RECORD OF DECISION FOR

SOUTHERN OPERATIONAL RANGE ASSESSMENT PROGRAM AREA RDX

Contract Number W912DY-10-D-0025

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U.S. ARMY GARRISON

FORT JACKSON

COLUMBIA, SOUTH CAROLINA

Final

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	constituent of concern
COPC	constituent of potential concern
DGR	Dynamic Groundwater Recirculation
Focused Area	area located south of Fort Jackson's Southern Operational Range Assessment Program Area and south and east of Weston Lake
FS	Feasibility Study
ft	foot/feet
gpm	gallon per minute
HAL	health advisory level
HHRA	human health risk assessment
HMX	1,3,5,7-tetranitro-1,3,5,7-tetrazocine; also known as High Melting Explosive
JV	PIKA-Pirnie JV, LLC
LUC	Land Use Control
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and Maintenance
PAL	Project Action Level
PP	Proposed Plan
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-trinitro-1,3,5-triazinane; also known as Royal Demolition Explosive or Research Department Explosive

RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SCARNG	South Carolina Army National Guard
SCDHEC	South Carolina Department of Health and Environmental Control
Southern ORA Area	Southern Operational Range Assessment Program Area
TNT	trinitrotoluene
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profile

PART 1: DECLARATION

The United States (U.S.) Army has prepared this Record of Decision (ROD) to address the environmental impacts of 1,3,5-trinitro-1,3,5-triazinane (RDX; also known as Royal Demolition Explosive or Research Department Explosive) resulting from past site operations at the U.S. Army Garrison Fort Jackson's Southern Operational Range Assessment Program Area (Southern ORA Area), south and east of Weston Lake Area in Columbia, South Carolina.

1.1 SITE NAME AND LOCATION

Fort Jackson, which includes the McCrady Training Center, is a military installation located in the eastern section of Columbia, South Carolina, in Richland County, and occupies approximately 51,316 acres (**Figure 1**). The Southern ORA Area is in the south-central area of the combined installations, south and east of Weston Lake as shown on **Figure 2**.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the Selected Remedy for the residences located south of the Southern ORA Area in the Focus Area (**Figure 2**). The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The U.S. Army, as owner/operator and the lead agency (terms that are defined in the NCP), issues this decision based upon the Administrative Record for the site. The State of South Carolina, represented by the South Carolina Department of Health and Environmental Control (SCDHEC), acts in a support role, providing primary regulatory oversight.

1.3 ASSESSMENT OF THE SITE

The Remedial Action (RA) selected in this ROD is necessary to protect the public health or welfare and the environment from actual or threatened releases of pollutants or contaminants from the site due to the presence of RDX in groundwater. Several field investigations have been conducted at Fort Jackson since the discovery of the RDX to characterize the nature and extent of contamination on and off site.

RDX was used extensively as a propellant for artillery shells and as an explosive in projectiles. Based on the timing of RDX prevalence in munitions used by ground forces, only ranges and training areas at Fort Jackson in use after 1950 are considered likely to have supported training with munitions containing significant quantities of RDX. According to the 2015 Archives Search Report, known or suspected historical munitions used at Fort Jackson that include RDX high-explosive charges are hand grenades, rifle grenades, rockets, mortars, artillery (howitzers and guns), and recoilless rifles (U.S. Army Corps of Engineers [USACE] St. Louis District 2015).

Based on the Remedial Investigation (RI; PIKA-Pirnie JV, LLC [JV] 2020), Kasserine Pass Range was identified as the likely historical source of RDX for the area located south of the Southern ORA Area and south and east of Weston Lake (Focused Area). Other explosive compounds were detected during the RI activities, including 1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX; also known as High Melting Explosive) and trinitrotoluene (TNT) breakdown products. Production-grade RDX generally contains significant amounts

(approximately 10%) of HMX (United States Environmental Protection Agency [USEPA] 2014). HMX is also used as a propellant and an explosive. Therefore, HMX can be present as an impurity of RDX or from munitions manufactured that use HMX as an explosive or propellant. However, HMX and TNT are not considered constituents of potential concern (COPCs) as their concentrations are below their respective USEPA Regional Screening Levels (RSLs) (USEPA 2022).

As discussed in Section 2.7 (Summary of Site Risks), risk assessments performed as part of the RI (JV 2020) determined that there are no unacceptable risks to human health at the Southern ORA Area due to soil, sediment, or surface water. One constituent of concern (COC) was identified in groundwater, RDX, which may pose a health hazard to off-post residents through ingestion.

RAs are required at the off-post residential wells to prevent human exposure to RDX. The U.S. Army is currently monitoring off-post residential wells, including private drinking water wells and public water systems, and providing an interim remedial measure in the form of point-of-use water treatment systems.

1.4 DESCRIPTION OF THE SELECTED REMEDIAL ALTERNATIVE

The Selected Remedy for the Focused Area uses the Dynamic Groundwater Recirculation (DGR) remediation technique to treat the groundwater throughout the RDX plume on and off-post. The DGR design to achieve remedial goals will require 15 extraction wells and 30 injection wells operating at a total rate of 150 gallons per minute (gpm) for an estimated 10 years. Prior to full-scale DGR system design, a pilot study will be implemented to determine the efficacy of remediation using site-specific conditions. The pilot study will provide site data (e.g., groundwater yield, injectability, and radius of influence data) for the design of the full-scale DGR system.

In addition to DGR, the following will continue to be implemented: Operation and Maintenance (O&M) and sampling of point-of-use treatment systems, the off-post residential well monitoring program for private drinking water wells and public water systems, on-post land use controls (LUCs), site-wide monitoring well sampling, and off-post annual notification letters and well surveys.

The current O&M will continue for the 10 interim remedial measure point-of-use treatment systems installed at the nine private drinking water wells and one public water system. These point-of-use treatment systems mitigate human health exposure to RDX in groundwater. O&M of these systems includes continuous operation, monthly inspections, semi-annual sampling, and repairs and maintenance as needed. The treated water from these systems is being used for non-potable and potable purposes.

The annual/semi-annual off-post residential well sampling program for private drinking water wells and public water systems in the Focused Area to monitor downgradient RDX groundwater contamination from Kasserine Pass Range will also continue. The groundwater monitoring program includes the annual sampling of approximately 75 wells (additional wells may be added if warranted). Annual notification letters will be sent to off-post residents and property owners within the area impacted by RDX concentrations greater than the RSL of 0.97 microgram per liter (µg/L) for as long as groundwater in the plume is above the preliminary remedial goal of 2.0 µg/L. Annual notification letters will notify property owners and residents of the RDX in groundwater, request permission to monitor existing potable wells, and request notification to the U.S. Army of newly installed wells. When the remedial goal is met, notifications will be terminated. Annual well surveys will be conducted in the area with RDX concentrations greater than the RSL to identify the presence of new wells. Semi-annual sampling will occur at a private drinking water well or public water system if RDX is detected at concentrations greater than the RSL during the annual sampling event.

The Selected Remedy will also include sampling of up to 20 groundwater monitoring wells: MW-OP-03, MW-OP-02, MW-OP-01S/D, MW-OP-04, MW-OP-05S/D, MW-07S/D, MW-08S/D, MW-09S/D, MW-10S/D,

MW-11S/D, MW-KP-16, MW-KP-17, and MW-KP-18. LUCs for on-post portions of the site will be applicable to the installation's planning process.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment and is compliant with federal, state, and applicable or relevant and appropriate requirements (ARARs). Based on information currently available, the lead agency believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the potential RAs with respect to the balancing and modifying criteria. The U.S. Army expects the Selected Remedy to satisfy the following statutory requirements of CERCLA 121(b): (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost effective, (4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of the pollutants or contaminants as a principal element through treatment).

CERCLA requires that a five-year review of remedial actions be conducted for all sites where a ROD allows hazardous substances, pollutants, or contaminants to remain in place above levels that allow for unlimited use or unrestricted exposure (UU/UE) to those hazardous substances, pollutants, or contaminants. A review is also required for a site if the remedial action will result in UU/UE but will not achieve it within five years. Because this remedy will result in pollutants or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure for the immediate future, an initial five year review is required no later than five years from the start of remedial action construction. Subsequent five-year reviews are triggered from the original due date of the previous five year review, rather than the signature date.

1.6 RECORD OF DECISION DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Section 2) of this ROD. This decision is based on information that can be found in the Administrative Record file for the Southern ORA Area.

Inset 1. Certification Checklist

COCs and their respective concentrations	Section 2.5.5, Section 2.8, **Figure 5**
Baseline risk represented by the COPCs	Section 2.7
Cleanup levels established for COCs and the basis for these levels	Section 2.7 and **Inset 2**
Ways in which source materials constituting principal threats are addressed	Section 2.13
Current and reasonably anticipated future land and groundwater use assumptions used in the baseline risk assessment and the ROD	Section 2.6
Potential land and groundwater use that will be available at the site as a result of the Selected Remedy	Section 2.14.4
Estimated capital, annual O&M costs, and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected	**Appendix A**
Key factors that led to selecting the remedy	Sections 2.13 and 2.14

1.7 AUTHORIZING SIGNATURE

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DREW C. WHITE
Director, Installation Services
Office of the Deputy Chief of Staff, G-9

DATE

PART 2: DECISION SUMMARY

This decision summary provides an overview of the general characteristics of Fort Jackson and site-specific characteristics for the Southern ORA Area (RDX plume site). In addition, it describes the remedial alternatives evaluated for the Southern ORA Area and a comparative analysis of those alternatives. The section concludes with the identification of the Selected Remedy for the Southern ORA Area and the statutory determinations supporting the Selected Remedy. This decision summary incorporates the content recommended in A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (USEPA 1999).

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Fort Jackson, which includes McCrady Training Center, occupies approximately 51,315.28 acres in Richland County, South Carolina (**Figure 1**). The South Carolina Army National Guard (SCARNG) holds a non-exclusive license for training operations on approximately 15,267 acres of the eastern portion of Fort Jackson. These 15,267 acres comprise the McCrady Training Center. The U.S. Army Range Inventory Database-Geodatabase (U.S. Army Environmental Command [USAEC] 2006a) identified 104 operational range areas at Fort Jackson encompassing a total of 29,475 acres. The operational areas support a variety of range uses, including live-fire weapons training, heavy and light maneuver exercises, dudded and non-dudded impact areas, and specialty training courses. The U.S. Army Range Inventory Database-Geodatabase (USAEC 2006b) for McCrady Training Center identified 62 operational ranges encompassing 14,895 acres. These ranges support live-fire weapons training and heavy and light maneuver exercises.

The Southern ORA Area is located in the south-central area of the combined installations. A site location map is provided on **Figure 2**.

The Southern ORA Area is not on the National Priorities List. The U.S. Army is the lead agency for environmental investigations and RAs, including developing and preparing this ROD.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Fort Jackson was established in 1917 as an infantry training center (then known as Camp Jackson). The installation was inactive from 1921 to 1925. In 1925, the War Department decided to use the post again as a training camp for the SCARNG. From 1925 to 1939, the state controlled the site and used it as an encampment and training area for SCARNG troops. During World War II, Fort Jackson became a permanent military installation used primarily for infantry training. Additional property was acquired on the eastern and northern sides of the installation until the acreage reached approximately 51,315.28 acres. In 1943, the land for McCrady Training Center, formerly referred to as Leesburg Training Center, was licensed to the SCARNG by the Department of the Army.

2.2.1 Southern ORA Area Background

RDX was used extensively as a propellant for artillery shells and as an explosive in projectiles. Based on the timing of RDX prevalence in munitions used by ground forces, only ranges and training areas at Fort Jackson in use after 1950 are considered likely to have supported training with munitions containing significant quantities of RDX. According to the 2015 Archives Search Report, known or suspected historical munitions used at Fort Jackson that include RDX high-explosive charges are hand grenades, rifle grenades, rockets, mortars, artillery (howitzers and guns), and recoilless rifles (USACE St. Louis District 2015).

The Southern ORA Area was investigated as part of the Operational Range Phase II Assessment completed in January 2014 (JV 2014a, 2014b). This assessment identified RDX concentrations in groundwater samples that exceeded the applicable Project Action Level (PAL) of 0.61 µg/L. The PAL used during Operational Range Assessment for RDX is a USEPA Integrated Risk Information System screening value and not an enforceable federal standard. Subsequent investigations downgradient of the operational ranges, which were completed from January 2014 to 2016 by JV, USACE, and Alion, confirmed the presence of RDX concentrations that were greater than the PAL in groundwater near Fort Jackson's southern boundary, as well as in off-post residential wells. RDX was also detected in groundwater samples collected from monitoring wells installed surrounding the Remagen Hand Grenade Range.

Based on the RI (JV 2020), Kasserine Pass Range was identified as the likely historical source of RDX for the Southern ORA Area. Other explosive compounds were detected during the RI activities: HMX and TNT breakdown products. Production-grade RDX generally contains significant amounts (approximately 10%) of HMX (USEPA 2014). HMX is also used as a propellant and an explosive. Therefore, HMX can be present as an impurity of RDX or from munitions manufactured that use HMX as an explosive or propellant. However, HMX and TNT are not considered COPCs as they are below their respective USEPA RSLs. RDX was determined to be the only COPC.

2.2.2 Enforcement Activities

No formal enforcement activities have occurred at the Southern ORA Area.

2.3 COMMUNITY PARTICIPATION

The U.S. Army made the Proposed Plan (PP) for the Southern ORA Area (JV 2023) and other relevant documents in the Administrative Record file available for public review for interested parties to gain an understanding of the site and the proposed cleanup actions. A copy of the PP, as well as the entire Administrative Record file, is located at the Richland Library Main, 1431 Assembly Street, Columbia, South Carolina.

