



### *Introduction and Mission*

Headquartered at Patrick Air Force Base (PAFB) Florida, the 45th Space Wing (45SW) oversees space launch operations on the Eastern Test Range, including Cape Canaveral Air Force Station (CCAFS) 20 miles to the north. Since the inception of the U.S. Space Program, these facilities have served as the world's premier gateway to space. The Wing's global importance is underscored by 16 launches during the award period, each with a payload worth up to \$500M.

Together these installations occupy 22,000 acres of the Central Florida Coast, bringing over 13,000 people and a billion dollars in economic activity to the region. The Wing also aggressively protects the region's natural and cultural resources. As barrier island facilities, CCAFS and PAFB occupy a unique coastal environment of sensitive dunal and scrub habitat between the Atlantic Ocean and the Banana River Lagoon (BRL). The BRL is part of the most ecologically-diverse estuary system in North America. Particularly at CCAFS, the Wing stewards dozens of rare and threatened species and also conserves numerous historical sites. Protected species and sensitive habitats thrive in the heart of the world's most active space launch facility!

### *Role of Restoration Program*

Groundbreaking achievements in the early space program were not without an environmental price. Early management practices led to the release of toxic industrial chemicals and fuels.

Industrial solvents (e.g., trichloroethene or TCE) were integral to the mission, but linger and migrate in the subsurface. These compounds left a legacy of over 1,100 acres of contaminated groundwater, as well as a number of highly-contaminated "source areas." Historical paint formulas contained polychlorinated biphenyls (PCBs) and heavy metals. Frequent sandblasting of launch structures, with little to no dispersion control, led to wide-spread soil contamination.

The Wing's Installation Restoration Program (IRP) meets and surmounts these challenges by applying cutting edge remediation techniques,

innovative thinking, and teamwork to ensure the safety of the work force and the integrity of the Wing's unique natural assets. Since inception, the 45SW IRP has investigated 163 sites, encompassing almost 3,000 acres. Of these sites, 74% have been returned to the mission for unrestricted use, with another 24% cleared for industrial use.



Historical view of CCAFS coastline during early space program. Many of these launch complexes are now IRP Sites.

### *Restoration Excellence Exemplified*

As an accomplished IRP staff member, Ms. Regina Butler is a driving force behind program initiatives. Her attention to detail, standard of excellence, and work ethic have garnered recognition at state and national levels and by MAJ-COM, Air Force (AF), and inter-service groups.

Ms. Butler holds a Bachelor of Science and Master of Science in Environmental Engineering from Michigan Technological University and Clemson University, respectively. She has worked in the environmental field for almost 17 years, spending the last 12 years in the 45SW restoration program. As a Restoration Project Manager in the Natural Assets office (45 CES/CEAN), she routinely manages the day-to-day operations of a \$10M to \$20M annual program.

### *Role and Responsibilities*

Ms. Butler is a leader in the IRP with responsibilities extending from site identification to close-out, planning to implementation, mission support to outreach, policy development to data management.



She capably manages the entire 45SW Environmental Restoration Account (ERA) budget (\$28.5M over the award period), including all planning, programming, and liability evaluations, ensuring that ERA resources are effectively allocated to return assets to the mission. She oversees the monitoring, performance assessment, and optimization programs. She organizes the Restoration Advisory Board (RAB) and is a core team member on the Restoration Partnering Team (RPT). She acts as primary liaison with multiple contracting service agencies. She oversees all IRP data management, having developed many of the information tools that make the program successful. Her roles on the AFRIMS Work Group, the EESOH-MIS Cleanup User Group, and the ERP Playbook Work Group apply her sizable knowledge to improving overall AF policy and information management initiatives.

TABLE 1—AWARDS, RECOGNITION, AND SERVICE

Award/Honor	Year	Level
General White Restoration Team Award	2007	AFSPC, USAF
Letter of Appreciation for organizing Tier III DoD Partnering Team tour	Feb 2009	DoD Region 4 Environmental Coordinator
Letter of Appreciation for organizing RAB tour	Aug 2008	Mission Support Group Commander
Air Force Restoration Information Management System (AFRIMS) Work Group Member	1999-2009	USAF
Enterprise Environmental Safety and Occupational Health Management Information System (EESOH-MIS) Cleanup Module User Group Member	2004-Current	USAF
AF Environmental Restoration Play-Book Work Group	2009-Current	USAF

including 6 during the award period, she regularly shares successes and lessons-learned, providing vital cross-feed and technical exchange (Table 2).

