



## Aberdeen Proving Ground

### INTRODUCTION

Aberdeen Proving Ground (APG) is a key to the nation's defense and counter-terrorism efforts. As the center for Army planning and testing of weapons, missile, and communication systems, munitions, vehicles, and equipment, APG has state-of-the-art facilities to research, develop, test, and evaluate Army materiel. These facilities include laboratories, ranges, and test courses for wheeled and tracked vehicles. APG also hosts the National Guard and US Army Reserve operations and training.

APG is Harford County's largest employer with 21,000+ civilian, military, and contractor employees. The installation is home to 11 major commands and supports 90+ tenants, 20 satellite, and 17 private activities. APG contributes \$400M+ in payroll and \$500M in contracts annually. As a \$1 billion research and development installation, APG is an economic and technological resource for the region. APG partners with local governments to enhance the quality of life for the community by participating in meetings, mentoring, and outreach programs and is a

strategic partner in the Chesapeake Science and Security Corridor.

APG is located on the north-western shore of the Chesapeake Bay in Maryland. The Bush River divides the land portion of APG into two noncontiguous areas. The supporting communities just west of the installation boundary are the City of Aberdeen (15,000 residents) and the towns of Edgewood and Joppa (42,000 residents). APG covers 72,500+ acres, more than half of which is water or marshy, wooded terrain.

### BACKGROUND

APG's environmental restoration program (ERP) is part of garrison operations. The ERP's function is to work with tenants and garrison staff to support the Army mission while addressing environmental impacts from past practices.

In 1990, the Army and US Environmental Protection Agency (EPA) signed a Federal Facility Agreement to evaluate potential environmental impacts at APG. From the 254 original restoration sites, only 93 remain. Continued efforts to resolve the remaining sites have resulted in the completion of five records of decision (ROD), five remedial action completion reports (RACR), one interim RACR (IRACR), one time critical removal action (TCRA) and one explanation of significant differences (ESD) in FY11 and FY12.

Many of APG's remaining sites are the most complex and challenging due to the nature and extent of contamination, APG's location abutting the highly sensitive ecosystems of the Chesapeake Bay, and the many unique ordnance and chemical warfare





materials (CWM) tested and disposed at APG. The challenge is to find innovative technologies to reduce risk and restore the environment for reuse while demonstrating fiscal responsibility with minimal impact to ongoing mission activities.

The ERP is executed by a diverse, multi-disciplined and experienced six person team within the Garrison's Directorate of Public Works. The team consists of a program lead, four project officers and one intern.

Environmental Management System (EMS) principles are implemented as part of APG's program strategy to address high risk areas, streamline contract actions, integrate data from multiple sources, and maintain close professional and transparent communications with stakeholders.

Community involvement is encouraged and supported through APG's Restoration Advisory Board (RAB), which was established in 1995. The RAB has remained active for 17+ years, continues to be well attended, and has convened 14 times within the past 2 years. RAB feedback plays an integral part in APG's success. The Community Relations Plan was updated in 2011.

Community outreach efforts include site tours, advertising public meetings, publishing and mailing RAB meeting minutes and informational documents, representing the ERP at local community events, and using social media, the web, and document repositories to provide public access to environmental initiatives. APG partners with local governments to enhance the quality of life for the community by participating in meetings, mentoring, and outreach programs.

APG's ERP has implemented various initiatives including contract refinement, improved regulatory and stakeholder communications, green solutions, Proof of Concept for white phosphorous (WP) remediation, innovative treatment technologies, active soil management, and enhanced participation in the installation's planning process to support APG's complex and diverse missions.

## JUDGING CRITERIA



**Program Management**

**Orientation to Mission**

**Technical Merit**



**Transferability**

**Stakeholder Interaction**

**Program Impact**



### PROGRAM MANAGEMENT

In the past two years, APG's ERP has consistently worked to streamline the environmental process. Significant improvements include using EMS principles and refocusing on regulatory and stakeholder relationships.

By incorporating EMS principles, APG has integrated environmental restoration concerns and issues in the management process to maintain compliance, ensure mission sustainability, and to identify and mitigate environmental risks. Up front planning through the National Environmental Policy Act (NEPA), master planning, real property, and excavation permit programs, allowed ERP to identify health and ecological risks and mission restrictions early in the review process which allowed planners, managers, engineers, and workers to maximize safety, minimize risks, and reduce mission impacts.

To centralize and disseminate site specific data to garrison staff and other internal offices, the ERP Geographic Information System (GIS) layers were improved to include site restrictions, critical restoration information, and related decision documents. APG's Share-Point site was also created to provide post-wide access to environmental legacy documents. Improving GIS layers and centralizing environmental documents resulted in program sustainability.

