater

**DOE Fellow: Paola Sepulveda-Medina**

Mentor: Yelena Katsenovich

Project Task: Effect of U(VI) and Bicarbonate on Cell Viability

**DOE Fellows: Claudia Cardona, Robert Lapierre**

Mentor: Yelena Katsenovich

Project Task: Sequestering Uranium at the Hanford 200 Area Vadose Zone by In Situ Subsurface pH Manipulation Using NH<sub>3</sub> Gas

**DOE Fellow: Christian Pino**

Mentors: Ravi Gudavalli, Hilary Emersion

Project Task: Evaluation of Ammonia Fate and Biological Contributions During and after Ammonia Injection for Uranium Treatment



## **DOE's Savannah River Site Support for Soil & Groundwater**

### **DOE Fellow: Hansell Gonzalez**

Mentors: Yelena Katsenovich, Vasileios Anagnostopoulos

Project Task: Sorption Properties of Humate Injected into the Subsurface System

### **DOE Fellow: Christian Pino**

Mentor: Ravi Gudavalli

Project Task: Synergistic Effects of Silica and Humic Acid on U(VI) Removal

### **DOE Fellow: Christine Wipfli**

Mentor: Vasileios Anagnostopoulos

Project Task: FIU's Support for Groundwater Remediation at SRS F/H –Area

### **DOE Fellow: Aref Shehadeh**

Mentor: Yelena Katsenovich

Project Task: Monitoring of U(VI) Bioreduction after ARCADIS Demonstration at F-Area

## **Soil and Groundwater Remediation Support**

### **DOE Fellow: Kiara Pazan**

Mentor: Ravi Gudavalli

Project Task: Modeling of the Migration and Distribution of Natural Organic Matter injected into Subsurface Systems

### **DOE Fellow: Natalia Duque**

Mentor: Angelique Lawrence

Project Task: Surface Water Modeling of Tims Branch

### **DOE Fellow: Yoel Rotterman**

Mentor: David Roelant

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

## **D&D Research**

### **DOE Fellows: Jesse Viera, Janesler Gonzalez, Mariana Evora, Meilyn Planas, Orlando Gomez**

Mentors: Joseph Sinicrope, Peggy Shoffner, Leo Lagos

Project Task: D&D Research for DOE EM-13, SRS, and INL: Testing and Evaluation of the FX2 Advanced Fogging Technology; Incombustible Fixatives; and Fixative Decision Model

## **D&D Knowledge Management Information Tool**

### **DOE Fellows: Revathy Venkataraman, Mariela Silva, Pedro Cordon, Jorge Deshon, Andrew De La Rosa, Steve Noel, Meilyn Planas**

Mentors: Himanshu Upadhyay, Peggy Shoffner

Project Task: Data mining activities and entries to populate D&D KM-IT

## 9.0 INTRODUCTION TO DOE FELLOWS AND THEIR RESERCH WORK

### 9.1 DOE Fellows and their Research: Class of 2014 – Eight Cohort

#### *Andrew De La Rosa (Computer Engineering)*



Andrew De La Rosa is a graduate student at Florida International University studying Computer Engineering with specialization in network and cybersecurity. He graduated in the Fall of 2014 earning his bachelor's degree in computer engineering. His concentrations were in integrated nano-technology, network security, and computer architecture. He was recently inducted into the Eta Kappa Nu honor society for his outstanding academic work. He plans to continue his education after his masters by pursuing a doctoral degree in electrical engineering. His current project 'Malware Forensics on Mobile Devices for DOE-EM Applications' is on analyzing the malware signatures from a mobile device and comparing them to the signatures from a desktop. From there, the

process is analyzed and a comparison on whether a desktop malware can affect a mobile device will be determined.

#### *Anthony Fernandez (Mechanical Engineering)*



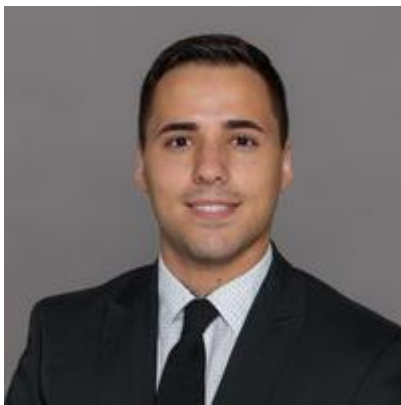
Anthony Fernandez is a junior undergraduate student pursuing a bachelor's degree in mechanical engineering at Florida International University (FIU). He worked as a student employee at the Applied Research Center for a year and a half prior to his acceptance as a DOE Fellow in the DOE/FIU Science and Technology Workforce Development Program. Anthony's professional interests include design optimization, robotics, computational modeling, manufacturing, applied mechanics, and energy efficiency, with a special interest in clean, renewable energy. After the completion of his bachelor's degree, he plans to continue his education in pursuit of a master's degree in engineering management, as well as a master's degree in

mechanical engineering.

