



Explanation of Significant Differences for Groundwater Remediation Requirements

Fact Sheet

INTRODUCTION

The “Explanation of Significant Differences for Groundwater Remediation Requirements” (ESD) documents significant changes associated with the remedy for groundwater contamination for both the On-Post and Off-Post Operable Units (OUs) at the Rocky Mountain Arsenal (RMA). The ESD documents changes to the shut-off criteria and monitoring requirements for the groundwater treatment systems, as well as the establishment of a new procedure for identifying site-specific Practical Quantitation Limits (PQLs) for analyzing groundwater samples to assess progress in meeting RMA groundwater treatment system goals. (A PQL is the minimum concentration of a substance that can be measured with a high degree of confidence that the substance is present at or above that concentration.)

From 1942 until the early 1980s, the Army manufactured chemical weapons and incendiary munitions at the Rocky Mountain Arsenal. Beginning in 1946, the Army leased some facilities to private companies to manufacture industrial and agricultural chemicals.

Shell Oil Co., the principal lessee, manufactured herbicides and pesticides at the site from 1952 to 1982.

Although the Army and Shell used accepted manufacturing and disposal methods of the time, contamination of the structures, soil and groundwater occurred. The characteristics and location of the groundwater plumes indicate the greatest contaminant releases to the groundwater occurred in the central manufacturing, transport, and waste disposal areas. Groundwater contamination migrated off post prior to the implementation of groundwater pump-and-treat systems.

To prevent further off-post migration of contamination, three containment and treatment systems were installed in the late 1970s and early 1980s at the north, northwest and western boundaries of RMA. Additional extraction and treatment systems were installed on post as Interim Response Actions (IRAs) near historic manufacturing, transport and disposal areas. These treatment systems were incorporated into the final remedial action identified in the On-Post Record of Decision (ROD).

Off post, the Groundwater Intercept and Treatment System (OGITS) was designed to extract and treat contaminated alluvial groundwater that flows north and northwest of RMA along two primary pathways defined by the First Creek and Northern Pathway paleochannels. The OGITS was originally installed before completion of the Off-Post ROD but later became part of the Off-Post ROD remedy.

During the second five-year review (2000-2005), two groundwater-related issues were identified that required additional clarification or detail. Changes to the original remedy were then required to clarify the shut-off criteria and monitoring requirements for the groundwater treatment systems. It also became clear that there was a need to establish site-specific laboratory standards (known as PQLs) for analyzing groundwater samples to assess progress in meeting RMA groundwater treatment goals. Those changes resulted in the need for an Explanation of Significant Differences.

EXPLANATION OF SIGNIFICANT DIFFERENCES

This ESD summarizes modifications to the Groundwater Remediation Requirements that resulted from new information developed by the Army since the ROD was signed. The ROD is a document that describes and establishes the RMA's overall cleanup program. Significant changes to the ROD that are contained in the ESD include modifying the treatment system shut-off criteria and revising the PQL determination process.

During the Five-Year Review (FYR), two groundwater-related issues were identified that required additional clarification or detail. In evaluating the ROD extraction well shut-off criteria for groundwater treatment systems, it became apparent that the ROD language related to future requirements for shutting down the groundwater boundary systems was vague. It also became clear that shut-off decisions and monitoring programs should be tailored to the type, purpose and location of each treatment system. A detailed review of the shut-off monitoring requirements was performed for each groundwater treatment system during revision of the Long-Term Monitoring Plan for Groundwater and Surface Water (LTMP).

As a result, broad-scale shut-off criteria and requirements for each treatment system were identified based on the type of system. It was also decided that when a groundwater treatment system appears to have completed its function and is a candidate for system shut-down, a consultation with the regulatory agencies will occur that will result in the development of system-specific monitoring requirements. In addition, it was clarified that a five-year monitoring and evaluation period will be required prior to the physical shut-off of any system (or portion of a system) to assess whether the shut-down is appropriate.

A second issue identified during the FYR involved the PQL (laboratory standards) determination process for certain compounds remediated through the RMA groundwater treatment program. For those compounds, the groundwater treatment goals established for RMA are below the concentration levels that commercial laboratories are

currently able to detect. The levels that can be measured with confidence using typical commercially available methods are called PQLs.

During the FYR, it was decided that, based on ongoing changes to the RMA analytical programs and recent advancements in analytical technology, it would be beneficial to follow a standardized procedure for evaluating the analytical capabilities of several laboratories and establishing site-specific PQLs for RMA compounds.