Professional and charitable affiliations include:

- Society of American Military Engineers
- American Veterans Institute (Board Member)

Accomplishments

**Partnerships**—The 45SW IRP is built on a foundation of partnering and cooperation. The Wing’s Tier I RPT serves as a DoD benchmark for team building, effective communication, and efficient site closure. Ms. Butler has been a core member for over 10 years. She developed a number of information management tools to elevate team operations to new levels of productivity and efficiency, as exemplified in the robust database used to manage daily IRP tasks, including:

- Tracking project deliverables to ensure regulatory milestone compliance
- Indexing past, present, and future work phases against sites, regulatory milestones, AF goals, documents, and correspondence
- Tracking corrective action, monitoring, long term management, and site control details
- Allowing real-time preparation of meeting minutes and reports
- Annotating and cross-referencing all RPT discussions and decisions for easy access

Ms. Butler confers with the contractor during well installation at a CCAFS site.



Awards and Service

Ms. Butler is acknowledged as a restoration expert by industry and AF peers. On numerous occasions, she and team members have been honored with MAJCOM, AF, and DoD awards (Table 1). As a respected professional, she serves on multiple AF working groups, putting her experience to work for the greater good of the AF. As an invitee at technical conferences,



The RPT reaches out to a variety of stakeholders. The Florida Department of Environmental Protection (FDEP) participates as a core team member, while other agencies are consulted on specific issues. This includes the Environmental Protection Agency, the National Aeronautics and Space Administration (NASA), the Fish and Wildlife Service, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, St. Johns River Water Management District, and the National Estuary Program.

TABLE 2—PUBLICATIONS AND CONFERENCES

<i>Event</i>	<i>Presentation</i>
AFCEE Technology Transfer Conference, Mar 2008	In-situ Steam and Iron Enhanced Soil Mixing at Cape Canaveral (co-author)
Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 08	Poster: Countdown to Cleanup at Cape Canaveral—A Base Perspective (co-author)
National Conference on Triad Investigation, Jun 08	Briefing: Using Triad Concepts to Streamline Programmatic Management (author/presenter)
Florida Remediation Conference, Oct 08	Briefing: Innovation and Implementation—A Retrospective on Environmental Cleanup Technologies Tested and Deployed at the World’s Premier Space Launch Facility (Co-author/Co-presenter)
FDEP Industry Conference, Dec 08	Briefing: Innovation and Implementation—A Retrospective on Environmental Cleanup Technologies Tested and Deployed at the World’s Premier Space Launch Facility (Co-author/Presenter)
EPA Clean-Up Information (CLU-IN) Triad Month, Aug 09	Webinar/Pod-Cast: Tools and Approaches for Managing Multi-Year, Multi-Site Datasets to Allow and Enhance Triad Implementation (Author)

The recently completed construction of two innovative hydrologic treatment basins in the CCAFS industrial area underscores the success of partnering. The basins replace 3 energy and labor-intensive legacy groundwater plume control systems. The basin system combines passive hydraulic control of contaminated groundwater with sustainable treatment technologies, and also vastly improves stormwater management capabilities. While technically sound, there was initially great resistance to this ground-breaking marriage of stormwater management and groundwater plume control. Ms. Butler was a vocal project proponent, working diligently to break down the many barriers encountered during design and implementation. Tireless coordination with more than 10 regulatory and government agencies achieved success! The \$4M basins will come on-line in 2010, providing an unprecedented combination of plume and stormwater control, and a highly visible example of “Green Remediation.” Over the life of the plume, this system will save over \$18M in energy and operational costs, compared to legacy systems.

In addition to working with regulatory partners, Ms. Butler also focuses on maintaining a positive and cooperative relationship with other Wing offices and mission partners. In 2009, she

pioneered a flexible and innovative soil remediation approach at the historic Cape Canaveral Lighthouse. The process integrated feedback from base management, the base archaeologist, the State Historic Preservation Office, the Federally-Recognized Tribes, and the non-profit “Lighthouse Foundation.” Initially, the presence of early settler and Tribal artifacts almost derailed the project, threatening to permanently close the historic site to public access. By opening communication, Ms. Butler identified a creative combination of excavation, screening, and tilling that shows proper respect to our forebears, while making the site safe for our children!