***Aref Shehadeh (Environmental Engineering)***

Aref Shehadeh is a senior undergraduate student pursuing a Bachelor of Science degree in environmental engineering at Florida International University (FIU), with an expected graduation date of December 2015. His professional interests include bioremediation technology, green energy initiatives, and researching methods to promote a sustainable future for a growing population. Aref is also president of the American Academy of Environmental Engineers and Scientists (AAEES) chapter at FIU where he meets with other students to collaborate on ideas and to work on various projects managed by the organization. Upon graduating with his BS in environmental engineering, Aref plans to continue his education by

pursuing a master's degree.

***Brian Castillo (Biomedical Engineering)***

Brian Ivan Castillo is an undergraduate student at Florida International University currently pursuing a Bachelor of Science degree in biomedical engineering and a minor in mechanical design. His expected graduation date is Spring of 2016. Brian's professional interests include biomechanics, BME optics, robotics, and project management. Upon graduation, Brian plans to continue his education in pursuit of a master's degree.

***Christine Wipfli (Environmental Engineering)***

Ms. Christine Wipfli is currently pursuing a bachelor's degree in environmental engineering at Florida International University (FIU). Her expected graduation date is December of 2016. Christine received her first bachelor's degree in communications with an emphasis in journalism from Cardinal Stritch University in Milwaukee, Wisconsin. She joined the Department of Energy's Science and Technology Workforce Development Program at FIU in November of 2014.

Prior to becoming a DOE Fellow, Christine worked for two years at a civil and environmental engineering consulting company gaining experience by performing environmental compliance audits, reviewing site assessment and quarterly reports, managing data from on-site monitoring equipment, submitting County permits, and assisting in the due diligence process for Phase I and Phase II reports. Christine has also gained experience working for a Fortune Global 500 Company as an engineering assistant to the North American Vice President of Solid Waste. In 2014 Christine participated in a fellowship program, organized under the National Research Council, by publishing

a research paper and travelling to a conference in Washington D.C to present her findings to Transportation Research Board members.

In FIU's Science and Technology Workforce Development Program, Christine is working under the guidance of Dr. Yelena Katsenovich and Dr. Vasileios Anagnostopoulos. Her current project is based off of the Savannah River Site and deals with novel approaches for the abatement of uranium levels in groundwater. In a series of procedures Christine will aim to meet the objectives of the experiment which are to evaluate the potential use of silicates for uranium removal from the aqueous phase, as well as the restoration of the treatment zones' pH.

Christine plans to continue her education with a master's degree in engineering management upon graduation.

### ***Janesler Gonzalez (Mechanical Engineering)***



Janesler Gonzalez is an undergraduate student pursuing a Bachelor of Science (B.S) degree in mechanical engineering at Florida International University (FIU). Mr. Gonzalez's engineering interests fall under the field of robotics and design optimization. Having joined the DOE/FIU Science and Technology Workforce Development Program in October of 2014, Janesler is now being mentored by Mr. Joseph Sinicrope.

### ***Jesse Viera (Mechanical Engineering)***



Jesse Viera is a junior undergraduate student pursuing a Bachelors of Science (B.S) degree in mechanical engineering at Florida International University (FIU), with an expected graduation date of fall 2016. Jesse is a member of the Tau Beta Pi Engineering honor society and American Society of Mechanical Engineers at FIU. Jesse's professional interest includes robotics, energy efficiency, and mechanical design. Upon graduating with his BS in mechanical engineering Jesse plans to continue his education by pursuing a master's degree.

***John Conley (Mechanical Engineering)***

John Conley is an undergraduate student pursuing a Bachelor of Science degree in mechanical engineering and a minor in physics at Florida International University (FIU), with his expected graduation date being fall 2017. After completing his degree in mechanical engineering, John plans on pursuing a master's degree. Before becoming a DOE Fellow, John worked in HVAC for four years installing, repairing, and servicing mainly residential air conditioning units. John's professional interests include HVAC, energy efficiency, and mechanical design.

***Jorge Deshon (Computer Engineering)***

Jorge Deshon is a junior undergraduate student pursuing a Bachelor of Science in Computer Engineering with a specialization in Data System Software, Computer Architecture and Microprocessor Design, and Network Engineering. His expected graduation date is in Spring 2016 and after completing his degree, he plans to attain his Master's degree. Jorge is currently the Webmaster for the Society of Hispanic Professional Engineers (SHPE) chapter at Florida International University (FIU) and continues to develop his web development skills further on his free time. He was also inducted in Fall 2014 as a member of Tau Beta Pi and participated in the 2014 hackathon for HackFSU.