NCP §300.430(f)(3)(i) requires the lead agency to do the following after preparation of the PP and review by the support agency:

- Publish a notice of availability and brief analysis of the PP in a major local newspaper.
- Make the PP and supporting analysis and information available in the Administrative Record file.
- Provide a reasonable opportunity, not less than 30 calendar days, for submission of written and oral comments on the PP and the material contained in the Administrative Record file.
- Provide the opportunity for a public meeting to be held during the public comment period.
- Keep a transcript of the public meeting held during the public comment period and make such a transcript available to the public.
- Prepare a written summary of significant comments, criticisms, and new relevant information submitted during the public comment period and the lead agency response to each issue. This summary (i.e., the Responsiveness Summary) must be available with the ROD.

The requirements of NCP §300.430(f)(3)(i) were met as described here. The PP (JV 2023) was made available to the public on May 1, 2023. It can be found in the Administrative Record file and the information repository, along with the RI report (JV 2020) and Feasibility Study (FS) report (JV 2021). Notices of availability of the Administrative Record file documents were published in Columbia Star and Fort Jackson

Leader newspapers on April 28, 2023 and May 4, 2023, respectively. The PP was also posted online at https://home.army.mil/jackson/application/files/1216/8234/7284/RDX_Proposed_Plan.pdf.

A public comment period was held from May 8, 2023, to June 7, 2023, and a public meeting was held on May 11, 2023, to present the PP to the community. Public comments received during the public comment period and expressed during the public meeting are described in the Responsiveness Summary (Section 3). No revisions were made to the PP following the public comment period.

Additional community outreach has occurred over the course of the investigations at the Southern ORA Area. In November 2013, Fort Jackson held a media roundtable, including television, radio, and newspaper staff, and Public Meeting #1 to discuss RDX detections. During that meeting the U.S. Army asked residents living near the southern boundary for permission to sample their wells. Additional meetings occurred as the investigations took place to keep the public informed regarding results and upcoming work. Public Meeting #2 was held in February 2014. Public Meeting #3 was held in June 2014. Public Meeting #4 was held on February 4, 2015. A letter was mailed to all residents in the area on December 1, 2016, informing them of upcoming RI work, including off-post work that would occur in public rights-of-way and cause lane closures.

Public Meeting #5 was held on November 12, 2019, after the conclusion of the RI and during the FS. It was a station style open house where community members could visit the following stations and speak with experts:

- Welcome Station—Presented by Barbara Williams, Chief Fort Jackson Environmental Division;
- Station 1: Fort Jackson & RDX: A Brief History—Presented by JV Federal Program Manager Patrick Shirley and Mark Albe, JV Account Leader;
- Station 2: Historical Missions of Fort Jackson—Presented by Henry Howe, Fort Jackson Museum, and Chan Funk, Fort Jackson Cultural Resources Program Manager;
- Station 3: Results from the Remedial Investigation: Soil & Groundwater Sampling—Presented by Kathleen Hamrick, JV Principal Scientist and Project Manager;
- Station 4: Groundwater: Residential Sampling & Treatment—Presented by Allen Evans, Senior Environmental Engineer in charge of treatment systems;
- Station 5: RDX & Your Health—Presented by Fort Jackson Head of Preventative Medicine, COL Paul Kwon (medical doctor and engineer) and CPT Dixon Irizarry, Environmental Health Chief;
- Station 6: The Path Forward—Presented by JV Senior Engineer, Peter Campbell, lead designer of the Selected Remedy; and
- Station 7: Remagen Range: Protecting Groundwater—Presented by Brooke Petery and Jacob Lalley, Research Engineers with the US Army Engineer Research Development Center.

In addition, the Fort Jackson Garrison Commander, Public Affairs Office staff, and Environmental Division staff, USACE—Huntsville Center Contracting Officers Representative and Technical Manager, and personnel from the U.S. Army Public Health Center attended the meeting and engaged with the attendees. Andrea Clark from the U.S. Army Public Health Center led training for all presenters prior to the meeting.

Station 6 included descriptions of all the alternative presented in the FS report (JV 2021), including the Selected Remedy presented in the PP (JV 2023) and this ROD. During the meeting, several residents expressed displeasure with Alternative 3—Connect 13 Affected Residences to the City Water Supply and Monitoring, as some residents do not want to be on the city water supply.

In addition to public meetings, Fort Jackson maintains a website with updates to the project at: https://home.army.mil/jackson/index.php/about/Garrison/directorate-public-works/ORAP. It includes a link to the posters from Public Meeting #6.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Most sites at Fort Jackson are under the jurisdiction of the Fort Jackson Resource Conservation and Recovery Act (RCRA) Hazardous Waste Permit #SC3 210 020 449 (Fort Jackson 2020); however, the Southern ORA Area is not subject to RCRA because RDX is not a listed or characteristic hazardous constituent under federal RCRA or under South Carolina state law (i.e., RDX is not a RCRA hazardous constituent listed in 40 Code of Federal Regulations [CFR] Part 261 Appendix VIII). In addition, military munitions were used on the Fort Jackson Active Range for their intended purpose thereby negating their classification as hazardous waste. The U.S. Army has moved expeditiously to address impacts to off-site residential drinking water wells under the Department of Defense's CERCLA authorities as authorized under Executive Order 12580. Under CERCLA and Executive Order 12580, the U.S. Army has the authority to respond to contamination due to U.S. Army activities that comes to be located beyond the installation boundary. As such, the U.S. Army's response under its CERCLA authorities will strive for protection of human health and the environment while providing coordination with SCDHEC and community participation.

The Selected Remedy presented in this ROD reflects the final remedy for the Southern ORA Area. This ROD provides a summary of the remedial alternatives considered for the Southern ORA Area and selects Alternative 4—Dynamic Groundwater Recirculation with Operation of Point-of-Use Treatment Systems and Monitoring.

The Selected Remedy will include installation and implementation of the DGR remediation technique to treat the groundwater throughout the RDX plume on and off-post. The extraction wells will be focused on the central, higher-concentration portion of the plume to maximize the mass flux removal, and the injection wells will be placed to hydraulically contain the plume, enhance pore flushing, and alleviate potential hydraulic stagnation points that may develop between wells. The Selected Remedy was chosen based on its ability to protect human health and the environment and to effectively address the environmental impacts posed by RDX in groundwater at the Southern ORA Area. The components of the Selected Remedy are discussed in further detail in Section 2.11.4.

2.5 SITE CHARACTERISTICS

This section provides an overview of the site characteristics affecting selection of the Selected Remedy at Fort Jackson, including the nature and extent of contamination, which allows assessment of the potential exposure pathways to contamination. Additional details are provided in the RI report (JV 2020).

2.5.1 Topography

The majority of Fort Jackson and McCrady Training Center are characterized by gentle to moderately rolling, moderately dissected high plains. These high plains are interrupted by the nearly flat alluvial plains of Gills, Cedar, and Colonels Creeks, and their tributaries, and an irregularly distributed, gently sloping, low relief area in the central portion of the installation near the headwaters of Cedar Creek. Local relief in the high plains is 200 to 250 feet (ft). The lowest elevation in the high plains is 200 ft above mean sea level adjacent to the alluvial plain of Colonels Creek in the eastern portion of the installation. Upper valleys of

Mill and Cedar Creeks occupy low plains along the southern boundary of Fort Jackson. Local relief in the low plains is generally less than 40 ft, and slopes are usually less than 3% (Gene Stout & Associates 2004).

2.5.2 Regional Geology

The installation lies on the northwestern edge of the Coastal Plain physiographic province, a region of low to moderate relief and gently rolling plains known as the Sand Hills. The installation sits directly on the unnamed sediments of Tertiary age and the upper Coastal Plain portion of the Cretaceous aged Middendorf Formation (Kite 1988; Speiran and Aucott 1994; Aucott 1996).

The majority of the installation sits directly on the Middendorf Formation, with Tertiary age sediments locally capping uplands in the southern half of the installation. The Middendorf Formation (also referred to as the Tuscaloosa Formation) consists of deltaic deposits of light-colored sands and kaolin clays. It thickens considerably to the southeast, sitting on top of crystalline bedrock that dips to the southeast at approximately 25 ft per mile. The thickness of the unconsolidated sediments varies considerably across the installation depending on distance from the fall line and the local topography. The total thickness of unconsolidated sediments of the Tertiary units and Middendorf Formation vary from approximately 300 ft in the northwestern portion of the installation to approximately 500 ft in the southwestern corner of the installation (JV 2014a).

2.5.3 Surface Hydrology

There are 26 lakes, ponds, and impoundments at Fort Jackson and McCrady Training Center. These water bodies range in size from 0.5 to 173 acres; however, most are less than 35 acres. The largest lake, Weston Lake, is north of Leesburg Road, east of the cantonment area. The lake has a surface area of about 173 acres and accounts for more than one-third of the total impounded surface acreage for the installation. Weston Lake is also the installation's primary waterside recreation lake, with camping facilities, picnic shelters, a community house, a beach pavilion, and a swimming area (Gene Stout & Associates 2004).

Fort Jackson and McCrady Training Center are located within the Santee River Basin and the Congaree River sub-basin. All creeks and streams leaving Fort Jackson and McCrady Training Center eventually flow into either the Wateree River or the Congaree River. These rivers meet about 16 miles southeast of Fort Jackson and McCrady Training Center, where they form the Santee River, the principal river of the region. (Gene Stout & Associates 2004).

The Southern ORA Area at Fort Jackson encompasses two watersheds drained by Colonels and Cedar Creeks, described below.

Colonels Creek Watershed

The headwaters of Colonels Creek originate at Fort Jackson and McCrady Training Center. This is a predominantly wooded watershed. Colonels Creek drains the northern and eastern portion of the installation, including areas north of the East Impact Area and the operational area licensed to the SCARNG McCrady Training Center, and flows southeast, leaving the installation near the McCrady cantonment area. It continues to the Wateree River, a tributary of the Congaree River.

Cedar Creek Watershed

Cedar Creek drains the majority of a large dudded impact area and flows southward through the Weston Lake Recreation Area, eventually entering the Congaree River.

2.5.4 Groundwater Hydrogeology

The aquifer system in the region is described as stratified, consisting of shallow, intermediate, and deep groundwater flow systems (Aucott 1996). The shallow and intermediate flow systems are expected to follow topography and drainage patterns, ultimately discharging to local streams and rivers. Because of the proximity of the installation to the Fall Line dividing the Piedmont and Coastal Plain geologic provinces, the deeper Cape Fear aquifer and shallower Black Creek aquifer are absent. Where present within the region, deep groundwater flow systems discharge to regional discharge points. The Congaree and Wateree Rivers to the south and east of the installation, respectively, have been identified as regional discharge points for the deep component of the groundwater system in Richland County.

Two types of aquifers are encountered in the region:

- Sedimentary aquifer: Groundwater flow within the Middendorf aquifer near the installation would be considered shallow and potentially intermediate when viewed from a regional perspective. The Middendorf aquifer is entirely coincident with the Middendorf Formation. The Middendorf aquifer constitutes the primary aquifer used as a groundwater supply in the area with half of the residential wells being less than 100 ft deep. The majority of the residential wells directly south of the installation are screened at an elevation of 175 ft above mean sea level or higher within the Middendorf aquifer.
- Bedrock aquifers: Residential wells located several miles north of the installation extract groundwater from bedrock aquifers. Very few supply wells on the installation or residential wells directly south of the installation extract groundwater from the bedrock aquifers because of the great depths to bedrock (and associated cost of well installation) (JV 2020).

2.5.5 Nature and Extent of Environmental Impacts

Field investigations conducted at the Southern ORA Area during the RI (JV 2020) focused on determination of the RDX plume source and delineation of the RDX plume, and the RI included the installation of permanent groundwater monitoring wells to assess the distribution of RDX. It also included vertical aquifer profile (VAP) soil and grab groundwater sampling, groundwater monitoring well installation, site-wide groundwater monitoring well network sampling, surface and subsurface soil sampling, and an instrument-aided visual survey to locate surficial RDX-containing munitions and explosives of concern. The nature and extent of other explosive compounds were also investigated.

Results of these investigations were deemed sufficient to identify COPCs, delineate their nature and extent, complete a baseline human health risk assessment (HHRA), and develop appropriate remedial alternatives.

The following subsections present narrative discussions of the nature and extent of environmental impacts at the Southern ORA Area. Additional detail is provided in the RI report (JV 2020).

2.5.5.1 Soil

Soil sampling at the Kasserine Pass Range (RDX source area) determined RDX and other explosive compounds to be present in surface soil, but not at significant concentrations.

Two rounds of soil sampling were conducted on the eastern Kasserine Pass Range area (upgradient of the RDX detections identified in groundwater along the range perimeter), as well as near surface munitions debris piles observed during the January 2017 instrument-aided visual walkover survey in the northern part of the range. The soil sampling locations were based on perimeter VAP transect groundwater results and

locations of munitions constituents and munitions and explosives of concern observed during unexploded ordnance avoidance activities and the instrument-aided visual walkover survey.

The first round of soil borings (34 total) were drilled to a maximum depth of 30 ft below ground surface (bgs), and several soil samples were collected at each location. RDX was detected in soil from the 1 ft depth interval located within the north-eastern corner of the Kasserine Pass Range as well as outside the Kasserine Pass Range boundary. Additionally, HMX was also detected in two soil borings.

The second round of soil sampling consisted of 48 soil samples collected from December 2017 to February 2018, which included confirmation sampling of the previous soil analytical results found during the first round of sampling and 20 discrete surface soil samples collected near 3.5-inch rockets (unexploded ordnance and low-ordered detonations). In addition, 20 incremental soil sampling units were defined and sampled (**Figure 3**). An additional five soil borings were advanced to depths of 26 to 57.5 ft bgs to assess deeper soils. RDX was only detected in surface soil at one incremental soil sampling unit, where 2,4-dinitrotoluene and nitroglycerin were also detected. HMX was detected in several samples and 2-nitrotoluene was detected in one discrete soil sample.