In addition to local partnering, Ms. Butler and her team constantly build bridges within DoD and across all management levels. In 2009, Ms. Butler organized a tour for the Tier III Partnering Team (Southeast Region managers), including representatives from all services and various regulatory entities. Relying on contacts and partners throughout the Wing, she orchestrated a half-day tour of 8 IRP sites, integrating natural and historical features. In addition to visiting an ozone groundwater treatment system and observing an endangered gopher tortoise relocation, an up-close encounter with a Delta IV rocket at the Delta processing facility was a tour highlight!



Ms Butler is a firm believer that communication and information exchange build strong partnerships. On a daily basis, she documents and cross-feeds progress, maintaining momentum and ensuring stakeholder accord!

- Accelerated 5 soil cleanups, which will return 32 facilities (4.5 acres) to unrestricted re-use 1 year early.
- Accelerated final investigation activities at 94 facilities by up to 2 years.
- Accelerated outyear soil cleanup of 6.2 acres at 56 facilities, which will return them for re-use 1 year ahead of schedule.
- Expedited groundwater treatment targeting 100,000 cu ft of aquifer, clearing the way for a monitored natural attenuation (MNA) remedy 1 year ahead of schedule.



Larger hydrologic treatment basin during construction—Jun 09. An innovative sustainable approach to plume control!

**Accelerated Cleanup**—Ms. Butler assiduously monitors milestones, schedules, and budget, ensuring the program remains on track while proactively seeking opportunities to accelerate projects and support mission requirements. During the award period, she planned and coordinated contracting for projects totaling over \$27M (91 projects on 43 sites). To ensure optimal execution efficiency, 77% of the budget was performance-based, greatly exceeding the AF’s 50% performance-based contracting (PBC) goal.

During the scoping and contracting process in 2008 and 2009, Regina successfully achieved >\$3.5M in cost savings by altering the technical approach to a large project and executing it as a PBC. She re-prioritized another \$1M of project funds to fast track removals in several areas with high contaminant concentrations. She astutely positioned a number of future projects for acceleration, getting approval to reprogram savings and advocating for an additional \$600K. A total of 9 projects were expedited by 1 to 2 years, with a cascading effect that accelerated 3 other outyear tasks. Overall, the following results occurred within the award period:

- Fast-tracked removal of high concentration PCB soils from 3 areas (0.4 acres).

*“...Ms. Butler demonstrates a level of professionalism and dedication that is considered a model to anyone who has been fortunate enough to work with her!”*

*Robert P. Beacham  
Environmental Program Manager  
Army Corps of Engineers, Mobile District*

Prior to these efficiencies, several sites were on a tight schedule to achieve “Remedy In Place (RIP)” by the AF 2012 goal. Expediting these activities ensures that the Wing will exceed the DoD 2014 goal by more than 2 years and makes early RIP very likely at 2 sites that consist of multiple areas identified during a base-wide Preliminary Assessment/Confirmation Sampling (PA/CS) effort completed in 2008.

The PA/CS effort reviewed previously unassessed facilities on both installations to identify remaining environmental liabilities. Eleven carefully sequenced projects totaling \$6.5M screened >3,345 facilities, followed by full PA on 1,116 and CS at 574. This cleared an impressive 3,209 facilities for unrestricted future land use. Ms. Butler was integral to this monumental effort, crafting the iterative decision process that eliminated facilities at each step, avoiding >\$393K in potential PA costs and >\$4M in sampling.

Completion of the PA/CS process finalized remaining delineation and remediation needs for the 136 areas with environmental concerns, allowing Ms. Butler to re-prioritize and accelerate pivotal projects, as described earlier.



Although focused on protecting human health and achieving RIP, Ms. Butler also aggressively optimizes sites with operating remedies. During the award period, she oversaw the Wing’s initial 5-year review and first Environmental Restoration Program Optimization (ERP-O).

The 5-year review (5YR), completed in Aug 2008, focused on 35 sites and identified many improvements. Resultant modifications to monitoring projects will enhance groundwater models at 19 sites, improve cost projections and provide better data for health, safety, and re-use decisions. The 5YR recommended additional sampling at 5 sites RIP’ed early in the program where “lessons-learned” indicate potential unassessed zones of contamination. Through expedited assessment, Ms. Butler has already confirmed the efficacy of past groundwater investigations, validating the current remedial strategy at 2 of these sites.