***Kiara Pazan (Environmental Engineering)***

Kiara Pazan is a senior undergraduate student pursuing a Bachelor of Science degree in environmental engineering at Florida International University. Her expected graduation date is Fall 2015. Kiara's personal interests include wastewater treatment and groundwater and soil remediation. Kiara is an active member of the American Academy of Environmental Engineers and Scientists and the Water Environment Federation. After graduation, Kiara plans to continue her education in pursuit of a master's degree.

***Maria Diaz (Environmental Engineering)***

Maria Diaz is a senior undergraduate student pursuing a Bachelor of Science degree in environmental engineering at Florida International University. Her expected graduation date is Fall 2014. Maria's professional interests include hazardous waste material assessment, soil and groundwater remediation, subsurface particle transport, contaminant assessment in vadose zone and water resources among others. Maria is currently serving as Vice President of the American Academy of Environmental Engineers and Scientist (AAEES) FIU Chapter. She is responsible for the organization of campus-wide events and career enhancing opportunities for the group. She is also an active member for the Water Environment Federation (WEF).

Prior to becoming a DOE Fellow, Maria was a Learning Assistant at the Mastery Lab for Mathematics, a component of FIU's Project Gateways which provide academic support to help students succeed in several areas such as mathematics, reading and writing. Her tasks in the lab included the implementation of individualized educational techniques as well as peer mentoring activities such as tutoring and leading group learning sessions.

***Maximiliano Edrei (Mechanical Engineering)***

Maximiliano Edrei is a Senior undergraduate student pursuing a Bachelor of Science degree in Mechanical engineering at Florida International University (FIU). His expected graduation is set for May of 2015. His professional interests include Fluid Mechanics, computational modeling, and design optimization. Maximiliano is currently an executive board member of the Mechanical Contractors Association of America (MCAA) chapter at FIU. Upon graduating with his BS in mechanical engineering, Max plans to continue his education by pursuing a master's degree.



***Meilyn Planas (Electrical Engineering)***

Meilyn Planas is an undergraduate student at Florida International University pursuing a bachelor's degree in electrical engineering with an expected graduation date of April 2016. Focused on nanotechnology, bioengineering, and network engineering, her main interests include optical design, logic design, and circuitry. She is the current Corresponding Secretary of Tau Beta Pi as well as Eta Kappa Nu and a member of the Honors College.

As a DOE Fellow, Meilyn is helping develop a computer-based model that will guide end users looking to deactivate and decommission (D&D) facilities located at DOE sites such as the Savannah River National Lab. The selection of the types of products used for decontamination depends on the end user's specific needs and site application. The objective of the decision model being developed at FIU is to provide a selection of the most applicable products, prioritizing the criteria that are more important for the user. The decision model will use feedback provided from DOE sites to ensure consistency and accuracy. Once a web-based model is developed, the groundwork for a mobile application will begin.

***Ryan Sheffield (Mechanical Engineering)***

Ryan Sheffield is an undergraduate student pursuing a Bachelor of Science degree in Mechanical Engineering and a professional certificate in robotics at Florida International University (FIU), with his expected graduation date being fall 2016. After completing his degree in Mechanical Engineering, Ryan plans on pursuing a Master's degree. Ryan's professional interests include energy efficiency, thermal systems and mechanical design.

***Yoel Rotterman (Mechanical Engineering)***

Yoel Rotterman is an undergraduate student pursuing a bachelor's degree in mechanical engineering at Florida International University (FIU). His expected graduation year is spring 2017. Yoel's professional interests include mechanical design, renewable energies, and material optimization. After the completion of his bachelor's degree, he plans to enter the labor force to gain experience before he continues his education in pursuit of a master's degree in engineering management.

## 10.0 LECTURE SERIES

FIU hosted Mr. Jim Voss, managing director of the Waste Management Symposium, during the DOE Fellows lecture series on Tuesday January 27, 2015 at FIU (Figure 35 - Figure 37). Mr. Voss gave a lecture titled, “Magnetic Separation of Uranium and Plutonium.” After the lecture, Mr. Voss toured ARC’s research laboratories and interacted with the DOE Fellows.