2.5.5.2 Groundwater

Waterloo Aquifer Profiling System® and VAP groundwater samples collected along stratigraphic flux transects, located downgradient of Kasserine Pass Range, identified preferential zones of contaminant migration and areas of RDX mass flux. The locations of the stratigraphic flux borings downgradient of Kasserine Pass Range are shown on **Figure 4**. Borings were advanced to the lower confining clay (approximately 120 to 180 ft bgs), and VAP groundwater samples were collected from between 4 and 11 intervals at each location. Along the stratigraphic flux transect downgradient of Kasserine Pass Range, RDX was detected at three groundwater sampling intervals in stratigraphic flux boring SB-SF-10, located south-southeast of the Kasserine Pass Range. One RDX detection of 2.5 µg/L in SB-SF-10 exceeded the USEPA Tapwater RSL of 0.97 µg/L. Additionally, several VAP samples located along the stratigraphic flux transect yielded detections of RDX below the RSL. The stratigraphic flux results downgradient of Kasserine Pass Range demonstrate that RDX mass flux is focused across a small cross-sectional area of the aquifer, downgradient of the eastern portion of the Kasserine Pass Range.

Source area investigations at Kasserine Pass Range consisted of upgradient and downgradient perimeter VAP soil borings. A transect, consisting of seven VAP soil borings, was completed along the downgradient perimeter of the Kasserine Pass Range. Additionally, VAP soil borings were completed at two locations upgradient of Kasserine Pass Range to confirm that no upgradient sources were contributing to the RDX plume. RDX was not detected at the VAP borings completed north and upgradient of Kasserine Pass Range, indicating the upgradient areas are also not a significant source of RDX. Downgradient VAP borings yielded RDX concentrations exceeding the RSL of 0.97 µg/L, the highest of which was 5.7 µg/L. HMX was detected in groundwater at two locations at the western end of the perimeter VAP transect. The concentrations of HMX detected in these samples were below the USEPA RSL of 1,000 µg/L, ranging from 1.6 to 2.1 µg/L.

To delineate off-post RDX concentrations downgradient of Kasserine Pass Range, a VAP transect consisting of seven VAP borings, was completed along Roberts and Harmon Roads, south of the Weston Lake area. In addition, one on-post VAP boring and five off-post VAP soil borings were advanced to provide delineation east and west of residential well RDX detections as well as characterization and confirmation of RDX detections along the core of the projected RDX plume. The concentrations of RDX detected in off-post VAP samples along the core of the plume ranged from 0.76 to 1.3 µg/L, with most exceeding the RSL

of 0.97 µg/L. HMX was also detected in one VAP soil boring at concentrations of 0.57 J to 0.73 J[1] µg/L, well below the RSL of 1,000 µg/L. Two other compounds, related to TNT degradation, were detected in one off-post VAP sample: 2-nitrotoluene and 3-nitrotyrosine were detected at concentrations of 0.84 JN[2] and 2.5 µg/L respectively, exceeding their respective RSLs of 0.31 and 1.7 µg/L.

On-post and off-post monitoring wells were installed adjacent to or in VAP borings to provide data for risk assessment and fate and transport analyses, and to serve as long-term monitoring wells for plume stability assessment. The locations of the monitoring wells (pre-existing locations and locations of wells installed during RI activities) are shown on **Figure 5**. Two site-wide Southern ORA Area groundwater sampling events were completed following the installation of the monitoring wells. The site-wide sampling events included sampling of 41 existing wells associated with the Southern ORA Area as well as 13 new monitoring wells.

RDX was detected in a total of seven on-post monitoring wells and two off-post monitoring wells during the site-wide groundwater sampling events. RDX concentrations detected along the core of the plume ranged from 0.46 J to 5.8 µg/L, with detections exceeding the USEPA Tapwater RSL of 0.97 µg/L. Residential wells within the core of the plume also had detections over the RSL. HMX was detected in a total of three monitoring wells, two on site and one off-post. Detections of HMX in all three monitoring wells were consistent during both events and ranged from 0.86 to 1.5 µg/L, well below the RSL of 1,000 µg/L. TNT breakdown products were not detected in monitoring wells included in the site-wide groundwater sampling event because of local variations in preferential transport pathways and the differences between the longer screened intervals in monitoring wells compared to the shorter intervals used for VAP groundwater sampling.

Based on detections of RDX in residential wells (within the plume shown on **Figure 5**), Fort Jackson began an annual residential well sampling program. In November 2015, Alion conducted full-scale groundwater sampling of 25 private drinking water wells that provide potable water to off-post residences to confirm they comply with human health and environmental standards including explosives (nitroaromatics and nitramines), select metals, general chemistry, pH, and volatile organic compounds migrating off-post from Fort Jackson (Alion, 2016). The 2014 to 2015 residential sampling events confirmed that four wells supplying groundwater to residences contained RDX concentrations greater than the lifetime health advisory level (HAL) and posed health hazards to the human receptors consuming it. Sampling continues annually at 75 to 100 residential wells.

A total of 10 point-of-use treatment systems were installed between December 2014 and July 2018 at wells that currently, or historically, contained RDX in excess of the USEPA lifetime HAL of 2.0 µg/L. These include nine private drinking water wells serving one residence each and one public water system serving four residences (total of 13 affected residences) located south of the Fort Jackson installation boundary, along Davis Road and Old Leesburg Road. The systems remove the RDX in the water (to non-detect levels) and adjust the pH to acceptable levels.

2.5.5.3 Fate and Transport of Contaminants

Generally, the majority of groundwater and contaminant transport occurs in the most permeable segments of the aquifer matrix, such as sand and gravel (i.e., transport zones). These zones will typically account for

[1] Laboratory qualifier J = Estimated result less than the limit of quantitation and greater than the detection limit.
[2] Laboratory qualifier N = Recovery is out of criteria.

greater than 90% of the groundwater flow and mass flux (JV 2020). Less permeable segments, like fine sand and silt or clayey sediments, are dominated by slow advection or, in the case of clays and clay mixes, may represent mass storage zones where diffusion is dominant. Because diffusion is time-dependent, soil near release locations often contains significant mass in the slow advection and storage zones, whereas at the leading edge of the plume, the mass will be present almost wholly within the transport zones. For mature plumes with constituents such as RDX (high solubilities and limited soil interaction), the mass has likely been stored in the low-permeability segments encountered along the length of the plume as well. In this case, the mass stored along the plume trajectory can behave as the source long after the original source area is depleted because of diffusion from the storage zones back to the transport zones along the trajectory of the plume (i.e., back diffusion). Sorption of dissolved RDX onto the soil results in slowing (retardation) of the contaminant relative to the groundwater flow velocity and a reduction in dissolved concentrations of a contaminant.

The RDX distribution and groundwater elevation contour maps show flow toward Cedar Creek to the southwest. Along the core of the RDX plume, groundwater velocity is estimated to range between 25 and 300 ft per year, with the highest velocities located in the deeper soil off the installation. Groundwater is likely in contact with surface water and potentially discharges to a portion of Cedar Creek. However, because of vertical and horizontal distances from the core of the plume to the creek and the low concentration of RDX in groundwater prior to the creek (below RSL), RDX that discharges to the creek would likely be at concentrations less than the RSL. Also, if any RDX is present in the groundwater that discharges to surface water, it quickly attenuates because of rapid degradation by photolysis in the surface water and sediments.

2.5.5.4 Other Areas of Interest

RDX was observed sporadically in the groundwater downgradient of Inchon Range at concentrations less than the RSL. These low concentrations and sporadic distribution indicate that Inchon Range is not an ongoing source of RDX. RDX was not detected north and upgradient of Inchon Range.

The groundwater flow direction at the Remagen Hand Grenade Range was identified as northerly and, therefore, is not contributing to the RDX plume off the installation to the south. The sampling results confirmed RDX contamination at the Remagen Hand Grenade Range and downgradient migration of groundwater on the installation to the north. Four of the five VAP groundwater sampling events at the Remagen Hand Grenade Range produced one or more groundwater samples containing RDX at concentrations exceeding the RSL of 0.97 µg/L (ranging from 1.0 J to 9.5 µg/L). All three shallow monitoring wells located downgradient (north) of the Remagen Hand Grenade Range and within the active operational training area also had groundwater RDX detections exceeding the RSL (concentrations ranging from 1.4 to 2.6 µg/L). RDX was also detected in REM-MW-03S located upgradient (at 12 µg/L). RDX was detected at depths varying from 60 to 120 ft bgs. Note that current use of RDX is ongoing at the Remagen Hand Grenade Range as part of basic training and mission readiness operations. The area is being treated with hydrated lime periodically in accordance with accepted best management practices for demolition ranges to help break down RDX and prevent migration to groundwater (JV 2016).

2.6 CURRENT AND POTENTIAL FUTURE LAND USE

Current users of the Southern ORA Area include Fort Jackson and McCrady Training Center personnel and contractors, recreational users of Weston Lake, and off-post residents; however, users that may be exposed to soil on the active ranges were not evaluated as part of the RI (JV 2020). Future land use activities will remain similar to the current, with industrial/military activities on-post and residential activities off-post.

Well logs obtained from Fort Jackson and SCDHEC show that residences south of the Southern ORA Area obtain drinking water from the shallow Middendorf aquifer. In addition, several wells are used to supply recreational facilities at Weston Lake. Well logs are not available for all the off-post residential wells. However, available well logs suggest a wide range of construction, ranging from shallower wells installed less than 60 ft below grade in lower elevation areas to wells greater than 200 ft below grade in the higher elevation areas. The residential well screen construction varies, but screens are typically 10 ft or greater in length.

2.7 SUMMARY OF SITE RISKS

RDX is present in groundwater at the Southern ORA Area and associated constituents were detected during the RI field activities. The RI report (JV 2020) presents an HHRA that evaluates the potential risks from exposure to the COPCs. COPCs that may present potentially unacceptable risks to future human receptors were evaluated to identify COCs for this site. An ecological risk assessment was not completed as there was not a complete exposure pathway for ecological receptors.

As presented in the RI report (JV 2020), the HHRA was completed to evaluate the potential cancer risks and non-cancer hazards to human health posed by health-based COPCs present at the Southern ORA Area. The HHRA was developed in accordance with the guidance outlined in the USEPA's Risk Assessment Guidance for Superfund: Volume 1 (2001) and Supplemental Guidance to Risk Assessment Guidance for Superfund (2000) and is provided in its entirety as an appendix to the RI report. The risk assessment only calculated risk for human exposure to groundwater, as resident ingestion of groundwater is the only complete exposure pathway.

For known or suspected carcinogens, the NCP established that acceptable exposure levels are generally concentration levels that represent an incremental upper-bound lifetime cancer risk in the range from $1x10^{-4}$ (i.e., 1E-04 or 1 in 10,000) to $1x10^{-6}$ (i.e., 1E-06 or 1 in 1,000,000) or less (USEPA 1990). However, $1x10^{-6}$ is used as the individual carcinogenic risk contribution considered significant for determining site-specific remedial goals following USEPA Region 4 guidance (2018). Additionally, SCDHEC uses a cancer risk of $1x10^{-6}$ in determining water quality standards. The cancer risks estimated for each exposure scenario are therefore compared to a $1x10^{-6}$ target cancer risk. Non-cancer hazard drivers are chemicals that contribute significantly to a total receptor target organ hazard index that exceeds 1 (JV 2020).

As presented in the RI report (JV 2020), the hazard index for resident exposure to tap water via ingestion and dermal contact, 0.05, is less than the USEPA acceptable non-cancer hazard quotient of 1, which indicates that adverse non-cancer health effects are unlikely. The estimated cancer risk for resident exposure to tap water via ingestion and dermal contact, $4x10^{-6}$ or 4E-06, is greater than the SCDHEC acceptable risk level used to set water quality standards as well as greater than the USEPA Region 4 individual carcinogenic risk contribution considered significant (i.e., $1x10^{-6}$). As such, RDX is considered a COC for which remedial alternatives are needed (JV 2020).

2.8 IDENTIFICATION OF CONSTITUENTS OF CONCERN

During the HHRA, COPCs were identified for the sampled environmental media (groundwater) based on a comparison of the maximum detected concentration to the human health risk-based screening level. The screening levels used for COPC identification in the HHRA were the USEPA RSLs for tap water, which are based on a target cancer risk of 1×10^{-6} (i.e., one-in-a-million excess lifetime cancer risk) or a non-cancer hazard quotient of 0.1. RDX was the only constituent detected at concentrations greater than the RSL, which for RDX is based on cancer risk, and it was selected as a COPC for further evaluation in the HHRA.

RSLs are generic screening values, not de facto cleanup standards. Once the HHRA was completed, a site-specific risk-based remediation goal was derived using the HHRA results, which is discussed in further detail in Section 2.10.

2.9 BASIS FOR ACTION

A statutory goal of the Defense Environmental Restoration Program is for the U.S. Army to take appropriate response actions to investigate and, where necessary, address releases of hazardous substances or pollutants and contaminants (U.S. Army 2004). The U.S. Army is required to select remedies that attain a degree of cleanup that assures protection of human health and the environment.

The Selected Remedy will control and mitigate the COC (RDX), which was identified in groundwater and poses an unacceptable cancer hazard to current and future off-post residents through the ingestion of potable water from private or municipal wells.

2.10 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are developed based on the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 (d)(2) of CERCLA. The RAOs for the Southern ORA Area have been developed in such a way that attainment of these goals will result in the protection of human health and the environment.

As indicated in the NCP, the USEPA expects the return of usable groundwater "to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site" (40 CFR 300.430(a)(1)(iii)(F)). Furthermore, the NCP states that "Maximum Contaminant Level Goals (MCLGs) that are set above zero…shall be attained by remedial actions for ground or surface waters that are current or potential sources of drinking water, where the MCLGs are relevant and appropriate…If an MCLG is determined not to be relevant and appropriate, the corresponding MCL shall be attained…" (40 CFR 300.430(3)(B) and (C)). A preliminary remedial goal of 2.0 µg/L was derived using the results of the HHRA.