Ms. Butler streamlined the June 2009 CCAFS ERP-O by preparing a 150-page informational package summarizing history/status at 32 sites and formulating detailed conceptual site models for 13 complex sites. This advance preparation facilitated a 1 week ERP-O by the visiting 13-person team, versus 2 weeks elsewhere. Ms. Butler’s experience organizing and developing data management tools paid off! During team deliberations and document reviews, she responded to queries within minutes, using her well-organized and easily-accessible databases to provide key information. All data requests were resolved on a same day basis. At ERP-O conclusion, the team lead praised the unprecedented planning and data availability. Ms. Butler’s efforts ensured the ERP-O was a true collaboration and may serve as a model for other bases.

**Reducing Risk to Human Health and the Environment**—Protecting human health and the environment is the key to all IRP decisions. By diligently fast-tracking requirements to identify and remediate contamination (as previously discussed), Ms. Butler demonstrates her commitment to human health and the environment.

This commitment is further exemplified by her leadership and dedication during the recent base-wide PA/CS. Her quick programming actions, combined with the relationships that she fostered among the Wing, the Air Force Center for Engineering and the Environment (AFCEE), contracting agencies, and FDEP, ensured a rapid remedial response to 3 areas with high levels of soil contamination and expedited delineation and cleanup in the other 133 areas. Until these actions are complete, Ms. Butler has ensured that the land use control (LUC) planning process guards against exposures.



Members of the visiting ERP-O Team enjoy a tour of various IRP sites in June 2009, arranged and narrated by Ms. Butler.

The Wing’s LUC program, encompasses almost 2,000 acres and includes 39 sites with formal controls (final remedies) and another 4 sites (138 separate areas) with on-going investigation and remediation. Ms. Butler was instrumental in developing LUC implementation plans and defining the programmatic management process.

Her development of processes to streamline and standardize all aspects of the program is one of Ms. Butler’s defining achievements. She crafted integrated program documents, including base operating procedures, field sampling plans, decision process references, and quality assurance plans, to streamline many aspects of the IRP. Contractor use of these documents ensures consistent comprehensive planning, safe high-quality field work, and accurate thorough documentation. Project-related work plans and reports are streamlined by referencing these protocols



and procedures. Standardization of deliverables accelerates the production, review and approval of project documents by months. Many documents are now approved “on-board” by the RPT or are finalized at draft, without lengthy comment-response or revision. This compresses the entire program, making it possible to expedite related projects to further reduce/control risk.

**Innovative Technologies**—During Ms. Butler’s tenure with the RPT, they successfully implemented over \$30M of innovative treatment technologies targeting dense non-aqueous phase liquid (DNAPL) chlorinated solvents (TCE) in groundwater, with an additional \$10M treatment contract in 2009.

Vegetable oil injection at CCAFS Facility 38320 Area in Jan 2008 to treat chlorinated solvent groundwater contamination.



As little as 10 years ago, DNAPL was believed to be nearly impossible to remove and is still a significant and persistent challenge. The technologies previously selected for full-scale treatment at CCAFS and PAFB include steam and iron-enhanced soil mixing (removed >13,000 lbs TCE from 2+ acres across 3 sites), vegetable oil (VO) injection (>300K gallons of VO mixtures injected over 5 acres across 5 sites — including 107K gallons injected during award period), and emulsified zero valent iron (EZVI) injection (>60,000 gallons at 2 sites, 0.2 acres). In her role as performance monitoring program director, Ms. Butler reviews and manages post-treatment data for all these sites. Data collected during the award period indicates unprecedented success, with 95% to 99% TCE destruction associated with both soil mixing and EZVI. Bioremediation using VO is a longer process, but performance

data still exhibits impressive reductions (50 to 90%, depending on the site). The use of VO, EZVI and soil mixing for groundwater treatment was pioneered at CCAFS, through cooperative efforts with EPA, NASA, AFCEE, and others.

The \$10M DNAPL PBC funded in 2009 builds on these past successes. The project combines EZVI and VO injection (>600,000 gallons of VO and >68,000 gallons of EZVI), incorporating lessons-learned from other Wing sites to maximize injection radius and efficiency. This project will result in RIP of the last remaining Wing DNAPL site on-schedule in FY2011.