**Figure 35. Mr. Jim Voss presenting at the DOE Fellows lecture series.**



**Figure 36. DOE Fellows lecture series.**





**Figure 37. Mr. Jim Voss with DOE Fellows Program Director Leonel Lagos and DOE Fellows.**

FIU-ARC held the DOE Fellows lecture series on April 8, 2015 featuring Dr. Miles Denham from Savannah River National Laboratory (SRNL). The title of Dr. Denham's presentation was "Helping Nature Heal – Enhanced Attenuation." Dr. Denham discussed the soil and groundwater challenges/limitations at the Savannah River Site (SRS), remedy selection criteria, active and passive remediation technologies and enhanced natural remediation (Figure 38). He talked about the various technologies that are being applied at SRS to remediate contaminants such as uranium, strontium and iodine. After the lecture series, Dr. Denham toured the ARC laboratories where ARC scientists and researchers showcased various ongoing research activities to support DOE-EM's mission (Figure 39). Dr. Denham also participated in DOE Fellow Hansell Gonzalez's Ph.D. proposal defense titled "Unrefined Humic Substances as a Potential Low-Cost Remediation Method for Acidic Groundwater Contaminated with Uranium in Acidic Conditions."



**Figure 38. Dr. Miles Denham (SRNL) presenting SRS research for the DOE Fellows lecture series.**



**Figure 39. Dr. Miles Denham (middle) with DOE Fellows and ARC staff.**

On May 19, 2015, FIU ARC hosted a guest lecture as part of the DOE Fellows Lecture Series, featuring Mr. Dennis Washenfelter from Washington River Protection Solutions (WRPS). Mr. Washenfelter shared his experiences working on challenges they faced with waste transfer pipelines at Hanford's tank farms. FIU ARC hosted another guest lecture featuring Dr. Hope Lee, Environmental Scientist, from Pacific Northwest National Laboratory (PNNL) on May 22, 2015. Dr. Lee talked about the history of PNNL, current environmental issues and needs at the site, and remediation technologies being used to address these issues. Dr. Lee participated in lab tours and presentations by DOE Fellows (Figure 40).



**Figure 40. Dr. Hope Lee with DOE Fellows and ARC staff.**

## 11.0 OTHER PROGRAM ACTIVITIES

### *EFCOG Lessons Learned and Best Practices*

DOE Fellows continued to assist EFCOG in developing Lessons Learned and Best Practices documents. A total of 11 Best Practices and Lessons Learned documents are final. During June 2014, FIU completed incorporating the comments and suggestions received from the EFCOG DD/FE working group review on the four open best practices and lessons learned. Two of the documents were then sent to DOE for review on June 26: 1) SRS R and P -Reactor Disassembly Basin In Situ Decommissioning; and 2) Use of a Remote Tapping Tool at Idaho National Laboratory to Minimize Worker Exposure and Avoid Future Contamination Accidents. The other two documents were sent to the new site point of contact for review on June 26: 1) Use of Earthen Benches and other Technologies to Support River Structures' Demolition Activities; and 2) 327 Facility Source Term Stabilization and/or Removal Prior to Demolition.

FIU received notification that the DOE Energy Facility Contractors Group (EFCOG) DD/FE Working Group, as well as most of the other EFCOG working groups, are being discontinued and re-organized into a total of 4 working groups. FIU has been providing support to the DD/FE WG in the development of lessons learned and best practices for deactivation and decommissioning (D&D) throughout the DOE complex. The objective of these efforts is to capture previous work performed by the D&D community and facilitate the transfer of knowledge and lessons learned. DOE Fellows at FIU work closely with the DD/FE Working Group members as well as site contacts in the collection of information and the development of these documents. Once approved by EFCOG and DOE, these documents are made available via D&D KM-IT and the EFCOG website.

During July 2014, FIU received comments and suggestions from DOE on 2 best practices: 1) SRS R and P -Reactor Disassembly Basin In Situ Decommissioning, and 2) Use of a Remote Tapping Tool at Idaho National Laboratory to Minimize Worker Exposure and Avoid Future Contamination Accidents.

During August, FIU completed the revisions on the SRS best practice in coordination with the SRS site contacts and based on the comments received from the DOE review. This document was sent back to DOE on August 21 for final review and approval for publishing on the EFCOG and D&D KM-IT websites. FIU received approval from DOE and published the SRS best practice on D&D KM-IT and sent it to the EFCOG webmaster for publishing on the EFCOG website on September 3, 2014.

Two other best practice documents were sent to the new site point of contact at Hanford for review: 1) Use of Earthen Benches and other Technologies to Support River Structures' Demolition Activities; and 2) 327 Facility Source Term Stabilization and/or Removal Prior to Demolition. During September, FIU worked with the new site point of contact at Hanford to complete the revision of the two best practices. These documents were sent to DOE for review/approval on September 5, 2014.

