Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army											Date: February 2016	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603728A *I Environmental Quality Technology Demonstrations*							
COST ($ in Millions)	**Prior Years**	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
Total Program Element	-	11.311	14.727	11.137	-	11.137	10.382	10.570	10.773	10.989	-	-
002: *Environmental Compliance Technology*	-	3.122	3.278	3.262	-	3.262	2.190	2.336	2.431	2.480	-	-
025: *Pollution Prevention Technology*	-	0.000	1.489	1.489	-	1.489	1.488	1.489	1.489	1.519	-	-
03E: *Environmental Restoration Technology*	-	5.939	5.960	6.386	-	6.386	6.704	6.745	6.853	6.990	-	-
03F: *Environmental Quality Tech Demonstrations (CA)*	-	2.250	4.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates technologies that assist the Army in becoming environmentally compliant and limiting future liability without compromising readiness or training assets critical to the success of the future force. Project 002 demonstrates tools and methods for compliance with environmental laws relevant to conservation of natural and cultural resources while providing a flexible realistic training environment for mission activities. Project 025 demonstrates pollution prevention tools and methods to minimize the Army's use and generation of toxic chemicals and hazardous wastes. Project 03E focuses on maturation and demonstration of technologies for advanced life cycle analysis, advanced sensing, and advanced remediation of Army-unique toxic or hazardous materials. This program demonstrates technological feasibility and transitions mature technologies from the laboratory to the user. Technologies matured and demonstrated by this program element improve the ability of the Army to achieve environmental restoration and compliance at its installations, at active or inactive ranges and other training lands, and in modernization programs. Technologies demonstrated focus on reducing current and future environmental liability costs.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

This program is fully coordinated and complementary to PE 0602720A (Environmental Quality Technology).

Work in this PE is performed by the Army Engineer Research and Development Center, Vicksburg, MS, and the US Army Research, Development, and Engineering Command, Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army	Date: February 2016
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603728A *I Environmental Quality Technology Demonstrations*

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	11.445	10.727	11.137	-	11.137
Current President's Budget	11.311	14.727	11.137	-	11.137
Total Adjustments	-0.134	4.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	4.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.134	-			

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Project: 03F: *Environmental Quality Tech Demonstrations (CA)*		
Congressional Add: *Program Increase*	2.250	4.000
Congressional Add Subtotals for Project: 03F	2.250	4.000
Congressional Add Totals for all Projects	2.250	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 002 / *Environmental Compliance Technology*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
002: *Environmental Compliance Technology*	-	3.122	3.278	3.262	-	3.262	2.190	2.336	2.431	2.480	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies transitioned from Program Element (PE) 0602720A (Environmental Quality Technology), Projects 048 and 896, that assist Army installations and operations in achieving environmental compliance. Army facilities are subject to fines and facility shutdowns for violation of federal, state, and local environmental regulations. Efforts under this project enable the Army to reduce environmental constraints at installations while complying with the myriad of federal, state, local, and host country environmental regulations and policy. Current and planned efforts enable the Army to efficiently characterize, assess, and sustain training and testing capacity; power and water management in contingency operations and on installations; and noise mitigation and management. Technologies demonstrated aim to reduce the cost of resolving compliance issues for the Army, avoid reductions in availability of training facilities, and sustain the viability of testing and training ranges as well as protect the critical resources, i.e., land, air, and waters of the Army.

Work in this project supports the Army Science and Technology Innovation Enablers (formerly Enduring Technologies) Portfolio.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy, and supports the Army Strategy for the Environment.

Work in this project is performed by the Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Sustainable Ranges and Lands	3.122	0.303	0.909
Description: This effort provides ecosystem vulnerability assessment and ecosystem analysis, monitoring, modeling and mitigation technologies to support sustainable, unconstrained, realistic access and use of the Army's ranges and lands. This effort demonstrates environmentally safe and cost effective technologies to manage and reduce the increase in noise and pollution concerns associated with training ranges.			
FY 2015 Accomplishments: Developed and evaluated gray water treatment and reuse system (G-WTRS) designed to reduce water demand and sustainment cost at 600-3000 personnel contingency operating bases; performed pilot scale testing of G-WTRS prototype; conducted baseline flow, water quality, energy consumption, and maintenance testing; optimized G-WTRS design and operation based on pilot scale testing for maximal performance and energy efficiency; facilitated Army Evaluation Center certification of G-WTRS; matured an intuitive integrated planning, design, and analysis model that addresses power, water, waste, and protection related design and resource requirements for contingency bases ranging in size from 50-2000 population; validated standalone models for power,			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 002 / *Environmental Compliance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
water, waste (solid, sanitary, and hazardous), and protection; matured characterization and forecasting capabilities to assess multi-scale ecological response to compliance mandated altered fire regimes and the consequences for accessible, sustainable, and realistic military training lands. ***FY 2016 Plans:*** Mature and validate the design for a robust, operationally-efficient gray water reuse system that can reduce water demand at Contingency Operating Bases (COBs) of 600-3000 Pax capacity that will result in US Army Public Health Command and US Army Test and Evaluation Command safety and performance approval for fully integrated grey water reuse system for contingency bases. ***FY 2017 Plans:*** Will exploit assessment methodologies that quantify the adaptive capacity of social-ecological systems to understand potential climate change drivers on the continental United Stated (CONUS) and outside of the continental United States (OCONUS) installation security, resilience, and sustainability.			
Title: Adaptive & Resilient Installations ***Description:*** This effort demonstrates sustainable, cost efficient and effective facilities while providing technologies and techniques for achieving resilient and sustainable installation and base operations. Demonstrates the applicability of using automated adaptive construction techniques to impact manpower and materials necessary for contingency construction through the maturation of a prototype additive construction system utilizing cementitious materials. ***FY 2016 Plans:*** Integrate contingency base planning, design, operations, and management modeling tools that link with the Joint Construction Management System (JCMS) to provide a single system for all Services to plan and execute construction in support of the Joint Force. Assess the cementitious material requirements and characteristics required for automated additive construction that will be assessed utilizing a rudimentary pre development prototype system. ***FY 2017 Plans:*** Will complete software validations and transition contingency base planning modeling tools to the Army Facilities Components System and to the Joint Construction Management System. Will demonstrate an automated construction capability to print a custom-designed 500 square foot expeditionary structure within 24 hours that will reduce operational logistics demands and improve energy efficiency.	-	2.975	2.353
Accomplishments/Planned Programs Subtotals	3.122	3.278	3.262

