

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE					
2 - Applied Research		0602720A - Environmental Quality Technology					
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	19203	20076	16064	15766	15666	15722	15838
048 IND OPER POLL CTRL TEC	2920	2976	3038	3074	3097	3165	3237
835 MIL MED ENVIRON CRIT	3132	3246	3298	3307	3364	3415	3488
895 POLLUTION PREVENTION	4401	3703	4036	3790	3983	4071	4163
896 BASE FAC ENVIRON QUAL	6910	5779	5692	5595	5222	5071	4950
EM5 ENVIRONMENTAL QUALITY APPLIED RSCH - AMC (CA)		1192					
F35 Environmental Quality Applied Research (CA)	1840	3180					

A. Mission Description and Budget Item Justification: The objective of this applied research program element is to provide technologies that support the long-term sustainment of Army training and testing activities by improving the Army's ability to comply with requirements mandated by federal, state and local environmental/health laws and reducing the cost of this compliance. This program provides the Army with capabilities to decontaminate or neutralize Army-unique hazardous and toxic wastes at sites containing waste ammunition, explosives, heavy metals, propellants, smokes, chemical munitions, and other organic contaminants; as well as technology to avoid the potential for future hazardous waste problems, by reducing hazardous waste generation through process modification and control, materials recycling and substitution. This program develops technologies to predict and mitigate range and maneuver constraints associated with current and emerging weapon systems, doctrine, or regulations. Research is transitioned to PE 0603728A (Environmental Quality Technology Demonstrations). The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement, and supports the Army Strategy for the Environment. The U.S. Army Engineer Research and Development Center, headquartered at Vicksburg, Mississippi, the Center for Health Promotion and Preventive Medicine located at Aberdeen, Maryland, and the Army Research Laboratory located at Aberdeen, Maryland, execute the work.

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<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	19605	15809	15223
Current BES/President's Budget (FY 2009)	19203	20076	16064
Total Adjustments	-402	4267	841
Congressional Program Reductions		-133	
Congressional Rescissions			
Congressional Increases		4400	
Reprogrammings	-36		
SBIR/STTR Transfer	-366		
Adjustments to Budget Years			841

Three FY08 congressional adds totaling \$4400 were added to this PE.

(\$1200) Propelling Agent for Slurry Gel
 (\$1600) Biowaste to Bioenergy: Phase Two
 (\$1600) Vanadium Technology Program

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BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602720A - Environmental Quality Technology					PROJECT 048	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
048 IND OPER POLL CTRL TEC	2920	2976	3038	3074	3097	3165	3237	

A. Mission Description and Budget Item Justification: The objective of this applied research project is to provide technologies to enable the Army to reduce or eliminate environmental impacts both in the United States and abroad. These technologies reduce the impact of legal and regulatory environmental restrictions on installation facilities, training and testing lands and ranges, as well as avoid fines and facility shutdowns within the United States and reduce environmental impacts to the warfighter abroad. New and innovative technologies are essential for the effective control and reduction of military unique hazardous and non-hazardous wastes on military installations worldwide. Efforts include a focus on the impacts of new materiel that will enter the Army inventory within the next decade and beyond. This project focuses on industrial pollution sources from production facilities, facility contamination, and other waste streams providing compliance through sustainable environmental protection technologies. Efforts abroad include a focus on technologies to provide deployed forces with environmentally safe and cost effective technologies and/or processes to achieve maximum diversion, minimization, or volume reduction of basecamp/field waste. Additional work is focused on environmental risk assessment for ranges. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. The U.S. Army Engineer Research and Development Center, headquartered at Vicksburg, Mississippi, executes the project work.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Industrial Compliance and Pollution Prevention Readiness: In FY07, maximized adhesive and agglomerative properties of cellulosic component and transferred polymer component to reduce barrier/fortification requirements. Developed reductive treatment/transformation studies for Dinitro Anisole (DNAN) and Methyl Nitro para Aniline (MNA), and conducted structural activity analysis to predict fate and treatment effectiveness. Developed improved physics-based algorithms for blast and small arm noises through comprehensive measurements and application of non-linear wave steepening and time/frequency modeling. In FY08, complete development of a Structural Activity Relationship (SAR) Predictive Model for insensitive munitions treatment kinetics and research chemical/physical characteristics of fugitive industrial particulates. In FY09, will conduct research in chemical/physical characteristics of fugitive industrial particulates and develop new sensing modalities using mimicked human physiological responses to detect acutely toxic substances in water.	2920	2935	3038
Small Business Innovative Research/Small Business Technology Transfer Programs		41	
Total	2920	2976	3038