The RAOs for Fort Jackson include the following:

- *Primary RAO*—To prevent contact with and ingestion of groundwater with RDX concentrations exceeding the HAL of 2.0 µg/L. The exposure area containing average RDX concentrations above the exposure limit of 2.0 µg/L includes nine individual private drinking water wells and one public water system at the 13 affected residences located within the Focused Area downgradient of Kasserine Pass Range.
- *Secondary RAO*—To monitor RDX concentrations in residential wells to the preliminary remedial goal of 2.0 µg/L.

The RSL of 0.97 µg/L is used as a trigger to increase residential well sampling frequency to semi-annual in order to more closely monitor wells near the HAL.

Thus, the overall RAO for the Selected Remedy is to achieve the remedial goals shown in **Inset 2** in the most effective, implementable, and cost-effective manner.

Inset 2. Remedial Goals for Groundwater Constituents of Concern

Groundwater COCs	Remedial Goal (µg/L)
RDX	2

2.11 DESCRIPTION OF REMEDIAL ALTERNATIVES

Four remedial alternatives were developed in the FS (JV 2021) for the Southern ORA Area. They are as follows:

- **Alternative 1**—No Action;
- **Alternative 2**—Operation of Point-of-Use Treatment Systems and Monitoring;
- **Alternative 3**—Connect 13 Affected Residences to the City Water Supply and Monitoring; and
- **Alternative 4**—Dynamic Groundwater Recirculation with Operation of Point-of-Use Treatment Systems and Monitoring.

The following subsections present a description of the remedial alternatives developed in the FS (JV 2021).

2.11.1 Alternative 1

Estimated Capital Cost:	$45,460
Estimated O&M (cost over 30 years):	$0
Estimated Present Worth Cost:	**$45,460**

Under Alternative 1, no corrective action of any kind would be employed. This alternative would not adequately control the physical hazards posed by the exposure to the RDX groundwater plume. However, the No Action alternative must be evaluated (in accordance with 40 CFR 300.430(e)(6)) to establish a baseline of comparison regarding future performance and risk for the remaining alternatives, even though this alternative would not be a viable option itself.

2.11.2 Alternative 2

Estimated Capital Cost:	$0
Estimated O&M (cost over 30 years):	$334,475
Estimated Abandonment Cost After 30 Years:	$8,660
Estimated Present Worth Cost:	**$8,305,780**

Under Alternative 2, the current O&M of the 10 interim remedial measure point-of-use treatment systems installed at the nine private drinking water wells and one public water system would continue. These point-of-use treatment systems mitigate human health exposure to RDX in groundwater. The treated water from these systems is being used for non-potable and potable purposes. The O&M monitoring program is designed for 30 years and includes quarterly sampling in the first year followed by semi-annual sampling for the remaining 29 years. Field parameters, including pH, are collected and documented for each sample. Samples are sent for laboratory analysis by the following USEPA methods: explosives (Method 8330A), metals (Methods 200.7 and 200.8), alkalinity (Method SM 2320B-2011), hardness (Method SM 2340C-2011), turbidity (Method 180.1), specific conductance (Method SM 2510B-2011), total coliform (Method SM 9223B-2004), and fecal coliform (Method SM 9222D-2006).

This alternative would also include sampling of up to 20 groundwater monitoring wells including MW-OP-03, MW-OP-02, MW-OP-01S/D, MW-OP-04, MW-OP-05S/D, MW-07S/D, MW-08S/D, MW-09S/D, MW-10S/D, MW-11S/D, MW-KP-16, MW-KP-17, and MW-KP-18.

This alternative would also continue the annual/semi-annual off-post residential well sampling program for private drinking water wells and public water systems in the Focused Area to monitor downgradient RDX groundwater contamination from Kasserine Pass Range. The groundwater monitoring program includes

the annual sampling of approximately 75 wells (additional wells may be added if warranted). The program also includes semi-annual sampling of approximately three wells where RDX concentrations exceed the RSL but are less than the lifetime HAL. All annual and semi-annual groundwater samples are analyzed for explosives via USEPA Method 8330A.

Annual notification letters would be sent to off-post residents and property owners within the area impacted by RDX concentrations greater than the RSL of 0.97 µg/L for as long as groundwater in the plume is above the preliminary remedial goal of 2.0 µg/L. Annual notification letters would notify property owners and residents of the RDX in groundwater, request permission to monitor existing potable wells, and request notification to the U.S. Army of any new wells. When the remedial goal is met, notifications would be terminated. Annual well surveys would be conducted in the area with RDX concentrations greater than the RSL to identify any new wells.

LUCs for on-post portions of the site would be applicable to the installation planning process.

2.11.3 Alternative 3

Estimated Capital Cost:	$2,376,455
Estimated O&M (cost over 30 years):	$113,947
Estimated Present Worth Cost:	**$5,112,993**

Alternative 3 includes the installation of water mains in the residential neighborhood south of Fort Jackson. This would give residences that are currently using private drinking water wells and public water systems along Davis Road and Old Leesburg Road the ability to connect to the City of Columbia water supply. Fort Jackson would be responsible for connecting the 13 affected residences that have RDX detections greater than the HAL to the city water supply. All other residences, including those with RDX detections less than the HAL, would have the option to connect to the city water supply at their expense. Connecting the 13 affected residences to the city water supply would require the following steps:

1. A water main line of 10,500 ft (approximately 2 miles) would be installed along the right-of-way starting from the nearest tie-in point of the existing 10-inch by 6-inch City of Columbia water main (located more than 1 mile from the study area on Old Leesburg Road). It would continue along Old Leesburg Road to Davis Road, and then north on Davis Road to the northern-most point-of-use treatment system.
2. The City of Columbia would tap the newly installed water main line and run individual service lines from the tap to the property line of each of the 13 affected residences with a point-of-use treatment system. A water meter would be installed at the end of each service line for each residence.
3. A contractor would install a ¾-inch distribution line from the meter to the home's existing plumbing system to complete the connection to the city water supply.
4. Prior to establishing full connection to the city water supply, a contractor would flush all pipes within each residence with chlorine. Flushing the line with chlorine is a precautionary measure required to ensure any existing water within the residential pipes cannot backflow into the city's water supply, in accordance with International Plumbing Code 610.1 (International Code Council 2017).
5. A contractor would install a dual-check valve or backflow preventer as a secondary precaution to prevent backflow from the residential lines to the city's water supply.
6. The point-of-use treatment systems would be removed from the treatment sheds; however, the treatment sheds would be left in place.

7. The private groundwater supply wells would be plugged and abandoned at the discretion of the owner, in accordance with SCDHEC R.61-71, Well Standards (SCDHEC 2016). Property owners would be responsible for the abandonment.

In addition to the affected residences being connected to the City of Columbia water supply, the current annual/semi-annual off-post residential well sampling program, annual sampling of groundwater monitoring wells, on-post LUCs, and off-post annual notification letters and well surveys would continue as described in Alternative 2. Monitoring would continue for 30 years.

Currently unaffected wells may become impacted in the future. If this condition were to be detected during the residential well sampling, these residences would be connected to the city water supply. These costs are not considered because of the high uncertainty of this scenario.

2.11.4 Alternative 4

Estimated Capital Cost:	$4,568,895
Estimated O&M (cost over 30 years):	$681,064
Estimated Abandonment Cost After 10 Years:	$18,710
Estimated Present Worth Cost:	**$11,011,444**

Alternative 4 uses the DGR remediation technique to treat the groundwater throughout the RDX plume on and off-post. During the operation of the DGR system, the current O&M sampling of interim remedial measure point-of-use treatment systems will continue. DGR is a remedial approach that focuses on increasing groundwater movement through an aquifer. The outcome is controlled pore flushing to achieve remedial goals at an accelerated pace. A key design element includes the strategic placement of injection and extraction wells based on the distribution of contaminants and the site geology. The dynamic nature of this technology incorporates variations in pumping and injection to enhance flushing the plume from the aquifer or the uniform delivery of reagents to address contaminants in situ. The result is faster cleanup compared with traditional pump and treat systems.

The preliminary DGR design for the remediation of the RDX plume associated with the Kasserine Pass Range was assessed by estimating the volume of impacted groundwater (684 million gallons) and determining the number of pore flushes (1.1) necessary to reduce the average RDX plume concentrations to less than the preliminary remedial goal of 2.0 µg/L. For this initial assessment, the targeted closure period was defined as 10 years with estimated individual sustainable extraction rates of 10 to 15 gpm and sustainable injection rates of 5 gpm. Based on these criteria and the initial plume distribution, the DGR design to achieve remedial goals will require 15 extraction wells and 30 injection wells operating at a total rate of 150 gpm for 10 years. Limited sustainable injection and extraction rate data are available within the plume and will need to be further investigated prior to finalization of a full-scale DGR design. For the purposes of this remedial alternative, costs for full-scale design include those associated with pilot testing at several locations throughout the plume.

The general approach for DGR is to focus the extraction wells near the central, higher-concentration portion of the plume to maximize the mass flux removal and to place the injection wells such that they hydraulically contain the plume, enhance pore flushing, and alleviate potential hydraulic stagnation points that may develop between wells. A conceptual layout of the proposed DGR well network is shown on **Figure 6**. The conceptual design is for the 15 extraction wells to be located along the main axis of the RDX plume with a staggered pattern toward the central wider portion of the RDX plume. The 30 injection wells will be placed along the perimeter of the plume and between the proposed extraction wells within the footprint of the plume. This conceptual layout is intended to show the relative scale and distribution of the proposed DGR

network but is flexible to allow for further refinement based on land access and refinement of hydraulic parameters obtained from pilot study data.

Each injection well location will require a groundwater conveyance piping network and pre-injection treatment system to include filtration and ultraviolet treatment. Each groundwater injection carbon treatment system will treat extracted groundwater and inject into approximately two injection wells. Fifteen standalone injection treatment systems will be located strategically around the plume.

Prior to full-scale DGR system design, a pilot study will be implemented to determine the efficacy of remediation given site-specific conditions. The pilot study will determine if a full-scale DGR strategy is appropriate for the observed site conditions by collecting groundwater yield, injectability, and radius of influence data. If the remediation strategy is effective using site-specific conditions, the data will be used in an optimized system design.

Implementation of a plume-wide DGR strategy will include the following steps:

1. Submit a full-scale design document using pilot study results, detailing the system design O&M schedule for operation over 10 years.
2. Install 30 injection wells and 15 extraction wells throughout the plume.
3. Construct the DGR treatment infrastructure using approximately 15 separate small-scale treatment systems co-located at system extraction wells where groundwater will be treated through filtration and ultraviolet treatment prior to reinjection. Each DGR system will consist of down-well pumps for extraction, ex situ treatment through filtration, and reinjection using an above grade injection pump.
4. Install approximately 13,000 linear ft of distribution piping within trenches.
5. Install approximately 9,000 linear ft of overhead power supply lines and meter drops at each pumping site.
6. Perform O&M of the DGR system for an estimated 10 years.
7. Remove the DGR system after the 10-year implementation period pending the efficacy of the system and monitoring results.
8. Perform O&M of the existing point-of-use treatment systems.
9. Perform quarterly sampling of the post treatment water before reinjection throughout the operation of the DGR system and at a minimum in Years 1 and 2 for point of use treatment systems, followed by semi-annual sampling in subsequent years as appropriate.
10. Sample groundwater monitoring wells as described in Alternative 2. However, the sampling frequency will be increased to monitor remedial progress more closely. Instead of annually, the 20 monitoring wells will be sampled quarterly for the first year then semi-annually for the remaining years.
11. Continue the ongoing off-post residential well monitoring program for private drinking water wells and public water systems, on-post LUCs, and off-post annual notification letters and well surveys as described in Alternative 2.

2.12 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

The NCP requires the evaluation of remedial alternatives, both individually and against one another, using nine evaluation criteria in order to select a remedy (40 CFR 300.430(e)(9)). These criteria are as follows:

- Threshold Criteria—Requirements that each remedial alternative must meet to be eligible for selection as a remedial option.
    - Overall Protectiveness of Human Health and the Environment—Determines whether a remedial alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
    - Compliance with ARARs—Evaluates whether the remedial alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified. Identification of ARARs is dependent on the hazardous substances present at the site, site characteristics, the site location, and the actions recommended to remediate the site. Thus, requirements may be chemical-, location-, or action-specific. Action-specific ARARs are provided in Table 1. No chemical-specific or location specific ARARs are identified. Section 3.1 of the FS (JV 2021) contains a more detailed discussion of ARARs. Section 2.10 of this ROD establishes chemical-specific requirements as RAOs.
- Primary Balancing Criteria—Used to weigh major tradeoffs among RAs.
    - Long-Term Effectiveness and Permanence—Considers the ability of a remedial alternative to maintain protection of human health and the environment over time.
    - Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment—Evaluates the use of treatment in a remedial alternative to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
    - Short-Term Effectiveness—Considers the length of time needed to implement a remedial alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
    - Implementability—Considers the technical and administrative feasibility of implementing the remedial alternative, including factors such as the relative availability of goods and services.
    - Cost—Includes estimated capital and annual O&M costs as well as present worth cost. Present worth cost is the total cost of a remedial alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of −30 to +50%.
- Modifying Criteria—May be considered to the extent that information is available prior to the start of the public comment period but can be fully considered only after public comment is received on the PP.
    - State/Support Agency Acceptance—Considers the state's position and key concerns with the U.S. Army's analysis and recommendations, as described in the RI, FS, and PP documents.
    - Community Acceptance—Considers the components of the alternatives the local community supports, has reservations about, or opposes regarding the U.S. Army's analysis and preferred remedial alternative. Comments received on the PP are an important indicator of community acceptance.

Table 2 compares the effectiveness of the alternatives, Table 3 compares the implementability of the alternatives, and Table 4 compares the costs for the alternatives. A more detailed comparison is provided in the following sections.