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 002 / *Environmental Compliance Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 025 / *Pollution Prevention Technology*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
025: *Pollution Prevention Technology*	-	0.000	1.489	1.489	-	1.489	1.488	1.489	1.489	1.519	-	-

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This Project matures and demonstrates pollution prevention advanced technologies required for sustainable operation of Army weapon systems, to include compliance with regulations mandated by federal, state, and local environmental and health laws. Technology thrusts under this project include demonstration of advanced technologies to enable sustainment of propellant, explosive and pyrotechnic production and maintenance facilities and training ranges through elimination or significant reduction of environmental impacts. These technologies will ensure that advanced energetic materials required for future force's high performance munitions are developed that meet weapons lethality and survivability goals and that are compliant with environmental and health laws. Technology thrusts also include demonstration of more sustainable technologies for surface finishing processes, paints and coatings, cleaning solvents, refrigerants and fire suppressants.

Work in this Project supports the Army Science and Technology Innovation Enablers (formerly Enduring Technologies) Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering science and technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

The Project is fully coordinated and complementary to Program Element (PE) 0602720A, Project 895. This Project transitions technologies developed under that PE.

Work in this Project is performed by the Research, Development, and Engineering Command Army Research Laboratory, Aberdeen Proving Ground, MD, the Armaments Research, Development, and Engineering Center, Picatinny Arsenal, NJ, the Aviation and Missile Research, Development, and Engineering Center, Redstone Arsenal, AL, and the Tank Automotive Research, Development and Engineering Center, Warren, MI in conjunction with the Army Public Health Command, Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Pollution Prevention Technology	-	1.489	1.489
Description: This effort demonstrates pollution prevention advanced technologies required to sustain operation of Army weapons systems to comply with state, federal, and local environmental and health laws and regulations.			
FY 2016 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 025 / *Pollution Prevention Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Conventional Ammunition: qualify lead-free primary explosive from full-scale production lot; Pyrotechnics: Conduct prototype testing for chromate- and lead-free gasless delay formulations in a relevant end item; Toxic Metal Reduction: Conduct firing tests for large caliber gun barrel with hexavalent chromium-free liner. ***FY 2017 Plans:*** Will formulate environmentally sustainable high explosive compositions from kilogram-scale batches of novel energetic materials; will demonstrate non-chromate sealers for use in depot-level maintenance processes; will evaluate commercially available refrigerants with low global warming potential against military-unique flammability and toxicity requirements.			
Accomplishments/Planned Programs Subtotals	-	1.489	1.489

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 03E / *Environmental Restoration Technology*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
03E: *Environmental Restoration Technology*	-	5.939	5.960	6.386	-	6.386	6.704	6.745	6.853	6.990	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies transitioned from Program Element (PE) 0602720A (Environmental Quality Technology), Projects 835 and 896 by addressing the management and mitigation of materials and chemicals released to the natural environment and the residual environmental effects of military training and operations. The emphasis of this effort includes remediation of legacy materials, e.g., traditional explosives energetics, and unexploded ordinance; management of new materials, e.g., nanomaterials and emerging contaminants; and mitigation of residual impacts from implementation of sustainable technologies and processes. Technologies matured within this project enable the Army to cost effectively address current and future environmental liabilities resulting from the use of militarily relevant materials and chemicals in the environment. Current and planned efforts enable the Army to efficiently characterize, assess, and remediate soil and water at installations, ranges, facilities, and during operations under changing weather and climatic conditions. Efforts also identify ways to economically comply with the myriad of federal, state, and host country regulations dealing with contaminated soil and water. A key aspect of this work is the enhancement of risk assessment and life cycle analysis techniques that can more accurately predict and identify the environmental liabilities associated with fielding new systems and technologies. This program includes pilot scale field studies to demonstrate technological feasibility and optimize performance and productivity of the risk mitigation techniques.