The changes to the Groundwater Remediation Requirements, while resulting in the need for this ESD, do not in any way alter the overall hazardous waste management remedy that was selected in the ROD, nor are the implementation costs for the groundwater shut-off criteria and monitoring program and site-specific PQL determination process expected to result in a significant cost increase for the overall groundwater remedy.

These proposed changes are detailed in the “Explanation of Significant Differences for Groundwater Remediation Requirements” document dated March 21, 2012. The ESD is available for public review and comment (see bottom of fact sheet for locations).

WHAT ARE THE SIGNIFICANT CHANGES TO THE REMEDIATION PROJECT?

Changes to Groundwater Treatment System Shut-Off Criteria and Shut-Off Monitoring

The groundwater remedy has been modified to rely on input from regulatory personnel to better determine

when it is appropriate to shut down a groundwater treatment system and to develop specific monitoring requirements tailored to each system before, during and after shut off based on each system’s location and purpose.

The revised shut-off criteria and shut-off monitoring requirements consist of the following elements:

- The recommendation to initiate the shut-off process for a system or a discrete portion of a system will be based on the concentrations in the upgradient and cross-gradient water quality performance wells reported below their respective groundwater treatment goals. Consultation with the regulatory agencies will occur to decide if shut-off should proceed and if and what monitoring activities should be performed before shutting the system off. When the decision has been made to shut off a groundwater system, consultation with the regulatory agencies will occur to develop an appropriate, situation-specific monitoring program. Shut-off monitoring will begin after the entire extraction system, or a discrete portion of an extraction system, has been shut off to confirm that the groundwater remedy goal has been successfully achieved.
- Shut off of individual wells will be addressed under the operational monitoring program for each system as described in the 2010 Long-Term Monitoring Plan and in accordance with the *Operational Extraction Well Shut-Off Procedure*. Shut-off monitoring wells for system shut-off will be selected during the regulatory

agency consultative process and may be selected from key wells for each system. Shut-off monitoring will be performed for a minimum of five years with quarterly monitoring for the first and final years and annual monitoring for the intervening years. The duration of monitoring will be determined through consultation with the regulatory agencies and be documented in the sampling and analysis plan developed for each system.

- Any exceedance of the groundwater treatment goals during the first or second year of shut-off monitoring will trigger a restart of the shut-off monitoring period. If an exceedance occurs after the second year, an alternate shut-off monitoring schedule will be considered. The system will be restarted if concentrations are above the groundwater treatment goals for two consecutive sampling years.
- Permanent system shut off may occur following the shut-off monitoring performance period. Ultimately, a post-shut-off monitoring program will be performed for each system.

Addition of a Procedure to Establish Site-Specific PQLs

The RVO developed a procedure for establishing site-specific PQLs that requires PQL studies for analytes where the laboratory reporting limits are above the limits set for the RMA groundwater treatment goals. The PQL studies will be conducted in accordance with 40 Code of Federal Regulations 136 Appendix B and the PQL Guidance of the Colorado Department of Public Health and Environment.

The results of the PQL studies will be provided in a PQL Study Report, which will be provided along with supporting data to the regulatory agencies for review and validation. The site-specific PQLs determined from these studies will be implemented at RMA and will replace PQLs identified in the RODs.

A summary of groundwater remediation requirements changes is included in Table 1 on the next page.

SITE HISTORY

RMA is located in Adams County, Colorado, approximately 10 miles northeast of downtown Denver.

The RMA On-Post OU currently encompasses 1.7 square miles (1,084 acres) and is on the EPA's National Priorities List (NPL) for environmental cleanup as a result of contamination released during previous RMA operations. Groundwater underlying the central and northwestern portions of the site, approximately 15.5 square miles (9,920 acres), remains on the NPL. The On-Post ROD, which describes the site-wide remedy for the RMA, was signed by the U.S. Army, EPA, and the State of Colorado, with concurrence from Shell Oil Co. and the U.S. Fish and Wildlife Service, on June 11, 1996. The selected remedy includes 31 different cleanup plans for soils, structures and the treatment of groundwater contaminants.

The ROD for the Off-Post OU was finalized on Dec. 19, 1995, and was also signed by the Army, EPA and State of Colorado. The selected off-post remedy consists primarily of treatment of groundwater contaminants.

The RMA was established in 1942 by the U.S. Army to manufacture chemical warfare agents and incendiary munitions for use as a deterrent in World War II.