**Table 9. Best Practices and Lessons Learned**

<b>Doc</b>	<b>BP/LL</b>	<b>Title</b>	<b>POC</b>	<b>Status</b>
1	BP	Explosive Demolition of Buildings 337, 337B, and the 309 Stack at the Hanford's 300 Area	Daniel Beckworth, Bob Smith, Thomas Kisenwether	Final & Published
2	BP	Open Air Demolition of Asbestos Gunitite by Using a Track Mounted Wet Cutting Saw	Rob Vellinger	Final & Published
3	BP	185-3K Cooling Tower Demolition	Bill Austin	Final & Published
4	BP	Historical Hazard Identification Process for D&D	Paul Corrado	Final & Published
5	LL	Closure of the Reactor Maintenance, Assembly, and Disassembly Facility and the Pluto Disassembly Facility at the Nevada National Security Site	Annette Primrose	Final & Published
6	LL	Unanticipated High Dose During the Removal of Wire Flux Monitor Cabling from the HWCTR Reactor Vessel	Bill Austin	Final & Published
7	LL	Radiological Contamination Event during Separations Process Research Unit (SPRU) Building Demolition	Mike Montini	Final, Publication on hold by POC request
8	BP	Structural Code Guidance for D&D Activities at DOE Facilities	Kirk Dooley	Final & Published
9	BP	Electrical Code Guidance for D&D Activities at DOE Facilities	Kirk Dooley	Final & Published
10	BP	SRS R and P -Reactor Disassembly Basin In Situ Decommissioning	Jack Musall	Final & Published
11	BP	Use of Earthen Benches and other Technologies to Support River Structures' Demolition Activities	Bill Kirby/Scott Sax	DOE review complete. Being finalized for publication.

Doc	BP/LL	Title	POC	Status
12	BP	327 Facility Source Term Stabilization and/or Removal Prior to Demolition	Bill Kirby/Scott Sax	DOE review complete. Being finalized for publication.
13	BP	Use of a Remote Tapping Tool at Idaho National Laboratory to Minimize Worker Exposure and Avoid Future Contamination Accidents	Kirk Dooley	Final and Published

### ***NABG 33<sup>rd</sup> Annual Technical Conference***

DOE Fellows Christina Pino and Robert Lapierre submitted abstracts, developed PowerPoint slides, and made oral presentations based on their DOE EM research by participating in the NABG 33<sup>rd</sup> Annual Technical Conference (Environmental Innovation-Collaborations for the Future) held on September 17 - September 20, 2014, at Washington State University - Tri-Cities (WSU-TC) in Richland, Washington. The titles of the research presented at the conference by the DOE Fellows were:

- **DOE Fellow Christian Pino:** Use of XRF to Characterize Pre-Hanford Orchards in the 100-OL-1 operable unit
- **DOE Fellow Robert Lapierre:** Characterization of the Uranium-Bearing Phases Produced by Novel Remediation Technologies for Sequestration of Mobile Radiological Contaminants in the Hanford 200 Area Vadose Zone

### ***FIU McNair Scholars Research Conference***

Seven (7) DOE Fellows prepared research abstracts to submit to the FIU McNair Scholars Research Conference to be held at the main FIU campus on October 16 - 18, 2014. These Fellows also developed their research posters and presented at the conference.

### ***DOE Fellows Meeting Presentations***

The DOE Fellows who participated in a summer internship are also preparing and presenting an oral presentation at the weekly DOE Fellows meetings. The schedule for these presentations is provided in Table 10.



**Table 10. Oral Presentations for Weekly DOE Fellow Meetings**

<b>Student</b>	<b>Site</b>	<b>Mentor</b>	<b>Date</b>
Christian Pino	PNNL, Richland, WA	Amoret Bunn	9/12/14
Deanna Moya	DOE-HQ EM-12, Cloverleaf, MD	Justin Marble/Patricia Lee	9/12/14
Robert Lapierre	PNNL, Richland, WA	Jim Szecsody	10/3/14
Natalia Duque	DOE-HQ EM-13, Forrestal, Washington D.C.	Albes Gaona	10/17/14
Carmela Vallalta	WRPS, Hanford, WA	Dennis Washenfelter	10/31/14
Sasha Philius	WTP (Bechtel), Hanford, WA	Brad Eccleston/Joel Peltier	11/14/14
Anthony Fernandez	WRPS, Hanford, WA	Ruben Mendoza	11/21/14
Hansell Gonzalez	SRNL, Savannah River, SC	Brian Looney/Miles Denham	11/28/14
Steve Noel	SRNL, Savannah River, SC	Mary K. Harris	12/5/14

***FIU-DOE Cooperative Agreement Research Review Presentations***

During the March 31 to April 3 program review conducted between DOE EM and FIU ARC as part of the DOE Cooperative Agreement, twelve (12) DOE Fellows presented during the technical (projects 1-4) and workforce development presentations to highlight the applied research they are performing for DOE EM as part of this Cooperative Agreement.

***Graduated DOE Fellows***

Five of our current DOE Fellows graduated with a bachelor's degree and participated in the FIU graduation ceremony held on December 16, 2014.