2.12.1 Overall Protection of Human Health and the Environment

Alternative 1 takes no action and, thus, would not provide for the reduction of RDX concentrations through time, reduction of exposure, or long-term management. Alternative 2 mitigates the human health exposure to RDX through continued operation and semi-annual O&M sampling of groundwater point-of-use treatment systems serving the 13 affected residences. Alternative 3 would not eliminate or reduce the volume of potentially contaminated media at the affected residences, but it would eliminate the potential exposure pathways for current or potential future human receptors to RDX and any other potentially detected explosives at these residences. Alternative 4 will reduce the volume of potentially contaminated media throughout the plume. It will eliminate the potential exposure pathways for current or potential future human receptors to RDX and any other potentially detected explosives.

2.12.2 Compliance with ARARs

Alternative 1 is not compliant with ARARs as no RA would be taken. Alternatives 2, 3, and 4 all comply with ARARs.

2.12.3 Long-Term Effectiveness and Permanence

Under Alternative 1, no action would be taken to mitigate or eliminate human exposure to RDX in groundwater. Because the actions taken under Alternative 1 would be to discontinue point-of-use treatment system operations, O&M sampling of these treatment systems, and the groundwater monitoring program, this alternative would not reduce the toxicity, mobility, or volume of RDX in groundwater through treatment and would not provide long- or short-term effectiveness.

Alternative 2 provides a moderate level of long-term effectiveness and permanence, as it would mitigate the potential human exposure pathways for current or potential future receptors to RDX in groundwater.

Alternative 3 is an effective method for removing access and restricting potential pathways for human receptors that may be exposed to the contamination at the affected residences. This alternative is effective in the long term because access to RDX in groundwater would be permanently removed if the wells are abandoned.

Alternative 4 is effective in the long term because RDX concentrations in groundwater will be reduced to the level of or lower than the preliminary remedial goal.

2.12.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Because the actions taken under Alternative 1 would be to discontinue point-of-use treatment system operations, O&M sampling of these treatment systems, and the groundwater monitoring program, this alternative would not reduce the toxicity, mobility, or volume of RDX in groundwater through treatment.

Alternative 2 mitigates but does not eliminate human exposure pathways to RDX in groundwater, as it provides no treatment of RDX in the groundwater. This alternative would not reduce the toxicity, mobility, or volume of RDX in groundwater beneath the affected properties through treatment.

Alternative 3 is a permanent solution and eliminates exposure pathways to the contamination for human receptors; however, it does not eliminate or reduce the toxicity, mobility, or volume of RDX in groundwater through treatment.

Alternative 4 is effective within a medium duration of approximately 10 years as this alternative will use treatment to reduce RDX concentrations to less than drinking water standards and HALs. This alternative

will reduce and ultimately eliminate the volume of RDX in groundwater at concentrations greater than the preliminary remedial goal beneath the affected properties through treatment.

2.12.5 Short-Term Effectiveness

Because the actions taken under Alternative 1 would be to discontinue point-of-use treatment system operations, O&M sampling of these treatment systems, and the groundwater monitoring program, this alternative would not reduce the toxicity, mobility, or volume of RDX in groundwater through treatment and would not provide short-term effectiveness.

Alternative 2 would have good short-term effectiveness and would mitigate the potential human exposure pathways for current or potential future receptors to RDX in groundwater.

With Alternative 3, access to RDX-contaminated groundwater, which drives the health hazard, would be removed from each affected residence. By removing access to groundwater with RDX, the future human exposure pathway would be eliminated. This alternative would pose some short-term risks to the community and site workers during the construction required to connect the affected residences to the City of Columbia water supply and during well removal. Well removal is the responsibility of the homeowner. Short-term risks would likely be attributed to typical safety hazards associated with construction. The potential exposure and safety hazards during construction would be reduced by using personal protective clothing and equipment as well as implementing safe construction practices.

Alternative 4 allows for an accelerated remedial timeframe by focusing on pore flushing through the plume. DGR creates hydraulic gradients and groundwater flow through an aquifer, enabling remediation of the more mobile and less mobile pore fractions of the aquifer to remove groundwater contaminant mass more rapidly. This alternative will pose some short-term risks to the community and site workers during the construction of the remediation system and during well removal. Short-term risks will likely be attributed to typical safety hazards associated with construction. The potential exposure and safety hazards during construction will be reduced by using personal protective clothing and equipment as well as implementing safe construction practices.

2.12.6 Implementability

Alternative 1 would not be implementable because community, regulatory, and governmental acceptance would not be obtained. Alternative 2 does not require implementation because the point-of-use treatment systems, O&M sampling, and residential well sampling program are already in place and operating currently. Alternative 3 would be implemented within a moderately reasonable timeframe because of the number of steps involved in this remedial alternative. The DGR remedial strategy in Alternative 4 is applicable to a wide range of hydrogeologic settings and has been successfully applied to numerous sites. Alternative 4 will be implemented within a moderately reasonable timeframe because of the number of steps involved in this remedial alternative.

2.12.7 Cost

Alternative 1 is the least costly and least effective option, with a capital cost of $45,460. Alternative 2 has no initial startup cost because it is currently being used at the site, with an annual operation cost of $334,475 and an abandonment cost of $8,660. The Alternative 3 capital cost is $2,376,445, with annual operating costs of $113,947. Alternative 4 has the most expensive capital and annual operating costs of $4,568,895 and $681,064, respectively. There is also an $18,710 abandonment cost.

2.12.8 State/Support Agency Acceptance

Alternative 1 was unacceptable to the state as it took no action, and Alternative 3 was determined not to be a viable remedial alternative because of concerns about getting affected residents to agree to the city water connection and a lack of reduction in toxicity, mobility, or volume.

The state agreed with the Army's decision in the Draft PP (JV 2023), in which Alternative 4—Dynamic Groundwater Recirculation with Operation of Point-of-Use Treatment Systems and Monitoring was selected as the Preferred Response Action in a letter dated December 1, 2022 (SCDHEC 2022).

2.12.9 Community Acceptance

Community acceptance of the Selected Remedy was evaluated at the conclusion of the public comment period (Section 3.0). Of note, some community members expressed reservations and reluctance to accepting municipally supplied water during a previous public meeting.

2.13 PRINCIPAL THREAT WASTES

The NCP establishes an expectation to use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat wastes at a site combines the concepts of both hazard and risk (USEPA 1991). In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health and the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

Wastes that generally will be considered to constitute principal threats include, but are not limited to, the following:

- **Liquid source material**—Waste contained in drums, lagoons or tanks, free product in the subsurface (i.e., non-aqueous phase liquids) containing COCs (generally excluding groundwater);
- **Mobile source material**—Surface soil or subsurface soil containing high concentrations of COCs that are (or potentially are) mobile because of wind entrainment, volatilization (e.g., volatile organic compounds), surface runoff, or subsurface transport; and
- **Highly toxic source material**—Buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include, but are not limited to, the following:

- **Non-mobile contaminated source material of low to moderate toxicity**—Surface soil containing COCs that generally are relatively immobile in air or groundwater (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting; and
- **Low toxicity source material**—Soil and subsurface soil concentrations not greatly above reference dose levels.

Given that the impacted media is groundwater with relatively low concentrations and low to moderate toxicity (relative to the reference dose levels), it does not constitute a principal threat waste.

2.14 SELECTED REMEDY

The U.S. Army selects Alternative 4 as the Selected Remedy to control human and ecological receptor exposure to RDX in the Southern ORA Area. The rationale, detailed description, costs, and expected outcomes of this Selected Remedy are discussed below.

2.14.1 Summary of the Rationale for the Selected Remedial Alternative

Based on the results of the comparative analysis and detailed evaluation presented in the FS (JV 2021), the U.S. Army recommends that Alternative 4 be implemented as the Selected Remedy to control human and ecological receptor exposure to RDX in the Southern ORA Area. Alternative 4 has an advantage over Alternative 3 because the DGR remedy allows for an accelerated remedial timeframe by focusing on pore flushing through the plume. In addition, Alternative 4 is effective in the long term because RDX in groundwater will be removed down to the preliminary remedial goal, whereas Alternative 3 does not physically treat the groundwater and instead focuses on removal of access to the contaminated groundwater plume.

Alternative 4 meets threshold criteria by providing protectiveness of human health and the environment in a reasonable timeframe (within 10 years of total active treatment) and meeting ARARs. Primary balancing criteria are met with Alternative 4, providing both long-term and short-term effectiveness. It also reduces toxicity through in situ treatment, is readily implementable, and is cost effective.

It should be noted that the RAs recommended can be changed in light of new information or in response to public comment. Public comment will be received through the activities discussed in the next section.

Based on information currently available, the lead agency believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the RAs with respect to the balancing and modifying the criteria. The U.S. Army expects the Selected Remedy to satisfy the following statutory requirements of CERCLA 121(b): (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost effective, (4) use permanent solutions and alternative treatment technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element.

2.14.2 Detailed Description of the Selected Remedial Alternative

The Selected Remedy will consist of Alternative 4, DGR, to treat the groundwater throughout the RDX plume on and off-post.

The components of the Selected Remedy are described in greater detail in Section 2.11.4.

2.14.3 Summary of Estimated Remedial Action Costs

The estimated present worth cost to implement the Selected Remedy is $11,011,444, with capital and annual operating costs of $4,568,895 and $681,064, respectively. The costs and detailed assumptions associated with implementation of Alternative 4 are presented in **Appendix A**. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternatives. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to −30% of the actual project cost.

2.14.4 Expected Outcomes of the Selected Remedial Alternative

The Selected Remedy will be implemented as a remediation measure to prevent human exposure to impacted groundwater at the Southern ORA Area, ultimately reducing risk to human health and the environment through implementation of DGR with point-of-use treatment systems and monitoring. This remedy will reduce and ultimately eliminate the volume of RDX in groundwater at concentrations greater than the preliminary remedial goal beneath the affected properties through treatment. It is anticipated that the current off-post land use (residential) will remain unchanged.

2.15 STATUTORY DETERMINATIONS

The Selected Remedy satisfies the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment, (2) be compliant with ARARs, (3) be cost effective, and (4) use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

2.16 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the Selected Remedy presented in the PP that was published for public comment. The PP (JV 2023) for the Southern ORA Area was released for public comment on May 8, 2023. The PP identified Alternative 4—Dynamic Groundwater Recirculation with Operation of Point-of-Use Treatment Systems and Monitoring as the Preferred Alternative.

PART 3: RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary. The purpose of the Responsiveness Summary is to provide a summary of the stakeholders' comments, concerns, and questions about the PP for the site and the U.S. Army's responses to these concerns.

Fort Jackson sent an invitation to the open house, which included instructions on how to access a copy of the PP (JV 2023), to the owners of properties with RDX treatment systems and all other property owners in the Focus Area on April 20, 2023 (**Appendix B**). The PP for the site was completed and released to the public on May 1, 2023, in the Administrative Record file and the information repository, as listed in Section 2.3. Hard copies of the PP were also available at the meeting. The PP was also posted online at https://home.army.mil/jackson/application/files/1216/8234/7284/RDX_Proposed_Plan.pdf.

A public comment period was held from May 8, 2023, to June 7, 2023. A newspaper notification was published to inform the public of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. Notifications ran in the Columbia Star and Fort Jackson Leader newspapers on April 28, 2023 and May 4, 2023, respectively. A copy of the certificate of publication is provided in **Appendix B**. Two signs were also posted on May 2, 2023 along Old Leesburg Road announcing the public meeting date, time, and location.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

A public meeting was held on May 11, 2023 between 5:30 p.m. and 7:00 p.m. The purpose of the meeting was to inform the public about the proposed RAs for the site and to seek public comments. At this meeting, representatives from the U.S. Army and contractors were present to answer questions about the site and the RAs under consideration including the Preferred Alternative. A fact sheet was provided to the public as part of the meeting. The fact sheet is provided in **Appendix C**.

The public meeting was a station style open house where community members could visit the following stations and speak with experts from Fort Jackson and their contractors:

- Welcome Station— Presented by Barbara Williams, Chief Fort Jackson Environmental Division;
- Station 1: Fort Jackson & RDX: A Brief History—Presented by Mark Albe, JV Account Leader;
- Station 2: Historical Missions of Fort Jackson— Presented by Henry Howe, Fort Jackson Museum, and Chan Funk, Fort Jackson Cultural Resources Program Manager;
- Station 3: Results from the Remedial Investigation: Soil & Groundwater Sampling— Presented by Patrick Shirley, JV Federal Program Manager;
- Station 4: Groundwater: Residential Sampling & Treatment—Presented by Allen Evans, Senior Environmental Engineer in charge of treatment systems;
- Station 5: RDX & Your Health—CPT Jeffrey Wischhusen, Department of Public Health Director, and MAJ April Robinson, Department of Public Health;
- Station 6: The Path Forward—Presented by Kathleen Hamrick, JV Principal Scientist and Project Manager; and
- Station 7: Improving & Protecting Groundwater—Presented by JV Senior Engineer, Peter Campbell, lead designer of the Selected Remedy.

In addition, the Fort Jackson Senior Commander, Command Sergeant Major, Garrison Commander, Public Affairs Office staff, Department of Public Health, and Environmental Division staff and personnel from the SCDHEC attended the meeting and engaged with the attendees.

The comments received during the public comment period including verbal comments expressed at the public meeting and comments received via email. No significant comments were received.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues have been raised or were encountered during the preparation of this ROD.

3.3 SUMMARY OF COMMENTS AND RESPONSES

In general, the public's primary concern is contamination of the entire aquifer and how this would impact their properties. There were questions regarding the process, location of the DGR wells, and the timing of the remedy. City water was also not acceptable as an option to area residents and stakeholders.

As of the date of this ROD, the U.S. Army selects the remedy for the Southern ORA Area as ***DGR and the continuation of O&M and sampling of point-of-use treatment systems, off-post residential well monitoring program for private drinking water wells and public water systems, on-post LUCs, site-wide monitoring well sampling, and off-post annual notification letters and well surveys.*** This remedy complies with ARARs and provides the greatest degree of overall protection of human health and the environment by reducing the volume of potentially contaminated media throughout the plume and eliminating the potential exposure pathways for current or potential future human receptors to RDX.