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602720A - Environmental Quality Technology					PROJECT 835	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
835 MIL MED ENVIRON CRIT	3132	3246	3298	3307	3364	3415	3488

A. Mission Description and Budget Item Justification: The objective of this applied research project is to provide quantitative means to determine the environmental and human health effects resulting from exposure to explosives, propellants, and smokes produced in Army industrial, field, and battlefield operations or disposed of through past activities. The end results of this research are determinations of acceptable residual Munitions Constituents (MCs) and Munitions and Explosives of Concern (MECs) contaminant concentration levels that minimize adverse effects on the environment and human health. This research is supported by the previously developed Army Risk Assessment and Modeling System (ARAMS) that links models and databases of expected result and transport to the exposure and effects of explosives and their degradation by-products. The Long-Term Monitoring program reduces or eliminates the costly and lengthy operation of off-site analyses and enhances overall monitoring capabilities by providing continuous/autonomous detection/analysis. The program of Characterization/Assessment of Distributed Source MCs on ranges yields knowledge and technologies to quantify MC transport and fate (what substances become through assimilation, chemical reactions and decay) in terrestrial range environments. New research in toxicogenomics, nanomaterial technologies, and computational/molecular modeling tools for toxicity and exposure assessment further reduces the uncertainty associated with both the probability of exposure and the ultimate effect if exposed. Interim products are U.S. Environmental Protection Agency approved health advisories and criteria documents to be used in risk assessment procedures. The Army uses these criteria during negotiations with regulatory officials to set scientifically and economically appropriate cleanup and discharge limits at Army installations. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. The U.S. Army Engineer Research and Development Center, headquartered at Vicksburg, Mississippi, manages execution of the project work.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
In FY07, identified novel contaminant detection systems and measurement protocols for near-real-time, on-site long term monitoring (LTM) for MCs, integrated a distributed source contaminant transport model into the ARAMS, and further refined computational biology virtual simulations. In FY08, design a laboratory-scale gene signature array microchip sensor, evaluate field negative ion miniature mass spectrometry for detection of MCs, define statistically valid range characterization/sampling protocols for MC sources, construct a toxicogenomic assessment framework as a modeling platform, identify methods for computational chemistry prediction of effects of water dissolved explosives, and identify analytical approaches to characterize nanomaterial properties to support toxicological and remediation approaches. In FY09, will evaluate LTM in situ biosensor technologies for direct push wells (installed by pushing or hammering the drive rods as opposed to drilling or augering), finalize protocols for MC residue reduction, complete mathematical modeling of toxicity and effects due to existing, well characterized MECs and devise computational chemistry methods for the prediction of reactivity and toxicity of explosives and decomposition products dissolved in water. Will identify exposure quantification metrics for select representative nanomaterials. Will explore a common framework to consolidate tools for comprehensive, multi-stressor range environmental risk assessments.	3132	3171	3298
Small Business Innovative Research/Small Business Technology Transfer Programs		75	
Total	3132	3246	3298

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602720A - Environmental Quality Technology					PROJECT 895	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
895 POLLUTION PREVENTION	4401	3703	4036	3790	3983	4071	4163