- Gabriela Vazquez (B.S. Mechanical Engineering) – DOE Fellow Class of 2012
- Dayron Chigin (B.S. Electrical Engineering) – DOE Fellow Class of 2012
- Sasha Philius (B.S. Mechanical Engineering) – DOE Fellow Class of 2013
- Andrew de La Rosa (B.S. Computer Engineering) – DOE Fellow Class of 2014
- Maria E. Diaz (B.S. Environmental Engineering) – DOE Fellow Class of 2014

Two of these newly graduated DOE Fellows are continuing their education by pursuing graduate degrees at FIU:

- Dayron Chigin – M.S. student in electrical engineering
- Andrew de La Rosa - M.S. student in computer engineering

Three DOE Fellows graduated from FIU and participated during FIU's Spring 2015 graduation ceremony held during May 3-5, 2015:

- Christian Pino (B.S. Chemistry) - Class of 2013
- Steve Noel (B.S. Computer Science) - Class of 2013
- Maximiliano Edri (B.S. Mechanical Engineering) - Class of 2014

DOE Fellow Steve Noel has accepted an offer of employment from Goldman Sachs. DOE Fellow Maximiliano Edri is planning to continue his education at FIU in pursuit of a master's degree. DOE Fellow Christian Pino is planning to continue his education at FIU in pursuit of either a Ph.D. degree or medical school.

### ***Life Science South Florida - 2015 STEM Undergraduate Research Symposia***

DOE Fellows (Figure 41) Aref Shehadeh (undergraduate in environmental engineering), Christian Pino (undergraduate in chemistry), Christine Wipfli (undergraduate in environmental engineering), and Kiara Pazan (undergraduate in environmental engineering) participated in the Life Science South Florida - 2015 STEM Undergraduate Research Symposia on Saturday, April 4, 2015, at Indian River State College Pruitt Campus. The DOE Fellows prepared and presented posters based on their DOE-EM research. Christine Wipfli (DOE Fellow - Class of 2014) obtained 3rd place (Figure 42) for her poster entitled "Sodium Silicate Treatment for Uranium (VI) Removal and pH Stabilization of the Groundwater Systems at the F/H Area of Savannah River Site." The poster titles presented include:

- Monitoring Mineralogical Changes Occurring in Savannah River Site F-Area Sediments via Enhanced Anaerobic Reductive Precipitation Process - **Aref Shehadeh (DOE Fellow)**
- Use of x-ray fluorescence to Characterize Pre-Hanford Orchards in the 100-OL-1 Operable Unit - **Christian Pino (DOE Fellow)**
- Sodium Silicate Treatment for U(VI) Bearing Groundwater systems at F/H Area at Savannah River Site - **Christine Wipfli (DOE Fellow)**
- Column Testing of the Migration and Distribution of Humate Injected into Subsurface Systems at Savannah River Site's F/H Area - **Kiara Pazan (DOE Fellow)**



**Figure 41. FIU DOE Fellows (Christine Wipfli, Kiara Pazan, Christian Pino, and Aref Shehadeh) along with Andres Arango, Alejandra Vivas, Elsa Bravo, and Lararo Mesa.**



**Figure 42. DOE Fellow Christine Wipfli awarded 3rd place for her research poster, pictured with DOE Fellows Program Director Leonel Lagos.**

