1. Introduction

1.1 Statement of Purpose

The Colorado Natural Resource Trustees (the Trustees) are assessing natural resource damages (NRDs) caused by releases of hazardous substances at the Rocky Mountain Arsenal (the Arsenal), located in Adams County, Colorado. Under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), also known as the Superfund law, parties responsible for releases of hazardous substances are liable for "damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss resulting from such a release" [42 USC § 9607(a)]. While the goal of the Superfund cleanup program is to address any threats to human health and the environment, the goal of the NRD provisions is to restore the environment to the state it would have been in had the pollution not occurred, and to compensate the public for the losses of natural resources up to the time that such restoration is complete. Restoration can be accomplished by directly restoring the injured resource, or by rehabilitating, replacing, or acquiring equivalent resources. Restoration as used in this document refers to all four types of activities.

With the publication of this Assessment Plan, the Trustees' assessment is being formally initiated pursuant to the U.S. Department of the Interior's (DOI's) natural resource damage assessment (NRDA) regulations [43 CFR Part 11]. The purpose of the Assessment Plan is to document the Trustees' basis for conducting a damage assessment, and to set forth the proposed approaches for quantifying natural resource injuries and calculating damages associated with those injuries. The Assessment Plan enables the Trustees to ensure that the NRDA will be completed at a reasonable cost. The Plan informs responsible parties (RPs) and the public of the proposed assessment methods so that stakeholders can participate in the assessment process productively. The RPs at the Arsenal are Shell Oil Company (Shell) and the U.S. Department of Army (Army).

1.2 The Rocky Mountain Arsenal

The Arsenal is a federally-owned facility in Adams County, Colorado, just northeast of the Denver metropolitan area and southwest of Denver International Airport. In 1942, the Army purchased this 27 square-mile property for the manufacture of chemical warfare agents, nerve agents, and incendiary munitions. Agents and munitions included rockets and projectiles containing blister agents (e.g., mustard gas), Sarin nerve agent, lewisite, phosgene bombs, incendiary bombs, and napalm. The Army used the Arsenal for "demilitarization" of nerve agents and bombs into the 1980s. It also stored and transported raw materials, and disposed of

manufacturing byproducts, unexploded munitions, and other wastes on-site. These activities resulted in the release of hazardous substances to soil, groundwater, surface water, and air.

After World War II, the Army leased portions of the site to private industry, primarily Shell. Shell manufactured pesticides, insecticides, herbicides, and other chemicals at the Arsenal from 1952 to 1982, and disposed of wastes on-site. These activities also resulted in the release of hazardous substances to soil, groundwater, surface water, and air. Later chapters of this Plan discuss the site's history, manufacturing, and cleanup operations in detail.

The Environmental Protection Agency (EPA) listed most of the Arsenal on the Superfund National Priorities List (NPL)¹ on July 11, 1987.² The remainder – the waste disposal impoundment known as Basin F – was included on March 13, 1989.³ Since 1989, the Army's sole mission at the Arsenal has been cleanup. The final environmental remediation plan was contained in two records of decision (RODs) finalized in 1995 and 1996. At the time, the Army anticipated completion of remediation, excluding the continued treatment of groundwater, by 2011. That estimate has now been revised to 2010.

1.3 The Assessment Plan

This Assessment Plan is divided into nine chapters. The remainder of Chapter 1 describes the State Trustees' authority for conducting an NRDA and the process that the Trustees intend to follow. Chapter 2 provides a general description of the site and the assessment area, includes a history of operations at the Arsenal, and identifies both the sources of contamination and the hazardous substances released. Chapter 3 discusses the remediation activities on- and off-post, and the long-term efficacy of the selected response actions. Chapter 4 discusses the exposure pathways from sources of released hazardous substances to the injured natural resources, and presents data confirming exposure of natural resources to hazardous substances. Chapter 5 describes groundwater resources in the assessment area, provides examples of approaches and illustrative calculations for assessing injury to groundwater, and discusses services lost due to contamination. Chapter 6 describes wildlife resources and outlines the anticipated assessment approaches for quantifying injury to wildlife. Chapter 7 describes air injuries in the assessment area, and identifies the anticipated assessment methodology for that resource. Chapter 8 discusses the approaches to be used for damage determination and restoration planning and

^{1.} CERCLA mandated the NPL to identify the worst contaminated sites in the country. These sites were to be the priorities for the federal cleanup program [42 USC § 9605(a)(8)(B)].

^{2. 52} FR 27619.

^{3. 54} FR 10512.

costing, and Chapter 9 discusses methods specifically intended for calculating groundwater damages, including both lost use and lost passive or non-use values.

1.4 Trusteeship Authority

1.4.1 State Trustees

The Executive Director of the Colorado Department of Public Health and Environment (CDPHE), the Director of the Division of Reclamation, Mining and Safety within the Colorado Department of Natural Resources, and the Attorney General of Colorado are the three natural resource Trustees for the State. The National Contingency Plan (NCP), which constitutes CERCLA's implementing regulations, provides that "[s]tate trustees shall act on behalf of the public as trustees for natural resources, including their supporting ecosystems, within the boundary of a state or belonging to, managed by, controlled by, or appertaining to such state" [40 CFR §300.605]. Natural resources include land, fish, wildlife, biota, air, water, groundwater, and drinking water supplies belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by a government [42 USC § 9601(16)].