The ERP has updated all required plans to include the Installation Action Plan (IAP), which is updated annually, and the Community Relations Plan (CRP) which was last updated in 2011.



Program milestones were met by implementing monthly meetings with contractors, participating in monthly Command program reviews, and initiating quarterly meetings with EPA. These efforts resulted in accelerated document review times and program goals being met.



Focusing on the future and commensurate with DoD's EMS principle of contract minimization, APG consolidated eight contracts into two Performance Based Acquisition (PBA) contracts, one PBA contract for a small and disadvantaged business and one PBA contract for a large business with a small business requirement. The recent consolidation in contracts has resulted in streamlined contracting; generation of 12+ small business jobs; and \$7M in cost savings.



## TECHNICAL MERIT:

APG's ERP used innovative techniques to achieve significant cost savings, expedited schedules, reutilization of resources, and reduced long-term management and remediation of significant acreage for reuse during the period of consideration. The program was effective in protecting, enhancing and restoring the environment as illustrated by the following examples:

- APG has completed 161 restoration sites with 93 remaining
- Working on reuse of groundwater treatment plant effluent for a boiler plant
- Reused excess soil from Base Realignment and Closure construction for remedial cover and fill material (36,685 tons of excess soil and cost savings of \$800K)
- 67 acres of previously restricted land made available for mission training and mitigation areas
- Expedited a Military Munitions Response Program (MMRP) site cleanup to keep a \$100M property development initiative on schedule, allowing reuse of 416 acres of compromised property
- Site characterization improvement was demonstrated using state-of-the-art interface probe technology to detail subsurface contamination



A significant difference from past environmental management practices/techniques is that EMS principles have been implemented. By planning and communicating with other installation organizations, risks to human health and the environment are minimized with little impact to mission.

To meet DoD goals and objectives, it is important to accelerate projects whenever possible. This was completed by enhanced partnering with regulators and the community to streamline the coordination and approval process necessary to accelerate cleanup. Frequent progress reviews with stakeholders allowed for the sharing of lessons learned and improved transfer of knowledge for a more efficient decision making process. Examples include:



- To expedite cleanup of a groundwater



Carbon Treatment Vessel

treatment plant that had reached a point of diminished contaminant reduction return, an innovative solution was selected. APG determined that chemical oxidation, achieved through excavation, and the application of sodium percarbonate would



accelerate the degradation of the remaining contaminants, achieve focused treatment, avoid pitfalls of dig and haul technologies, allow resource reuse, expedite site closure, save energy, and provide cost savings of \$300K.

- A TCRA was implemented to stabilize a landfill shoreline from erosion. This action will become part of the remedy and minimize human and ecological risks.
- A pilot study using electrical resistive heating technology was conducted to address a military unique contaminant. The process successfully accelerated contaminant degradation and will be further evaluated for selection as the final treatment technology.



**TM** Green innovative solutions are guiding principles in evaluating remedial technologies and are consistent with DoD, Army, and EPA guidance. Contract proposals including green innovative solutions are considered more favorably. The following examples demonstrate APG's commitment to recent green and innovative solution implementation:

- When WP was discovered during a remedial action, the total project cost increased from \$418K to \$4.5M. In close collaboration with federal and state regulatory agencies, an innovative solution for the treatment of the WP was successfully developed and accomplished in a "Proof of Concept" effort. The underlying principle is that WP will self ignite if heated to 29°C/85°F in a slightly moist environment. By crushing and exposing the soil surface area to oxygen and adequate heat, the WP would burn off. Uncrushed material (gravel) was also rendered safe by placing the material in a box and subjecting it to elevated temperatures supplemented from the sun's energy (as in a closed car on a hot day). Costly disposal options were avoided and material was made available for reuse. The revised total cost was \$729K, resulting in cost savings of \$3.8M.

- A disposal site with soil, groundwater, sediment, and surface water contamination compounded with the presence of buried ordnance and CWM was remediated. The feasibility study identified 4 potential alternatives ranging from \$4.6M - \$38M. Looking for a more viable, sustainable, and innovative solution, the Army worked with local, state, and federal entities to select a multi-faceted, innovative, and cost-effective approach that uses a wetland buffer, bio-beneficial sediment cover, permeable soil cover and groundwater bio-enhancement. Site characterization techniques were improved by looking at the individual impacts. This allowed the Army to address multiple hazards and sources of contaminants with a series of remedial components which were selected to work together to