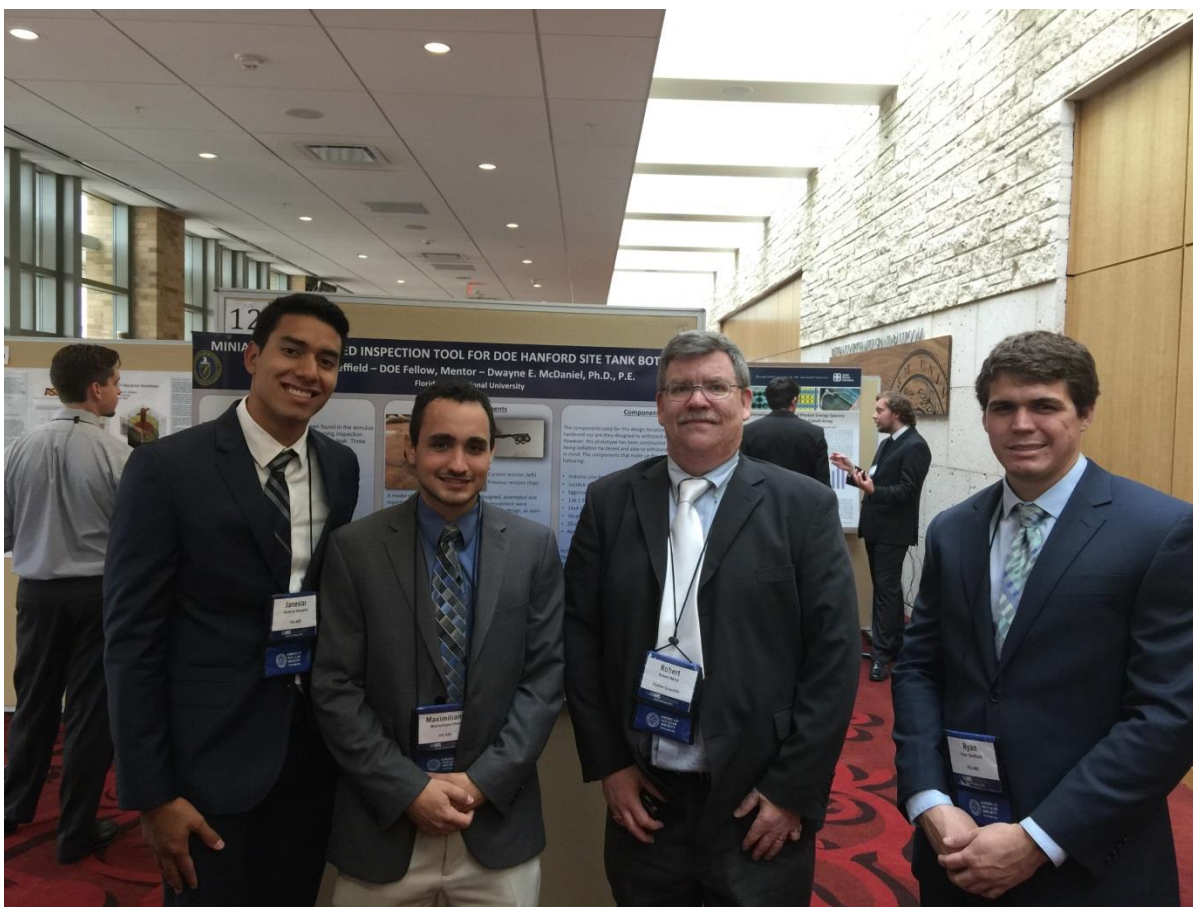
### ***PNNL Visit to FIU***

In addition, Brady Lee and Sabrina Saurey from PNNL visited FIU-ARC in January. DOE Fellows supporting the PNNL research work under Project 2 participated and presented during their visit. In addition, the DOE Fellows showcased the laboratories and the current research they are conducting to support DOE-EM's mission.

### ***ANS Conference***

DOE Fellows (Figure 43) Ryan Sheffield, Max Edrei and Janesler Gonzalez prepared posters for the ANS conference held at Texas A&M University College Station on April 9 – 11, 2015.

- Miniature Motorized Inspection tool for the Hanford DOE site Tank Bottoms - **Ryan Sheffield (DOE Fellow)**
- FX2 Advanced Fogging System - **Janesler Gonzalez (DOE Fellow)**
- Direct Numerical Simulation of Turbulent Multi-phase flow of a Bingham Plastic – **Maximiliano Edrei (DOE Fellow)**



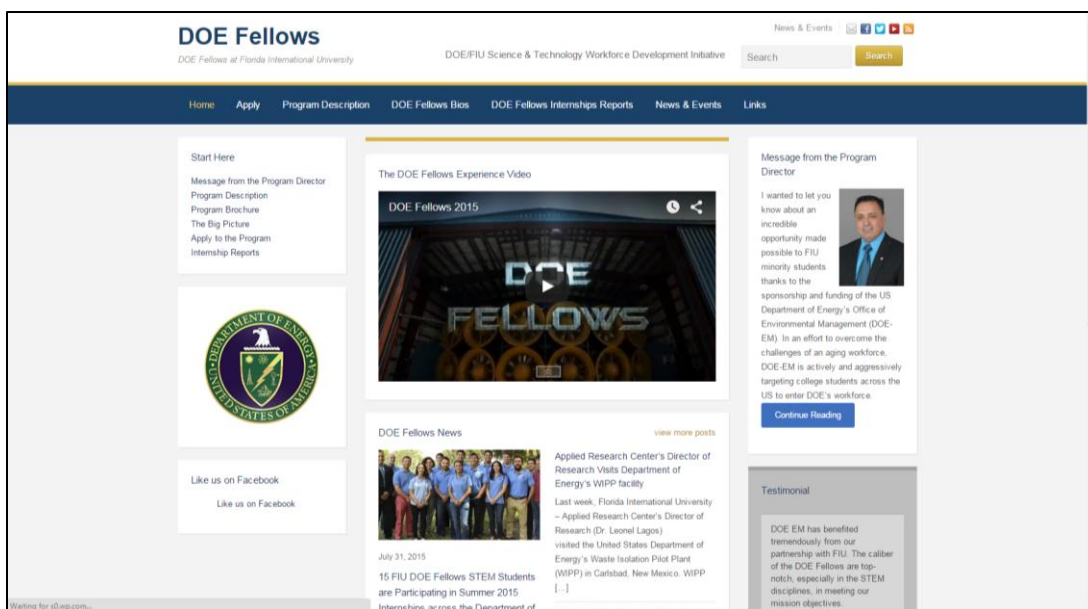
**Figure 43. DOE Fellows at the American Nuclear Society conference.**