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PART 5: GLOSSARY OF TERMS

Administrative Record—Documents generated during the investigation of a site used to determine the appropriate response action under the Comprehensive Environmental Response, Compensation, and Liability Act.

Applicable or Relevant and Appropriate Requirements (ARARs)—Federal or state environmental rules and regulations.

Capital Costs—Costs associated with construction, treatment equipment, site preparation, services, transportation, disposal, health and safety, installation and startup, administration, legal support, engineering, and design associated with Response Actions.

CERCLA § 121(c) Review—The mandatory **e**valuation of a remedy's protectiveness if residual contamination above remedial goals is left at the site as part of the remedial alternative (also known as the 5-year review). The Comprehensive Environmental Response, Compensation, and Liability Act requires that the site conditions and remedy protectiveness be evaluated once every 5 years.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—A federal law, commonly referred to as Superfund, passed in 1980 that provides for cleanup and emergency response in connection with existing inactive hazardous waste disposal sites that endanger public health and safety and/or the environment.

Focused Area—The area located south of Fort Jackson's Southern Operational Range Assessment Program Area and south and east of Weston Lake, including the nine individual private drinking water wells and one public water system at the 13 affected residences.

Health Advisory Level—A concentration of a contaminant in drinking water established by the United States Environmental Protection Agency, at which adverse health effects and/or aesthetic effects are not anticipated to occur over specific exposure durations (e.g., 1 day, 10 days, a lifetime).

Land Use Controls (LUCs)—Legal, institutional, and administrative means to limit the use of a particular site or tract of land to specified uses or activities.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP)—The federal regulation that implements the Comprehensive Environmental Response, Compensation, and Liability Act cleanup process.

Operation and Maintenance—Annual post-construction cost necessary to ensure the continued effectiveness of a Response Action.

Point-of-Use Treatment Systems—A treatment device installed to treat the water entering a house or building for the purpose of treating water distributed throughout the entire house or building. These are currently in use at the Focused Area.

Present Worth Costs—Costs used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year. This allows the cost of the Response Actions to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover capital and operation and maintenance costs associated with each Response Action over its planned life.

Public Comment Period—The time allowed for the members of a community to express views and concerns regarding the Selected Remedy proposed to be taken by an agency.

Receptor—A person who may be exposed to chemicals present in the site groundwater through drinking the water (ingestion), showering or washing (dermal contact), or inhalation of vapors released during showering or other water use.

Record of Decision (ROD)—A legal document signed by the U.S. Army, which provides the cleanup action or remedy selected for a site, the basis for selecting that remedy, public comments, responses to comments, and the estimated cost of the remedy.

Regional Screening Level (RSL)—Concentration for an individual chemical that corresponds to a target risk level, usually a cancer risk level of $1x10^{-6}$ (one in one million) for carcinogens, and a hazard index of 1 for non-carcinogenic effects. These screening levels have been published twice a year since May 2008 and are administered through Oak Ridge National Laboratory.

Remedial Action Objective (RAO)—Describe what the proposed site cleanup is expected to accomplish.

Remedial Alternatives—Cleanup options for attaining the remedial action objectives.

Remedial Goal—A concentration of a particular contaminant that will meet the remedial action objectives.

Resource Conservation and Recovery Act (RCRA)—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976.

Response Action—A removal action, remedy, or remedial action, including enforcement activities related thereto.

Responsiveness Summary—A part of the Record of Decision in which the U.S. Army documents and responds to written and oral comments received about the Proposed Plan.

Selected Remedy—A remedial alternative identified as meeting the threshold criteria and providing the best balance of tradeoffs with respect to the balancing and modifying criteria.

Superfund Amendments and Reauthorization Act—A Congressional act that modified the Comprehensive Environmental Response, Compensation, and Liability Act. It was enacted in 1986 and again in 1990 to authorize additional funding for the Superfund Program.

TABLES

Table 1
Action-Specific ARARs
Alternatives Analysis
Record of Decision
Fort Jackson, Columbia, South Carolina

Requirement	Requirement Reference	Federal, State, County, or Municipal Requirement	Description	Comments	FS Consideration
South Carolina Department of Health and Environmental Control (SCDHEC) Groundwater Sources and Treatment	State Primary Drinking Water Regulation R61-58.2	State	SCDHEC state regulations for modification to public water systems	ARAR	SCDHEC regulations for well abandonment will need to be adhered to when DGR system operation is complete and associated wells are removed.
Underground Injection Control (UIC)	Regulation 61-87	State	Related to the control of underground injection of water at the site	ARAR	The DGR system will inject treated groundwater back into the plume. UIC permits will be required for each injection well.

NOTES:
ARARs - Applicable or Relevant and Appropriate Requirements
DHEC – Department of Health and Environmental Control
SC – South Carolina
UIC – Underground Injection Control

Table 2
Comparison of Effectiveness of the Remedial Alternatives
Military Munitions Response Program
Southern Operational Range Assessment Program Area RDX
Decision Document
Fort Jackson, Columbia, South Carolina

Effectiveness	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Further Action	Operation of Point of Use Treatment Systems and Monitoring	Connect 13 Affected Residences to the City Water Supply and Monitoring	Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems
Protection of public safety and the environment	NC	3	1	2
Compliance with ARARs	NC	1	1	1
Long-term effectiveness	NC	3	2	1
Reduction of toxicity, mobility, or volume through treatment	NC	4	4	1
Short-term effectiveness	NC	1	2	3
Total	NC	12	10	8
Rank	NC	3	2	1

Notes:

Scoring: 1=most desirable, 2=more desirable than undesirable, 3=more undesirable than desirable, 4=undesirable; NC=not considered
ARAR = Applicable or Relevant and Appropriate Requirement

Table 3
Comparison of Implementability of Alternatives
Military Munitions Response Program
Southern Operational Range Assessment Program Area RDX
Decision Document
Fort Jackson, South Carolina

Implementability	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Further Action	Operation of Point of Use Treatment Systems and Monitoring	Connect 13 Affected Residences to the City Water Supply and Monitoring	Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems
Technical feasibility	NC	1	1	2
Administrative feasibility	NC	1	3	3
Availability of services and materials	NC	1	1	2
Community acceptance	NC	3	4	1
Regulatory and governmental acceptances	NC	3	4	1
Total	NC	9	13	9
Rank	NC	2	3	1

Note:s

Scoring: 1=most desirable, 2=more desirable than undesirable, 3=more undesirable than desirable, 4=undesirable; NC=not considered
TBC = Scores and ranking to be considered following public comment

Table 4
Cost Comparison of the Remedial Alternatives
Military Munitions Response Program
Southern Operational Range Assessment Program Area RDX
Decision Document
Fort Jackson, Columbia, South Carolina

Costs and Assumptions	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Further Action	Operation of Point of Use Treatment Systems and Monitoring	Connect 13 Affected Residences to the City Water Supply and Monitoring	Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems
Capital Cost	$ 45,460	$ -	$ 2,376,445	$ 4,568,895
Annual Operating Costs	$ -	$ 334,475	$ 113,947	$ 681,064
O&M Years	NA	30	30	10
Abandonment Costs	NA	$ 8,660	NA	$ 18,710
Net Present Value	$ -	$ 8,305,780	$ 5,112,993	$ 11,011,444
Rank	NC	2	1	3

Notes:

*Annual operating costs for Alternative 4, Year 1 are $704,402 to include for quarterly sampling of the DGR system. The table shows annual operating costs for Years 2-10.
For the 30-year period with a 1.5% discount factor is used while for the 10-year period a 1.4% discount factor is used for economic projections based on OMB Circular No. A-94, Last Revision December 2018 Scoring: Alternatives are ranked 1 (lowest cost) through 3 (highest cost)
NA = not applicable; NC=not considered

FIGURES

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

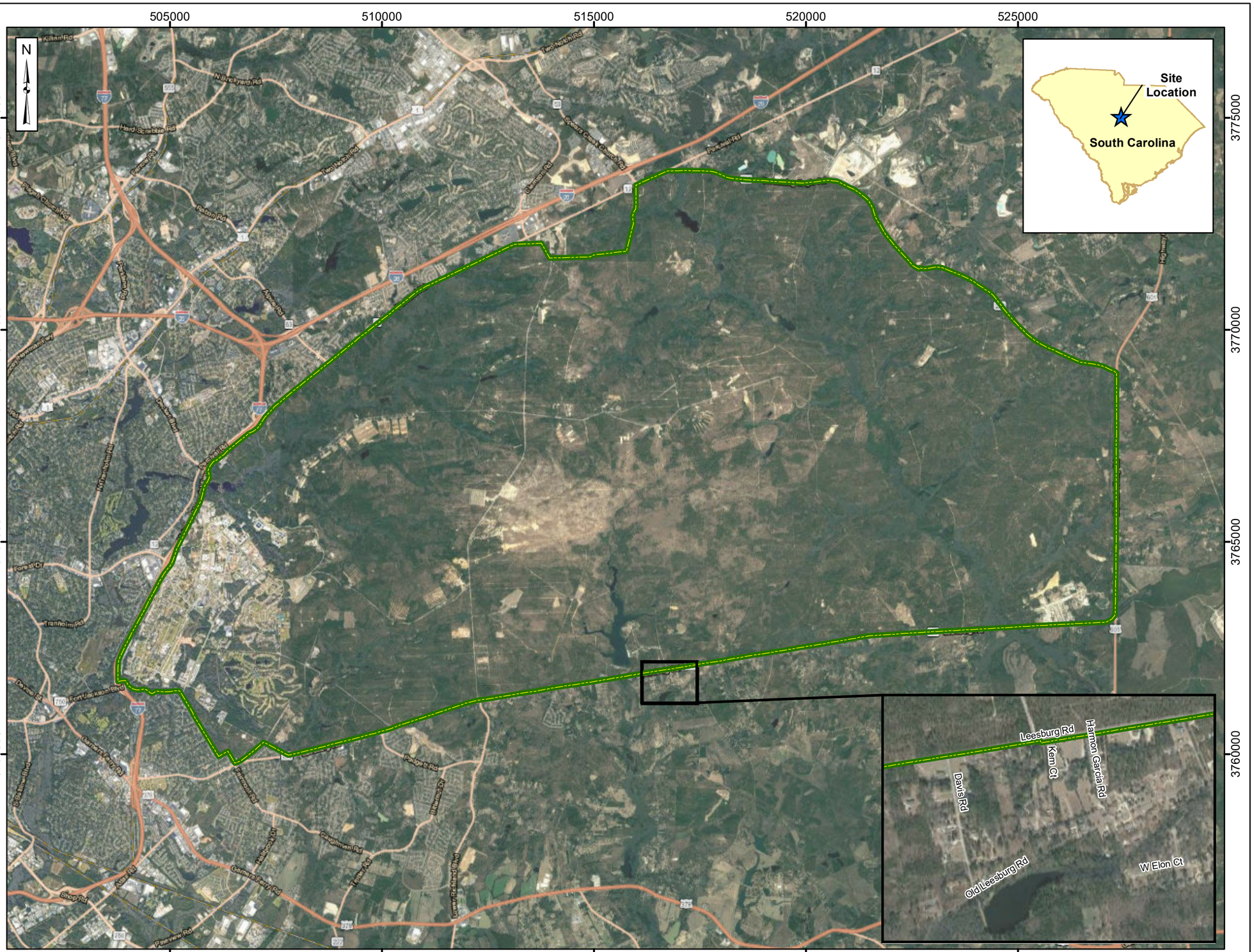


Figure 1
Fort Jackson and the McCrady Training Center

Legend

Fort Jackson / McCrady Training Center Boundary

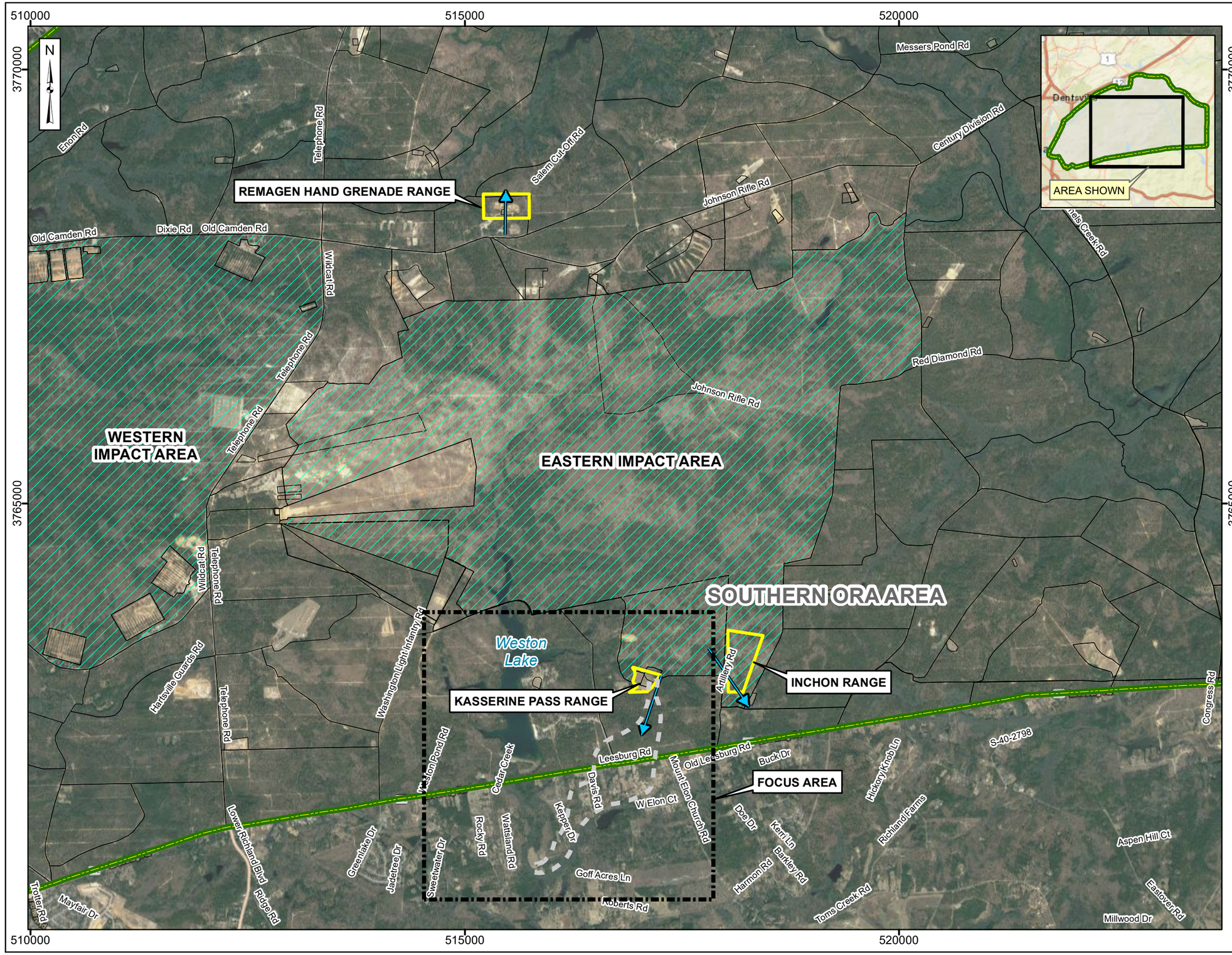
0 1 2
Miles

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 17N
Datum: WGS84
Units: Meters

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

Figure 2
Southern ORA Area



Legend

- Fort Jackson / McCrady Training Center Boundary
- Range of Interest
- Focus Area
- Impact Area
- Other Range
- Approximate Groundwater Flow Direction
- Extent of RDX in GW

Note:
1) The RDX extent was drawn to encapsulate the MW, VAP, and residential well RDX detections.