**TM** minimize human and ecological risks. Wetlands were incorporated as a buffer and bio-beneficial sediment cover restored habitats and created conditions that are helping to break down or sequester chemicals. The permeable cover was designed to help break down most chemical warfare agents and reduce the explosive hazard risk. Groundwater bio-enhancement provided injection of a bacteria food source. The



naturally-occurring bacteria break down chemicals and lock metals into less soluble and toxic forms. A chitin-based carbon source (crushed crab shells) in the wetland buffer and sediment cover is controlling pH, providing nutrients for plants, and providing a long-term food source for bacteria that also helps break down contamination. The benefits include: avoiding costly/risky excavation and minimizing the risks of explosion or agent release; a "green" remediation alternative using natural materials and sustainable natural processes; remedial components working together; maximized utilization of materials on site; well-defined optimization, ramp down, and exit strategies; cost efficiency; and reopening of the site for training activities. The revised lifetime estimated cost is \$3M which provides a minimum of \$1M in cost savings and allows 57 acres of previously restricted land for mission training and testing. This project has been recognized in Army Environmental Command publications as an innovative and sustainable remedy and the strategy has been applauded by EPA and State regulators. Presentations have been published in scientific literature regarding the innovative use of chitin in the sediment cover.





“The remedial action at O-Field is a great example of employing common sense in dealing with chemical warfare disposal sites, taking advantage of containment and natural degradation of chemical agents and avoiding the high risks and high costs associated with excavation and ex-situ demil. The Army will be evaluating that approach for other similar disposal sites.”

*Jim Daniel  
(Chief, Cleanup and Munitions Response Division  
Army Environmental Command)*



APG is committed to future innovative programs and through the years has sponsored several Environmental Security Certification Technology Program (ESCTP) funded studies. Their innovative technology evaluations have provided valuable information for possible incorporation into remedies at APG, Army-wide / DoD-wide, and beyond. With over 200 acres of contaminated wetlands, APG supported two innovative studies for addressing contaminants resulting from past chemical production operations. The preliminary cost estimates to remediate the site exceeded \$30M. The innovative technology used the application of activated carbon in wetland sediment to absorb the contaminants thereby reducing risk to the benthic community. If this technology is proven, cost savings will be in the millions with little adverse impact to the environment.



## **ORIENTATION TO MISSION**

APG’s goal is to remain responsive and to be positioned to support military readiness and mission requirements while protecting the environment, embracing the reality that the earth’s resources, while essential to military operations, are a valuable commodity.



To ensure alignment with the mission, APG’s ERP directly involves those responsible for mission readiness on a routine basis by communicating significant activities, frequent briefings and high level involvement for mission critical actions. The key to APG’s ERP successful execution of mission and enhanced mission readiness has been frequent



communication early in the planning process and continued involvement of all stakeholders.

The following examples demonstrate ERP’s contributions to readiness by minimizing mission impacts and by restoring sites for reuse.

MMRP investigations were conducted to assess the risk of exposure to munitions, explosives of concern, and munitions constituents. APG faced many issues when sites were next to Headquarters, laboratories, administrative, and residential housing areas due to safety zone requirements. Commands expressed concerns on impacts to overseas operations and on-going experiments if buildings were evacuated during operational hours. To sustain mission readiness and minimize impact to Army mission, APG worked with Commands, the garrison, and Army residents to investigate on evenings, weekends and non-duty hours. The investigation was completed with very little impact to Army readiness.



Sixty seven more acres of previously contaminated land is available for mission training purposes as long as the training actions do not affect the ERP remedy. Additionally, 416 acres were made available for construction thru the MMRP. Because the available property for mission activities is at a premium, successful implementation was very much appreciated and directly supported the mission without sacrifice.

Mission actions are vetted through the NEPA review process. Restrictions involving the presence of existing contamination are identified and communication with the proponent begins immediately to revise proposed actions in a way that meets mission requirements and diminishes the chances of further harm to the environment. Frequent interaction has built strong working relationships among the tenants and garrison staff, and educates all parties which in turn builds cooperation and expedites the mission function.



The ERP’s integration of science and research contributions to the mission is evident by the significant financial and environmental benefits, and property reuse opportunities to support mission





 readiness in the following ways. The science based solution that evolved for a complex contaminated site where chemical and biological processes were key components of the remedy. This directly supported the mission by reopening the site for mission testing and training. Another example is the support of research studies which evaluated innovative technologies for the sequestration of contaminants. These have shown positive results that have direct and significant financial and environmental benefits to the Army mission.