Following the war and through the early 1980s, the facilities continued to be used by the U.S. Army.

Table 1: Changes to Groundwater Remedy

ROD-Prescribed Remedy	Modification
Continued operation of the Boundary Treatment Systems (On-Post and Off-Post ROD)	No Change. Boundary treatment systems continue to operate in accordance with the On-Post and Off-Post RODs.
Continued operation of existing on-post groundwater IRA systems (Rail Yard Containment System and Basin A Neck Containment System) (On-Post ROD)	No Change. The Rail Yard and BANS continue to operate in accordance with the On-Post ROD.
Continued operation of the Off-Post Groundwater Intercept and Treatment System (Off-Post ROD)	No Change. The OGITS continues to operate in accordance with the Off-Post ROD.
<p>Shut-Off Criteria (On-Post and Off-Post ROD)</p> <ul style="list-style-type: none"> • Wells can be removed from production when contaminant concentrations are less than RMA groundwater treatment goals • Wells permanently removed from production are monitored quarterly for five years • Wells turned off for hydraulic purposes are not subject to the shut-off monitoring requirement • Extraction wells removed from production for water quality reasons will be placed back into production if shut-off monitoring shows contaminant concentrations exceed RMA groundwater treatment goals 	<ul style="list-style-type: none"> • No Change. Shut-off of individual wells will be addressed under the operational monitoring program for each system as described in the 2010 LTMP and in accordance with the <i>Operational Extraction Well Shut-Off Procedure</i>. • Change. Shut-off monitoring will be performed for a minimum of five years with quarterly monitoring for the first and final years and annual monitoring for the intervening years. The duration of monitoring will be determined during the consultative process and documented in an SAP. Change. Shut-off monitoring begins when the entire system, or discrete portion of the system, is shut off. Shut-off monitoring wells are identified through the consultative process. • Change. Monitoring is addressed by the operations and performance monitoring programs for each system as described in the 2010 LTMP and in accordance with the <i>Operational Extraction Well Shut-Off Procedure</i>. Shut-off monitoring for individual wells that are turned off prior to system shut off will be evaluated during the consultative process for system shut off. • Change. Exceedance of groundwater treatment goals during the first or second year of shut-off monitoring will trigger a restart of the shut-off monitoring period. If exceedance of groundwater treatment goals occurs after the second year, the consultative process will be initiated to determine an alternate shut-off monitoring schedule. Restart system if concentrations are above groundwater treatment goals for two consecutive sampling years.

<p>PQLs are identified in the On-Post and Off-Post RODs based on analytical methods available at the time (On-Post and Off-Post ROD)</p>	<p>Enhance by defining the process for establishing site-specific PQLs. PQL studies will be conducted in accordance with 40 CFR 136 Appendix B, CDPHE PQL Guidance, and approved site-specific procedures and work plans. The site-specific PQLs determined from these studies will be implemented at RMA and will replace PQLs identified in the RODs.</p>
--	--

Beginning in 1946, some facilities were leased to private companies to manufacture industrial and agricultural chemicals. Shell, the principal lessee, manufactured pesticides from 1952 to 1982. Common industrial and waste disposal practices used during these years resulted in contamination of structures, soil, surface water and groundwater.

All fieldwork related to the 31 environmental cleanup projects outlined in the ROD has been successfully completed, within budget and a year ahead of schedule. Documentation related to program completion will conclude in 2012. Groundwater treatment will continue until all water leaving the site meets federal and state standards. Long-term operations, maintenance, and monitoring are ongoing.

With the environmental cleanup concluding, the transformation of the Rocky Mountain Arsenal into a premier urban national wildlife refuge is nearly complete.

The Rocky Mountain Arsenal National Wildlife Refuge was officially established in 2004, when approximately 5,000 acres of RMA land was transferred from the Army to the U.S. Fish and Wildlife Service (Service) after the land was removed from EPA's NPL. In 2006, a second land transfer expanded the Refuge to 12,000 acres. In September 2010, the Army transferred

another 2,500 acres to the Service, bringing the Refuge to its final size of roughly 15,000 acres. The 1,084 remaining acres, which contain the landfills, soil cover areas and groundwater treatment plants, will be permanently retained by the Army to ensure the remedy performs as designed and remains protective of human health and the environment.

The Refuge now provides environmental education and interpretive programs, catch-and-release recreational fishing, close to nine miles of trails, wildlife viewing opportunities and site tours for the public. The Refuge also offers sanctuary to more than 330 species of animals, including wild bison, deer, coyotes, bald eagles and burrowing owls.