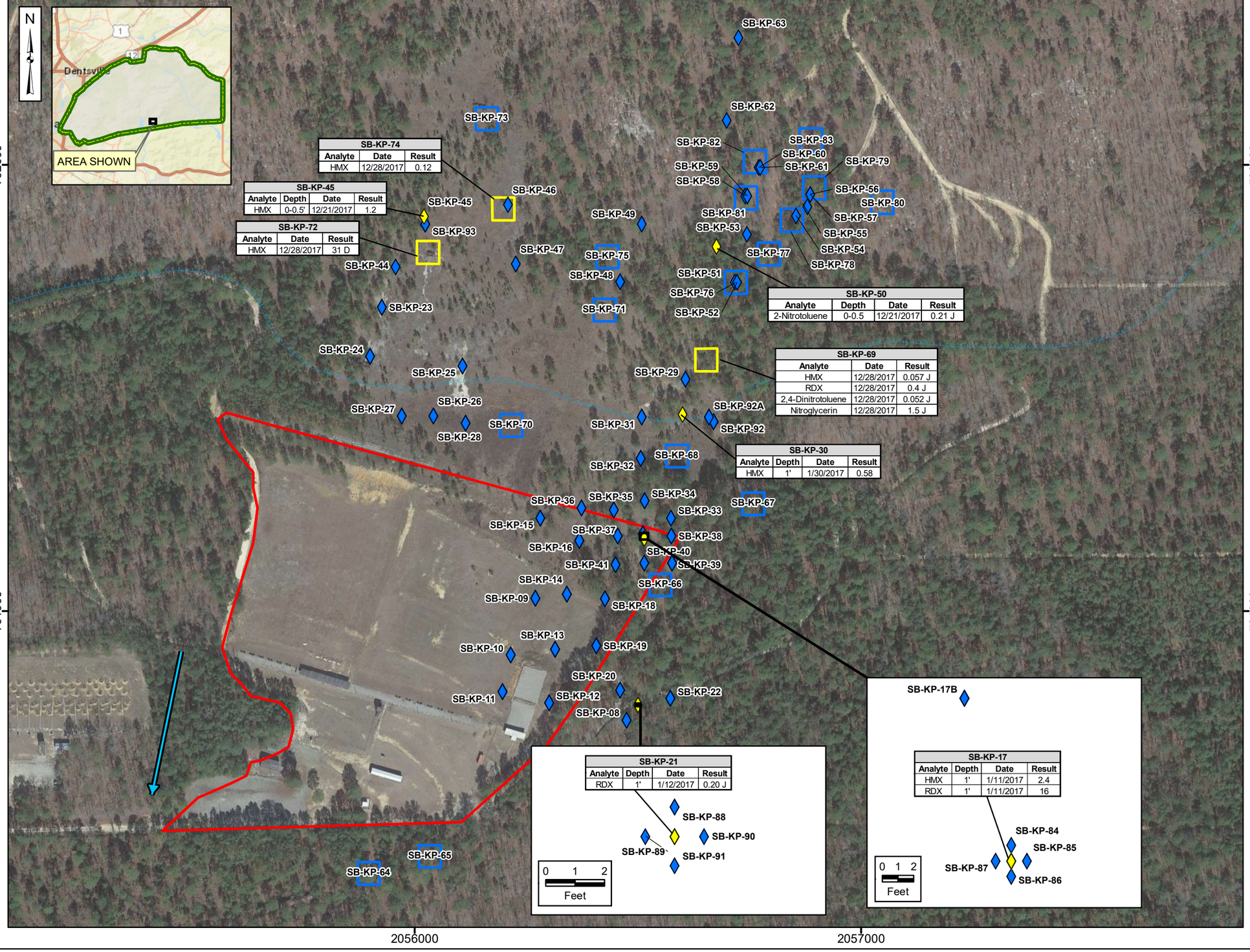
0 0.5 1
Miles

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 17N
Datum: WGS84
Units: Meters

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

Figure 3
Soil Boring Locations and Detections



Legend

- Kasserine Pass Range
- Stormwater Conveyance
- Approximate Groundwater Flow Direction
- HMX, RDX, or TNT Breakdown Product Detected in Soil
- No Detections in Soil

Incremental Sampling Units

- HMX, RDX, or TNT Breakdown Product Detected
- No Detections

Notes:
1) All results are in mg/kg.
2) Locations without data boxes had no detections.
3) D = Reported from dilution analysis
4) J = Estimated concentration
5) All results were below the USEPA Resident Soil RSLs except RDX at SB-KP-17, which was greater than the RSL of 8.3 mg/kg.

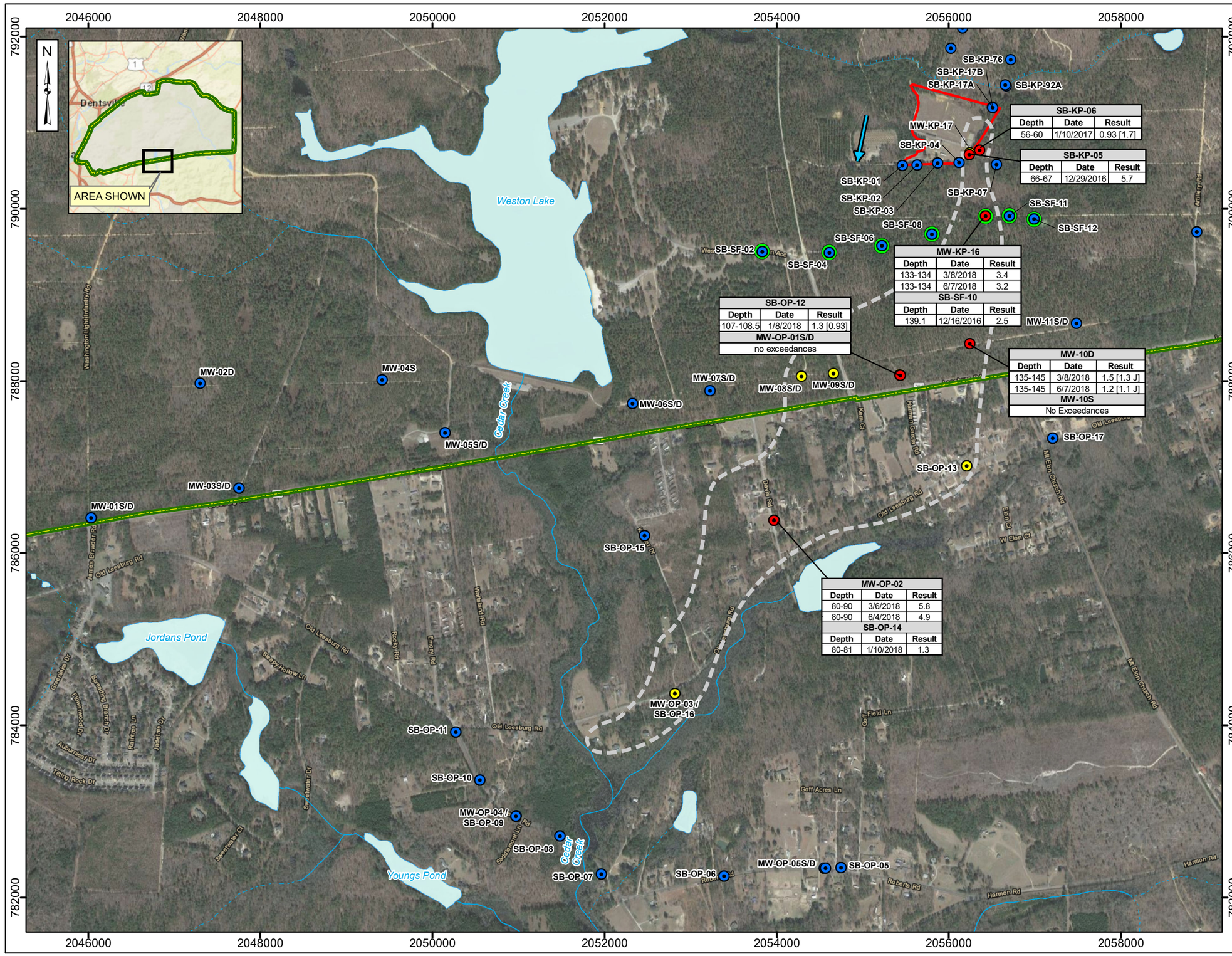
0 250 500
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: South Carolina State Plane
Datum: NAD83
Units: Feet

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

Figure 4
Groundwater Boring Locations and Exceedances



SB-KP-06		
Depth	Date	Result
56-60	1/10/2017	0.93 [1.7]

SB-KP-05		
Depth	Date	Result
66-67	12/29/2016	5.7

MW-KP-16		
Depth	Date	Result
133-134	3/8/2018	3.4
133-134	6/7/2018	3.2
SB-SF-10		
Depth	Date	Result
139.1	12/16/2016	2.5

SB-OP-12		
Depth	Date	Result
107-108.5	1/8/2018	1.3 [0.93]
MW-OP-01S/D		
no exceedances		

MW-10D		
Depth	Date	Result
135-145	3/8/2018	1.5 [1.3 J]
135-145	6/7/2018	1.2 [1.1 J]
MW-10S		
No Exceedances		

MW-OP-02		
Depth	Date	Result
80-90	3/6/2018	5.8
80-90	6/4/2018	4.9
SB-OP-14		
Depth	Date	Result
80-81	1/10/2018	1.3

Legend

- Fort Jackson / McCrady Training Center Boundary
- Kasserine Pass Range
- River/Stream (Perennial)
- Stream (Intermittent)
- Stormwater Conveyance
- Water Body
- Approximate Groundwater Flow Direction
- Apparent/Potential Extent of RDX in GW
- RDX Detected in GW (>= 0.97 µg/L)
- RDX Detected in GW (< 0.97 µg/L)
- RDX Not Detected in GW
- Stratigraphic Flux Boring

Notes:
1) All results are in µg/L.
2) Sample results are categorized based on the Tapwater RSL for RDX (0.97 µg/L).
3) Locations without data boxes had no RDX exceedances.
4) Locations beginning with "SB" are VAP borings.
5) Locations containing "MW" are monitoring wells.
6) J = Estimated concentration

0 1,000 2,000
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: South Carolina State Plane
Datum: NAD83
Units: Feet

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

Figure 5
Groundwater Exceedances / Plume Map

Legend

- Fort Jackson / McCrady Training Center Boundary
- Kasserine Pass Range
- River/Stream (Perennial)
- Stream (Intermittent)
- Stormwater Conveyance
- Water Body
- Approximate Groundwater Flow Direction
- RDX Detected in GW (>= 0.97 µg/L)
- RDX Detected in GW (< 0.97 µg/L)
- RDX Not Detected in GW
- RDX over HAL (2.0 µg/L)
- RDX over RSL (0.97 µg/L)
- Extent of RDX in GW

Notes:
1) All results are in µg/L.
2) Sample results are categorized based on the Tapwater RSL for RDX (0.97 µg/L).
3) Locations without data boxes had no RDX exceedances.
4) Locations beginning with "SB" are VAP borings.
5) Locations containing "MW" are monitoring wells.
6) J = Estimated concentration
7) The RDX extent, RSL, and HAL lines were drawn to encapsulate the MW, VAP, and residential well RDX detections from 2016 to 2019. Residential wells are not shown due to privacy issues.