## TRANSFERABILITY

 APG's ERP has successfully used four principles which are easily adaptable to other DoD and non-DoD organizations:

1. Apply EMS principles – Evaluates and streamlines the program process
2. Mutual Beneficial Opportunities – Looking for opportunities to reuse internal assets, i.e., reusing excess soil from construction activities for remediation projects
3. Streamline contracting efforts by consolidating contracts 
4. Employ green sustainable technology to reduce our impact to the environment

Transferring APG's ERP innovations has occurred through the Administrative Record, publications in scientific journals, program review meetings with stakeholders, and presentations at conferences and symposiums on new and upcoming technologies, i.e., "Proof of Concept" accomplished in the treatment of WP, the sequestration of contaminants using modified granulated activated carbon, and the use of bio-degradation of chitin as a tool for long-term remediation.  

## STAKEHOLDER INTERACTION:

 Interaction with the community, regulators, and non-government organizations continues to be vital to APG's success. Improvements in public education,

 in-house training and daily interactions allowed APG to build strong, solid working relationships.

The restoration team participated in annual public outreach programs to include Arbor Day, Earth Day and the Harford County Farm Fair by displaying educational materials, providing brochures and fact sheets and discussing the program to interested community members.

APG ERP conducted meetings with local county officials and non-government organizations to address traffic and safety concerns while conducting nearby potentially hazardous unexploded ordnance operations. Continued communications resulted in expedited operations with little impact to the community.

Partnering with the regulatory community resulted in innovative solutions such as the Proof of Concept for WP treatment and the multi-faceted green solution at a former Open Burn/Open Detonation and CWM disposal site. As a result of successful partnering, APG was also selected for a pilot DoD initiative to resolve reporting discrepancies to Congress. The pilot initiative was successful and Army-wide implementation is planned.  

Non-governmental organizations also played a part by conducting restoration research, and by sharing innovative technologies in public forums. 

The most active community outreach/partnering program is the RAB. Faced with pre-existing negative community opinions, APG worked diligently to restore trust and preserve the positive public opinion APG currently has with the community. The RAB is open to the public and members include local volunteers from the community, and local, state and federal representatives. RAB training consisted of educational briefings and remediation site tours. RAB member contributions were integral to APG's success by relaying public interests and concerns which played a significant role in the evolution of remediation solutions. RAB community members alleviated local citizen concerns at public meetings by sharing their knowledge and opinions on environmental programs at APG.



Education and outreach are a key component in characterizing ERP's performance. In-house training and workshops were developed to educate planners & workers on a programmatic level on issues such as land use controls and vapor intrusion and on specific environmental initiatives and impacts. Quarterly meetings are also conducted with tenant organizations and key public officials on current and pending environmental actions.

As part of the public outreach program, fact sheets and newsletters were developed and mailed to 2,000+ local residents and elected officials, and educational tours were conducted at various restoration sites.

To promote community access to information about attendance in public meetings, site tours and information regarding the ERP, APG advertises in newspapers, newsletters, community outreach events, the Community Program Survey, social media and the restoration web site.



Diseased Hybrid Poplar

The IAP provides the framework for mission longevity and monthly Army program reviews and CERCLA five year reviews are in place to track and improve future endeavors. A recent example is the Army's first phytoremediation study to determine if trees could capture and



treat shallow groundwater contamination. After 15 years, these trees are dying due to age and disease. To maintain the effectiveness of the treatment, APG has revised the strategy to utilize native species with greater longevity and to reduce potential impacts from disease and insects into the site specific Forest Management Plan. This plan will outlive the specific individuals responsible for the program and has been shared in a technical article written by EPA.



APG's aggressive and proactive approach in forging an open, strong, and lasting alliance with the community will long continue to provide benefits to the future of APG's ERP. The overall sense of community trust and respect accomplished through the RAB has spilled out into other APG programs and will long outlive the APG ERP. Likewise, successful innovative remedies developed and implemented by APG are having far reaching impacts that extend well beyond APG's boundaries.



## PROJECT IMPACT

With 36 years of restoration history, APG's challenge is to preserve and maintain document repositories, historical knowledge, and embrace emerging technologies while planning for a dwindling workforce.

Within the past two years, ERP has implemented several initiatives to ensure the preservation of APG's restoration history:

- Completed review of the document repository
- Centralized APG electronic documents by using SharePoint
- Consolidating and organizing historical documents in a building dedicated to APG's restoration program
- Improved environmental restoration layer in GIS

To ensure program continuity, APG staff conducts cross training to transfer site knowledge and past experience. APG's team approach provides both depth and flexibility.

"I have participated as a RAB member for more than 15 years and even with the turnover of Army leadership, APG continues to recognize the importance of community participation and I am confident this will continue in the future based on past history."  
*Christine Grochowski  
(RAB Community Co-chair)*