### ***DOE Office of Economic Impact and Diversity Visit to FIU***

During their visit to FIU in July 2015, Ms. La Doris Harris (Director of Office of Economic Impact & Diversity) and Ms. Annie Whatley (Deputy Director, Office of Minority Education and Community Development) from DOE interacted with the DOE Fellows and discussed their research experience at FIU- ARC and their summer internships. FIU discussed the success of the DOE Fellows program and the program's importance in helping DOE cultivate a young diverse workforce. Director Harris talked to ARC staff about the importance of instilling principles and values in young people to ensure the future success of our nation. In addition, FIU's College of Engineering & Computing, STEM Transformation Institute, and Division of Research were all part of these meetings.

### ***DOE Fellows Website***

This year the DOE Fellows website has a new modern look. This new appearance makes the website easy to use, navigate and is mobile-friendly. It contains all the up to date information on the DOE Fellows.



**Figure 44. DOE Fellows website.**

### ***Publications***

- Sepulveda-Medina P, Katsenovich Y, Wellman D, Lagos L, The effect of bicarbonate on the microbial dissolution of autunite mineral in the presence of gram-positive bacteria, 2015(a). J Environ Radioactive, 144, 77-85.
- Sepulveda-Medina P, Katsenovich Y, Musaramthota V, Lee H, Lee B, Dua R, Lagos L. 2015 (b). The Effect of Uranium on the Bacterial Viability and Cell Surface Morphology Using Atomic Force Microscopy in the Presence of Bicarbonate Ions. Res Microbiol J, 166 (6), 419-427.

## CONCLUSIONS

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This innovative workforce development program was officially established in March 2007. This project is successfully meeting its objectives by providing research training and mentoring for students from underrepresented groups on environmental problems at DOE sites in addition to providing several new formal recruitment and retention mechanisms for qualified students from underrepresented groups to pursue advanced studies, research training, and eventual career placement at DOE sites. During the summer of 2015, students participated in 10-week internships at PNNL, SRNL, Hanford, ORNL, INL, NETL and DOE HQ in Washington, DC. Additional information about the entire program and the DOE Fellows can be found on the website <http://fellows.fiu.edu/>.



## APPENDIX

The DOE Fellows finalized their DOE Fellows Summer Internship Reports for 2014 which were sent to DOE on October 17, 2014 (deliverable). The DOE Fellows Summer Internship Reports for 2015 will be sent to DOE in October 2015. These reports will also be submitted to OSTI. The table below shows the DOE Fellows, summer mentors, and report titles. The following reports are available at the DOE Fellows website, <http://fellows.fiu.edu>.

DOE Fellow		Location	Report Title
1	Deanna Moya	DOE-HQ EM-12, Cloverleaf, MD	<i>Advanced Simulation Capability for Environmental Management (ASCEM)</i>
2	Natalia Duque	DOE-HQ EM-13, Forrestal, Washington D.C.	<i>Sustainable Remediation and Literature Review for Savannah River Site A/M Area Groundwater Remediation System</i>
3	Carmela Vallalta	WRPS, Hanford, WA	<i>Analysis of Tank Chemistry Compliance with Chemistry Specification in Double-Shell Tanks</i>
4	Sasha Philius	WTP (Bechtel), Hanford, WA	<i>HVAC Design Assessments for the Hanford Waste Treatment and Immobilization Plant</i>
5	Anthony Fernandez	WRPS, Hanford, WA	<i>Enraf &amp; Densitometer Reference Level Updates for High-Level Nuclear Waste Tanks at Hanford Site</i>
6	Christian Pino	PNNL, Richland, WA	<i>Use of XRF to Characterize Pre-Hanford Orchards in the 100-OL-1 Operable Unit</i>
7	Robert Lapierre	PNNL, Richland, WA	<i>Studying the NH<sub>3</sub> Injection Methodology Proposed for Remediation of the Hanford Deep Vadose Zone</i>
8	Hansell Gonzalez	SRNL, Savannah River, SC	<i>Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination</i>
9	Steve Noel	SRNL, Savannah River, SC	<i>Development of Web Applications for Savannah River Site</i>

In addition, the following report is available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University: <http://doeresearch.fiu.edu>

1. Florida International University, *Project Technical Plan*, Project 5: DOE-FIU Science & Technology Workforce Development Program, June 2014.