0 1,000 2,000
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: South Carolina State Plane
Datum: NAD83
Units: Feet

SB-KP-06		
Depth	Date	Result
56-60	1/10/2017	0.93 [1.7]

SB-KP-05		
Depth	Date	Result
66-67	12/29/2016	5.7

MW-KP-16		
Depth	Date	Result
133-134	3/8/2018	3.4
133-134	6/7/2018	3.2
SB-SF-10		
Depth	Date	Result
139.1	12/16/2016	2.5

SB-OP-12		
Depth	Date	Result
107-108.5	1/8/2018	1.3 [0.93]
MW-OP-01S/D		
no exceedances		

MW-10D		
Depth	Date	Result
135-145	3/8/2018	1.5 [1.3 J]
135-145	6/7/2018	1.2 [1.1 J]
MW-10S		
No Exceedances		

MW-OP-02		
Depth	Date	Result
80-90	3/6/2018	5.8
80-90	6/4/2018	4.9
SB-OP-14		
Depth	Date	Result
80-81	1/10/2018	1.3

Military Munitions Response Program
RDX Record of Decision for the
Southern Operational Range Assessment Area
Fort Jackson and McCrady Training Center,
Columbia, SC

Figure 6
Proposed DGR
Well Network Layout

Legend

- Fort Jackson / McCrady Training Center Boundary
- Kasserine Pass Range
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Extent of RDX in GW
- Potential DGR Injection Well
- Potential DGR System Extraction Well
- Potential DGR System Conveyance Piping

Note:
1) The RDX extent was drawn to encapsulate the MW, VAP, and residential well RDX detections.

0 500 1,000
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: South Carolina State Plane
Datum: NAD83
Units: Feet

APPENDIX A

Cost Estimate for Response Action

Appendix A
Cost Estimate

Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems

Site: Fort Jackson
Date: 9/9/2021

Well Installation						
Well and SS Screen Install 6-inch	1275.00	LF	$ 40.70	$ 70,493	Based on unit rates	
Well and SS Screen install 4-inch	2550.00	LF	$ 27.50	$ 82,725	Based on unit rates	
Drill Rig	22.00	days	$ 6,000.00	$ 132,000	Based on unit rates	
Well Install Oversite - Field	22.00	days	$ 1,413.30	$ 31,093	Based on 200 LF per day and hand clearance	
Well Install Oversite - Support	5.00	days	$ 1,594.50	$ 7,973		
Well Development	16.00	Days	$ 2,800.00	$ 44,800	Based on 3 wells per day unit rates	
Well Development Oversite - Field	16.00	Days	$ 944.10	$ 15,106	Based on 3 wells per day unit rates	
Driller Mobilization	2.00	mob	$ 1,500.00	$ 3,000	One Mobilization per 10 days	
Contractor Mobilization	6.00	mob	$ 3,500.00	$ 21,000		
SUBTOTAL				$ 3,800,146		
Contingency	20%			$ 760,029		
Public Meeting						
Contract Price for Public Meeting	1	each	$8,720.13	$ 8,720	Based on price from Contract	
SUBTOTAL				$ 8,720		
TOTAL System Installation Cost			**Annual Total**	**$ 4,568,894.97**	Installation of Systems including trenching, well installation, power and units	

Annual DGR System Operation and Maintenance Costs

DESCRIPTION	**QTY**	**UNIT[(1)(2)]**	**UNIT COST**	**TOTAL**	**NOTES**
Operation, Maintenance, Sampling and Optimization (per Year)					
Operation, Maintenance, Sampling and Optimization	1.00	DGR System	$ 334,927.64	$ 334,928	Annual O&M for DGR System
SUBTOTAL				$ 334,928	
TOTAL ANNUAL DGR SYSTEM O&M COST			**Annual Total**	**$ 334,928**	Operation, Maintenance, Sampling and Optimization

Annual Residential System Operation and Maintenance Costs

DESCRIPTION	**QTY**	**UNIT[(1)(2)]**	**UNIT COST**	**TOTAL**	**NOTES**
Government Contracting Costs					
Government Contracting Costs	0.20	Each	$ 184,000.00	$ 36,800	$184,000 for a 5 year contract, including contract set up and post award cost
SUBTOTAL				$ 36,800	
Operation, Maintenance, Sampling and Optimization (per Year)					
Operation, Maintenance, Sampling and Optimization	10.00	Systems	$ 22,052.83	$ 220,520	Annual Contract Price for 11 Residences
SUBTOTAL				$ 220,520	
Annual Private Well Sampling (per Year)					
Right of Entry Support	1.00	Each	$ 2,444.64	$ 2,445	Contract Price for Right of Entry Support
Annual Sampling	1.00	Each	$ 63,033.59	$ 63,034	Annual Contract Price for 75 Wells
Semi-annual Monitoring Well Sampling	2.00	Each	$ 11,669.00	$ 23,338	Based on estimate from Pine Environmental
SUBTOTAL				$ 88,816	
TOTAL ANNUAL RESIDENTAL SYSTEM O&M COST			**Annual Total**	**$ 346,136**	Operation, Maintenance, Sampling and Optimization and Annual Private Well Sampling

Appendix A
Cost Estimate

Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems

Site: Fort Jackson
Date: 9/9/2021

Treatment System Abandonment

DESCRIPTION	QTY	UNIT[(1)(2)]	UNIT COST	TOTAL	NOTES
Treatment System Abandonment					
Removal of carbon and calcite media from tanks	25	Systems	$ 605.00	$ 15,125	Based on estimate from Culligan
Non hazardous waste disposal (1 drum per system)	25	drums	$ 65.00	$ 1,625	Based on estimate from A&D Environmental
Non hazardous waste removal--box truck	1	mobilization	$ 235.00	$ 235	Based on estimate from A&D Environmental
Non hazardous waste removal--forklift	1	mobilization	$ 725.00	$ 725	Based on estimate from A&D Environmental
Moving tanks to Fort Jackson	1	mobilization	$ 1,000.00	$ 1,000	Professional experience and accumulated cost estimates from similar large projects
SUBTOTAL				$ 18,710	

TOTAL TREATMENT SYSTEM ABANDONMENT COST — **Annual Total** **$ 18,710** Treatment System Abandonment

Present Value Analysis:

Cost Type	Year	Total Cost	Total Cost Per Year	Discount Factor[(3)]	Present Value	NOTES
				1.4%		
Capital Cost	0	$ 4,568,895	$ 4,568,895	1.00	$ 4,568,895	
Annual O&M Cost	1	$ 704,401.87	$ 704,401.87	1.00	$ 704,402	
Annual O&M Cost	2-10	$ 6,129,574.81	$ 681,063.87	8.40	$ 5,721,638	
Treatment System Abandonment	10	$ 18,710.00	$ 18,710.00	0.88	$ 16,509	

TOTAL PRESENT VALUE OF ALTERNATIVE **$ 11,011,444**

Notes:
(1) Lump Sum Unit Costs based on ARCADIS contract prices and project experience of similar size and nature and engineering judgment. Additional costs associated with specific project location and working calendar were accounted for.
(2) Individual Unit (i.e. each, tons, cubic yards) Costs based on executed construction bid documents (for other ARCADIS recent projects), vendor quotes and costing tools (e.g. RSMeans).
(3) 10-Year Real Discount Rate obtained from OMB Circular No. A-94, Last Revision November 2017

DGR - Dynamic Groundwater Recirculation
EPA - Environmental Protection Agency
gps - gallon per minute
HA - health advisory
LF - Linear Feet
LS - Lump Sum
O&M - operation and maintenance
OMB - Office of Management & Budget
ORA - Operational Range Assessment
RDX - Royal Demolition Explosive
RSL - Regional Screening Level
SS - Stainless Steel
TNT - trinitrotoluene

Appendix A
Alternatives Scoping and Costing

Additional Unit Costs

Per System, Treatment Shed

Treatment Shed Disassembly and Removal	1	shed	$2,600	per shed	$2,600	Professional judgement
Total Removal Cost					**$2,600**	

Per System, Addition of One Treatment

Installation of One Treatment System	1	each	$372,921	each	$ 372,921	Contract cost
Operation, Maintenance, Sampling and Optimization	1	system	$ 22,052.83	year	$ 569,308.92	Contract cost
Net Present Value	30years	25.81569				
Total Treatment System Addition					**$ 942,230**	

Per Residence, Connecting Additional Residence to Public Water

Construction Oversight (on-site)	1	days	$ 1,125.90	days	$ 1,125.90	Mid level engineer for 10 hours per day
Construction Oversight (office)	1	days	$ 478.35	days	$ 478.35	Senior engineer / project manager at 3 hours per day
Total footage of service line	150	ft	$ 20.00	ft	$ 3,000.00	Based on estimate from Derrick Plumbing
Cost of backflow preventers	1	units	$ 300.00	units	$ 300.00	Based on price from City of Columbia
Cost City of Columbia tapping plus water meter install	1	units	$ 2,512.00	units	$ 2,512.00	Based on price from City of Columbia
					$ 7,416	

Per Well, Monitoring Well Installation

Well Pumps and controls	1	each	$10,000	each	$ 10,000	Based on cost estimte from Cascade
Well install 4 inch	150	LF	$28	LF	$ 4,125	Based on cost estimte from Cascade
Well Screen 4 inch SS WW	10	LF	$42	LF	$ 420	Based on cost estimte from Cascade
Drill Rig	1	days	$6,000	day	$ 6,000	Based on cost estimte from Cascade
Well Install oversite	1	days	$ 1,413.30	day	$ 1,413	Based on cost estimte from Cascade
Well Install oversite - support	1	days	$ 1,594.50	day	$ 1,595	Based on cost estimte from Cascade
Well development	1	Days	$ 2,800.00	day	$ 2,800	Based on cost estimte from Cascade
Well development - oversite	1	Days	$ 944.10	day	$ 944	Based on cost estimte from Cascade
Driller Mobilization	1	mob	$ 1,500.00	per mob	$ 1,500	Based on cost estimte from Cascade
Contractor Mobilization	1	mob	$ 3,500.00	per mob	$ 3,500	Based on cost estimte from Cascade
Total Monitoring Well Install					**$ 32,297**	

APPENDIX B

Proof of Publication

THE COLUMBIA STAR

COLUMBIA, SOUTH CAROLINA

State of South Carolina
County of Richland

Personally appeared before me,
J. MICHAEL MADDOCK,
PUBLISHER OF THE COLUMBIA STAR,
who makes oath that the advertisement

PUBLIC NOTICE
Proposed Plan for Military Munitions Response Program Southern Operational Range Assessment Aria RDX Fort Jackson, SC
US Army Garrison, Fort Jackson invites public comment on the Proposed Plan... May 8, 2023 through June 7, 2023, etc.

a clipping of which is attached hereto, was printed in **THE COLUMBIA STAR**, a weekly newspaper of general circulation published in the City of Columbia, State and County aforesaid, in the issues of

April 28, 2023

J. Michael Maddock, Publisher

Sworn to before me on this
28th day of April, 2023

Tammie M. Maddock, Notary Public
My commission expires June 27, 2026

PUBLIC NOTICE
Proposed Plan for Military Munitions Response Program
Southern Operational Range Assessment Area RDX
Fort Jackson, SC

U. S. Army Garrison, Fort Jackson invites public comment on the **Proposed Plan for the Southern Operational Range Assessment Area Royal Demolition Explosive (RDX) Site located at Fort Jackson, South Carolina.** The Proposed Plan identifies the preferred response action to clean-up RDX in groundwater south of Fort Jackson, east of Weston Lake. The preferred response action is Alternative 4: Dynamic Groundwater Recirculation with Operation of Point of Use Treatment Systems and Monitoring.

The public is invited to review and comment on the Proposed Plan during a 30-day comment period that will run from **May 8, 2023 through June 7, 2023.**

The Proposed Plan may be obtained from the Fort Jackson website at https://home.army.mil/jackson/index.php/about/Garrison/directorate-public-works/ORAP or in-person from the Administrative Record at:

Richland County Public Library
1431 Assembly Street
Columbia, SC 29201

Written comments for the Proposed Plan may be submitted at any time during the comment period, but they must be **postmarked no later than midnight on June 7, 2023.** Comments should be submitted to the address shown in the Proposed Plan.

Fort Jackson will hold a public meeting to explain the Proposed Plan on **May 11, 2023 from 5:30 pm to 7:00 pm.** Oral and written comments will be accepted at the meeting. The meeting will be held at:

Weston Lake Community House
4420 Leesburg Road
Hopkins, SC 29061

Fort Jackson is committed to environmental excellence in all aspects of the mission. If you have any questions concerning this notice, please contact the Fort Jackson Environmental Division Chief at (803) 751-6858.

(4-28-23)

APPENDIX C

Public Meeting Reference Materials

OPERATIONAL RANGE ASSESSMENT PROGRAM OPEN HOUSE
May 11, 2023

Thank you for taking the time to attend Fort Jackson's Operational Range Assessment Program (ORAP) Open House.

In 2013, Fort Jackson informed the public that traces of Royal Demolition Explosive (RDX) were detected in water taken from on-post wells near the installation's southern boundary. To ensure the safety of our neighbors, we asked homeowners south of Fort Jackson for permission to sample their well water. Since then, we have sampled 195 residential drinking water wells and conducted multiple investigations, both on-post and off-post.

We've set up seven "stations" for you to visit to learn about the history of Fort Jackson, the Army's efforts to address the presence of RDX, and the path forward. Please feel free to visit the stations in any order, but we suggest you start at Station 1 if you have not attended one of our previous public meetings. The station topics are shown below:

Station 1: Fort Jackson & RDX: A Brief History

Station 2: Historical Missions of Fort Jackson

Station 3: Results from the Remedial Investigation: Soil & Groundwater Sampling

Station 4: Groundwater: Residential Sampling & Treatment

Station 5: RDX & Your Health

Station 6: Assessing Options for Groundwater Cleanup

Station 7: Improving & Protecting Groundwater

If you would like to have your well water sampled, please fill out a Right-of-Entry form, located at the tables, allowing us permission to enter your property. You can return the completed form tonight, mail it to the address shown on the form, or e-mail it to barbara.s.williams38.civ@army.mil.

The posters displayed at tonight's Open House will be posted on the ORAP website at https://home.army.mil/jackson/index.php/about/Garrison/directorate-public-works/ORAP.

If you have any questions or comments, please write it on one of the index cards located at the stations, or contact Barbara Williams, Chief, Environmental Division, at (803) 751-6858 or barbara.s.williams38.civ@army.mil.

Thank you for your continued support of Fort Jackson and America's Army!