OPERABLE UNITS

The RMA includes two Operable Units. The On-Post Operable Unit addresses contamination within the RMA boundaries. The Off-Post Operable Unit addresses groundwater contamination north and northwest of the RMA.

The overall remedy required by the 1996 ROD for the On-Post Operable Unit (OU) included:

- Interception and treatment of contaminated groundwater.
- Construction of two on-post RCRA-compliant landfills.
- Demolition of structures with no designated future use and disposal of the debris in either the two landfills

or the Basin A consolidation area, depending upon the degree of contamination.

- Containment of contaminated soil in the on-post landfills, under caps/covers, or through treatment, depending upon the type and degree of contamination. Areas that have caps or covers require long-term maintenance and will be retained by the Army. These areas will not be part of the Rocky Mountain Arsenal National Wildlife Refuge.
- Institutional controls that prohibit use of the property for residential, agricultural, or industrial purposes; use of the groundwater or surface water as a source of potable water; consumption of fish or game taken at RMA; and access restrictions to capped and covered areas.

The overall remedy required by the 1995 ROD for the Off-Post Operable Unit included:

- Operation of the Off-Post Groundwater Intercept Treatment System, including extraction of contaminated groundwater north of the RMA boundary in the First Creek and northern paleochannels, treatment of organic chemicals of concern using carbon adsorption, and recharge of treated groundwater.
- Attenuation of inorganic chloride and sulfate concentrations to meet applicable standards for groundwater in a manner consistent with the on-post remedial action.
- Continued operation of groundwater treatment systems within and at RMA boundaries, with facility improvements as necessary.
- Long-term groundwater monitoring (including monitoring after groundwater treatment has ceased)

continues, to assure compliance with the groundwater treatment goals.

- Exposure control through provision of alternate water supply for well owners located within the diisopropylmethylphosphonate (DIMP) plume footprint or otherwise as described in the Off-Post ROD.
- Institutional controls to prevent the use of groundwater exceeding remediation goals.
- Closure of poorly constructed wells within the Off-post Study Area that could be acting as migration pathways for contaminants found in the Arapahoe Aquifer.

SITE CONTAMINATION

The contaminated areas within the On-Post Operable Unit included approximately 3,000 acres of soil, 15 groundwater plumes and 798 structures. The most highly contaminated sites were identified in South Plants (i.e., Central Processing Area, Hex Pit, Buried M-1 Pits, Chemical Sewers), Basins A and F, the Lime Basins, and the U.S. Army and Shell Trenches. The primary contaminants found in the soil and/or groundwater at these areas were pesticides, solvents, heavy metals, and chemical agent by-products.

The most contaminated areas (those showing the highest concentrations and/or the greatest variety of contaminants) were located in the central manufacturing, transport and waste disposal areas. The highest contaminant concentrations occurred in soil within about five feet of the ground surface, though the higher contamination was also found at greater depths, particularly where burial trenches, disposal basins or manufacturing complexes were located.

The characteristics and locations of the groundwater plumes suggest that the greatest contaminant releases to the groundwater occurred from Basin A and the Lime Basins, the South Plants chemical sewer, the South Plants tank farm and production area, the Complex (Army) and Shell Trenches in Section 36, and the former Basin F. The Motor Pool/Rail Yard and North Plants areas were other sources of contaminant releases to the groundwater.

PUBLIC PARTICIPATION

The Army published a public notice in the Denver Post on March 23, 2012, making this draft ESD available for public review and comment. Notices were also published in the Brighton Blade and Gateway News.

A presentation explaining the proposed changes contained in the ESD was provided to the RMA Restoration Advisory Board (RAB) on November 9, 2010. The RAB is a community group that meets periodically to receive information and provide input on the cleanup being conducted at the RMA. The public comment period will close on April 23, 2012.

The requirements set out in the National Contingency Plan, Section 300.435©(2)(i) have been met. This ESD and all documents that support the changes and clarifications are part of the Administrative Record and are available at the Joint Administrative Records and Document Facility (JARDF) and the EPA Region 8 Superfund Records Center. The JARDF can be reached at 303-289-0983.

Hours of operation are Monday through Friday 12 p.m. to 4 p.m. or by appointment. EPA's Superfund Record Center can be reached at 303-312-7287. Hours of operation are Monday through Friday from 8 a.m. to 4 p.m.