A. Mission Description and Budget Item Justification: The goal of this project is to provide energetics/munitions technologies required to reduce/eliminate the environmental footprint resulting from the manufacture, maintenance, use and surveillance of Army ordnance. This program matures revolutionary technologies to eliminate or significantly reduce the environmental impacts that threaten the sustainment of energetics production and maintenance facilities and training ranges. The project supports the transformation of the Army by ensuring that advanced energetic materials required for the Future Force high-performance munitions (gun, rocket, missile propulsion systems, and warhead explosives) are devised to meet weapons lethality/survivability stretch goals in parallel with, and in compliance to, foreseeable sustainment requirements. Specific technology thrusts include environmentally-benign designer energetic molecules engineered by molecular modeling and simulation using Department of Defense (DoD) High-Performance Computing resources; novel energetics that capitalize on the unique behavior of nano-scale structures; chemically engineered explosive and propellant formulations produced with minimal environmental waste, long-storage lifetime, rapid/benign environmental degradation properties, and efficient extraction and reuse; and fuses, pyrotechnics, and initiators that are free from toxic chemicals. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement, and supports the Army Strategy for the Environment. Work in this project is performed by the Research, Development, and Engineering Command's (RDECOM) Army Research Laboratory (ARL), Aberdeen, MD, in collaboration with the Armaments Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, NJ, the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL, and the Edgewood Chemical Biological Center (ECBC), Edgewood, MD.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Rocket and Missile Propellants: In FY07, characterized decomposition products and environmental properties of new propellants. In FY08, model performance of propellant-engine combinations. In FY09, will optimize and evaluate performance of propellants in new engine. Conventional Ammunition: In FY07, synthesized and evaluated five new low-toxicity explosives in gram-scale and scaled-up synthesis of select materials for performance and environmental evaluation. In FY08, refine green chemistry synthesis procedures and perform full chemical and physical characteristic evaluation of new explosives. In FY09, will model performance of new environmentally benign explosives in weapons systems. Pyrotechnics: In FY07, evaluated environmental characteristics, performance, and compatibility of pyrotechnic candidates. In FY08, optimize low-toxicity smoke formulations. In FY09, will investigate environmentally sustainable simulators, flares, delays, and signals.	4401	3599	4036
Small Business Innovative Research/Small Business Technology Transfer Programs		104	
Total	4401	3703	4036

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BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602720A - Environmental Quality Technology					PROJECT 896	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
896 BASE FAC ENVIRON QUAL	6910	5779	5692	5595	5222	5071	4950	

A. Mission Description and Budget Item Justification: The objective of this applied research project is to provide environmental risk assessment, analysis, monitoring, modeling, and mitigation technologies to support sustainable use of the Army's facilities, training lands, firing ranges, and airspace to reduce or eliminate environmental constraints to military missions. This project provides the Army the technical capability to manage, protect, and improve the biophysical characteristics of training and testing areas needed for realistic ranges and training lands to accommodate the Current and Future Force. Technologies within this project enable users to match mission events and training schedules with the resource capabilities of specific land areas and understand how the use of those resources effect mission support and environmental compliance. The project provides advanced methods and technologies to restore lands damaged during training activities, allow sustained use of installation facilities and training land resources and maintain readiness by use of improved threatened and endangered species monitoring technology to fully utilize training lands. The project also provides tools and technologies to avoid training restrictions and costs due to training and testing noise. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement, and supports the Army Strategy for the Environment. The US Army Engineer Research and Development Center, headquartered at Vicksburg, Mississippi, executes the project work.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Threatened and Endangered Species (TES) Management to Reduce Operational Constraints: In FY07, completed new techniques for preparation of population goals on Army lands to ensure the Army was responsible for its fair share of species recovery. Completed groundwork in improving species at risk detection capability. In FY08, complete projects identifying effects of noise and physiological stress of transient training activities on the Indiana bat and gopher tortoise, conduct research in support of a Candidate Conservation Agreement for gopher tortoise, and enhanced Light Detection and Ranging (LIDAR) applications for habitat assessment. Completion of projects reduces potential constraints on military training associated with the Indiana Bat Recovery Plan currently in revision and under Army review and a possible Endangered Species Act listing petition for the gopher tortoise. In FY09, will evolve research from reactive, single species research applications for currently listed species to a multi-species approach for improved detection of species at risk and predictive synthesis models for effects of military disturbance on species at risk. This will assist the Army in reducing the number of future listed species and their associated constraints on military training.	3000	3077	2949
Predictive Risk Assessment and Management for Army Ranges and Training Lands: In FY07, completed initial groundwork for studies on impacts of discrete noise on ranges to meet new regulatory requirements and matured Army Training and Testing Area Carrying Capacity (ATTACC) protocols to incorporate non-military land and natural resource stressors. In FY08, begin developing and evaluating strategies to mitigate high priority invasive species impact on training, and the cumulative interaction of training activities and multiple use on natural resources. In FY09, will complete initial algorithms for weather and nonlinear effects on sound propagation for determining discrete noise impacts and describing variance in noise level decay with distance.	3910	2702	2743
Total	6910	5779	5692