Work in this Project supports the Army Science and Technology Innovation Enablers (formerly Enduring Technologies) Portfolio.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

Work in this Project is performed by the Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Sustainable Ordnance Mitigation and Management	1.264	1.300	-
Description: This effort develops real time detection and discrimination methodologies for unique and emerging non-metallic unexploded ordinance (UXO).			
FY 2015 Accomplishments: Developed electromagnetic induction algorithms for detection and discrimination of emerging non-metallic intermediate electrically conductive materials-based munitions, and models and algorithms applicable to difficult sensing environments.			
FY 2016 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 03E / *Environmental Restoration Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Validate algorithms for the detection and discrimination of intermediate electrically conductive material (IECM) munitions; and conduct field evaluations of electromagnetic induction (EMI) sensor systems on test ranges with the capability to detect non-metallic IECM munitions.			
Title: Hazard Assessment for Military Materials ***Description:*** This effort demonstrates tools to assess hazard and risk of Army-unique chemicals and materials. The tools provide for rapid environmental baseline survey reporting and screening assessments of existing and future militarily relevant compounds and allow for improved predictive risk assessment and provide environmental life cycle assessment capability. ***FY 2015 Accomplishments:*** Integrated a suite of environmental quality sensors with analytical capabilities to provide environmental guidance and data visualization associated with environmental monitoring in Army operations in theater; developed rapid hazard screening tools for new Army compounds. ***FY 2016 Plans:*** Mature sensor technologies (e.g. biological sensors, geochemical sensors, and petroleum kit additions) for rapid and reliable data collection, providing real time screening for contamination within an operational environment. ***FY 2017 Plans:*** Will mature environmental lifecycle tool for use in developing new materials. Will demonstrate sensor technologies that are field-rugged and long-lasting for accurate assessment of contaminant presence in complex operating environments. Will provide algorithms for sensor systems to auto-populate Environmental Baseline forms as required by the Engineer Field Manual.	1.008	1.100	2.090
Title: Technologies for Sustainable and Green Operations and Acquisition ***Description:*** This effort exploits and matures technologies to control contaminant transport in environmental media on Army lands and mission spaces as well as assesses and demonstrates novel detection, remediation, and mitigation capabilities for existing and emerging contaminants. ***FY 2015 Accomplishments:*** Developed cost-effective, efficient, and integrative tools for remediation of contaminated wastewater from insensitive munitions production. Tools are transitioned under technology transition agreement with the Project Director Joint Services for next generation Army ammunition Industrial Base Insensitive Munitions (IM) Wastewater Treatment technologies. ***FY 2016 Plans:***	1.893	2.089	1.908

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 03E / *Environmental Restoration Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Validate computational tools to predict the physical and chemical properties and toxicity of insensitive munitions to assess hazard potentials and health effects of insensitive munitions. Mature predictive models and computational tools to assess surface water characterization and contaminate potential in austere environments. ***FY 2017 Plans:*** Will validate novel treatment approaches with reactive membrane materials and mature an operational prototype effluent treatment system that will minimize water demand and minimize decontaminated waste.			
Title: Risk Prediction and Decision Technologies ***Description:*** This effort matures and provides integrated science and technology solutions to Army environmental challenges with a focus on predicting the environmental attributes of emerging chemicals and materials, predictions that inform acquisition lifecycle models in order to minimize impacts to the mission and to the Soldier. ***FY 2015 Accomplishments:*** Developed and demonstrated appropriate data, scenarios, and processes necessary for conducting the life cycle analysis of the antimony (Sb) containing small arms formulations, and for new insensitive munitions formulations, IMX 101 and 104. Economic life cycle assessments provide scientifically defensible approaches for determining environment risk, and increase confidence in anticipating product impact with respect to environmental regulatory requirements when fielding. ***FY 2016 Plans:*** Mature experimental protocols and characterization factors in new small arms formulations for environmental risk determination; mature and demonstrate software for interpreting life cycle impact assessment calculations using decision support tools. ***FY 2017 Plans:*** Will begin demonstration of fate and transport models of contaminant movement and persistence in the environment using a novel soils informatics approach. Will begin expansion of the environmental lifecycle assessment methodology beyond new materials to weapons system approaches.	1.774	1.471	2.388
Accomplishments/Planned Programs Subtotals	5.939	5.960	6.386

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 03E / *Environmental Restoration Technology*

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army												Date: February 2016
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*				Project (Number/Name) 03F / *Environmental Quality Tech Demonstrations (CA)*			
COST ($ in Millions)	**Prior Years**	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
03F: *Environmental Quality Tech Demonstrations (CA)*	-	2.250	4.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This is a Congressional Interest Item.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016
Congressional Add: Program Increase	2.250	4.000
FY 2015 Accomplishments: Program increase. Developed knowledge and tools that inform regulatory, liability risk, and management decisions related to the development and transition of advanced materials including engineered nanomaterials.		
FY 2016 Plans: Program increase.		
Congressional Adds Subtotals	2.250	4.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A