**Promoting Small Business**—Small businesses played a pivotal role in Ms. Butler’s contracting strategy during the award period. Local small businesses are routinely more cost efficient and responsive to program needs than larger firms located outside the region. Ms. Butler developed a plan to incorporate small businesses with the appropriate expertise into the myriad of IRP projects. She ensured a good balance of small firms ranging from Alaska Native corporations to 8(a) small, economically-disadvantaged companies to firms with HUBzone designations. Of the \$28.5M ERA budget executed during the award period, \$23M (81%) went to small businesses, with 99% to firms headquartered within a one hour drive of the Wing.

Overall, IRP contracts created or sustained at least 45 jobs within the local community on an annual basis during the award period. Ms. Butler’s persistence proved beneficial for both the IRP and their contractors. In 2008, Apex Environmental Engineering & Compliance Inc was named the “2007 SBA Small Business of the Year.” Also in 2008, CORE Engineering & Construction, Inc. won the DoD Nunn-Perry Award for their exemplary performance at the 45SW under a mentor-protégé program with AMEC Earth and Environmental, Inc. These successful companies are core members of the RPT and represent outstanding business models for any firm.

**Restoration Advisory Board**—The RAB has been an integral part of the IRP since 1995. This



group of 25 people represents a cross-section of residents from 15 neighboring communities and 5 local and state government organizations.

Ms. Butler served as the RAB’s chief registrar and primary support person beginning in 2005. In 2008, her responsibilities expanded to all IRP public relations activities, making her the RAB organizer and primary contact.

The aim of the program is to ensure a high degree of transparency and engender community trust. Over the award period, 8 RAB meetings were held, incorporating 24 diverse briefings and 2 tours. Organized and led by Ms. Butler, the tours provided a “real world” peek at IRP activities, highlighting 7 CCAFS sites and 8 PAFB sites that exemplify the cradle-to-grave restoration process.

The IRP’s periodic newsletter, “IRP Cornerstones,” is a vehicle for public outreach to 285 diverse subscribers. Ms. Butler completely reinvented the newsletter and edits all content.

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*“...Ms. Butler...has demonstrated an encyclopedic knowledge of AF programs and procedures. Her grasp of budget issues has streamlined cleanup and allowed a productive interchange between the AF and the State.”*

*John Armstrong  
Remedial Project Manager  
Florida Department of Environmental Protection*

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To provide greater transparency, Ms. Butler previously designed several accessible management tools, including a publically-available on-line “electronic archive,” which currently contains over 4,100 document and correspondence items ([http://www.mission-support.com/45SW\\_IRP\\_EA](http://www.mission-support.com/45SW_IRP_EA)). Within the award period, this has been a positive Environmental Safety and Occupational Health Compliance Assessment Management Program (ESOH CAMP) finding and was reviewed by AFCEE as a potential AF model!

**Green Remediation**—Sustainability and climate change are priorities for the DoD. Ms. Butler has spearheaded many initiatives to reduce the carbon footprint of the IRP. Her focus on these

issues drives RPT decisions that address current climate concerns and result in significant savings and cost avoidance for generations to come.

Under Ms. Butler’s direction, the cleanup plan for the Wing’s final DNAPL site was modified to employ a safer, greener technology. Original plans specified in-situ alcohol flushing over a 2-acre area. Long-term operation raised issues for the new facility tenant, the National Reconnaissance Office, as well as fire and safety concerns.

Ms. Butler’s intervention led to a change in technology (VO/EZVI injection). The new approach addressed stakeholder concerns, resulted in a more energy efficient and less labor intensive effort, reduced initial treatment project cost by \$3.5M, and eliminated the \$400K annual energy expenditure for alcohol circulation.

In the arena of sustainable remediation, the aforementioned hydrologic treatment basins are the IRP’s current crown jewel, illustrating the commitment to innovation, teamwork, and sustainability. After years of intensive coordination with numerous stakeholders, Regina’s perseverance is reaping rewards for the Wing, the BRL and the war against climate change. Designed to control widespread groundwater contaminant plumes emanating from multiple solvent releases in the CCAFS industrial area, the basins replace energy-intensive equipment and provide vital protection to the BRL. Configured to act as an “interceptor trench,” the basins capture low-level residual solvents as groundwater transports them toward the BRL. Solar-powered aerators combined with phytotechnology eliminate the solvents and assure a long-lasting legacy of sustainable stewardship.

### **Conclusion**

Members of the 45SW take pride in the modern space program and their role in assuring access to the high frontier. As the leading member of the Wing Environmental Restoration Team, Ms. Butler works diligently and creatively to support that mission, while translating the AF legacy of vision, innovation, and responsibility into efficient and effective environmental restoration!