1.4.2 Trusteeship

The DOI regulations require Trustees to provide a statement of authority for asserting trusteeship, or co-trusteeship, for those natural resources considered within the Assessment Plan [43 CFR 11.31(a)(2)]. The basis for the State's assertion of trusteeship over each injured resource is explained below.

Water

Colorado's Constitution states that "[t]he water of every natural stream, not heretofore appropriated, within the State of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the State, subject to appropriation as hereinafter provided" [Colo. Const. Art. XVI, §5; CRS § 37-92-102]. This includes water "hydraulically connected to" tributary groundwater if "it can influence the rate or direction of movement of the water in [the] alluvial aquifer or natural stream" [CRS § 37-92-103(11)]. These provisions confirm the State's trust interest in the waters of the State. In addition, pursuant to its sovereign or trust interest, the State exercises management and control over water – and the use of surface and groundwater – whether tributary or not. For example, CRS § 37-82-101 *et seq.* and CRS § 37-92-102 *et seq.* regulate the appropriation of surface water and tributary groundwater, and CRS § 37-90-102 *et seq.* regulates the appropriation of deep groundwater such as the water in the lower aquifers underlying the Arsenal. Further, among other State water

quality regulatory authorities, the CDPHE has authority pursuant to CRS § 25-8-101 *et seq.* to enforce promulgated water quality standards [5 CCR 1002-41 (Regulation 41), and 5 CCR 1002-31 (Regulation 31)]. A state's natural resource trusteeship over its waters has been recognized in a number of cases, including a recent Tenth Circuit decision.⁴

Wildlife

All wildlife in Colorado that is not privately owned is the property of the State [CRS § 33-1-101 (2)]. The Colorado Division of Wildlife (DOW) and the Wildlife Commission manage and control wildlife for the benefit of the people, including the taking, possession, and the use of wildlife, pursuant to Articles 1 through 6 of Title 33 of the Colorado Revised Statutes, and the rules and regulations promulgated by the Wildlife Commission [2 CCR § 406 (2006)]. This control extends to federal military installations. For example, 10 USC § 2671 requires all hunting and fishing on a military reservation to "be in accordance with the fish and game laws of the State in which it is located." Thus, ownership, trusteeship, and management and control form the basis of the State's trusteeship over wildlife resources.

Air

As far back as 1907, the Supreme Court recognized the unique trust interest of states in the air breathed by their citizens.⁵ Colorado law states that "the prevention, abatement, and control of air pollution in each portion of the state are matters of statewide concern and are affected with a public interest and that the provisions of [Article 25] are enacted in the exercise of the police powers of this state for the purpose of protecting the health, peace, safety, and general welfare of the people of this state" [CRS § 25-7-102 and 5 CCR § 1001-2]. Thus, through its recognized public trust interest, and because of its extensive management and control, the State asserts trusteeship over the air resources adversely affected by Arsenal releases.

Co-trusteeship

The United States claims co-trusteeship for natural resources at the Arsenal through the Army and the U.S. Fish and Wildlife Service (USFWS).

1.5 Restoration and Compensation Determination Plan

The DOI regulations require Trustees to develop a Restoration and Compensation Determination Plan (RCDP). This Plan can be included with the Assessment Plan if existing data are available.

^{4.} New Mexico v. General Electric, 467 F.3d 1222, 1243 (10th Cir. 2006).

^{5.} Georgia v. Tennessee Copper Co., 27 S.Ct. 618, 619 (1907).

If sufficient data are not available for the Assessment Plan, the RCDP may be developed at any time before the completion of the Injury Quantification phase, and published separately. The Trustees have determined that separate publication of the RCDP will be necessary at this site.

1.6 Natural Resource Damage Assessment Process

The DOI regulations establish a process for Trustees to follow when assessing NRDs, including pre-assessment, assessment, and post-assessment phases. The use of these regulations is optional, but an NRDA performed in accordance with these regulations has the force and effect of a rebuttable presumption in any administrative or judicial proceeding to recover NRDs [42 USC § 9607(f)(2)(C)]. A rebuttable presumption means that the opposing party has the burden of producing evidence to overcome or rebut the presumption that the Trustees' assessment should form the basis of the damage award.

The assessment process described in the NRDA regulations involves four major components:

- 1. The Preassessment Screen Determination (PASD)
- 2. The Assessment Plan
- 3. The Assessment
- 4. The Report of Assessment.

1.6.1 Completion of Preassessment Screen Determination

Pursuant to the DOI NRDA regulations, the Trustees conducted a preassessment screen "to provide a rapid review of readily available information" on trust natural resources that may have been injured by releases of hazardous substances [43 CFR § 11.23(b)]. In accordance with the criteria at 43 CFR § 11.23(e), the PASD supported the conclusion that there is a reasonable likelihood that State natural resources have been injured as a result of hazardous substance releases, that sufficient data exist to conduct an assessment, and that response actions will not remedy the injury to natural resources without further actions. Therefore, the Trustees concluded that an NRDA should be undertaken to develop a damage claim under 42 USC § 9607.

1.6.2 The Assessment Plan and Selection of Type B Procedures

The assessment phase begins with the Assessment Plan. This document serves as the work plan for the NRDA. The Assessment Plan is being provided for public review to help the Trustees ensure that the NRDA proceeds efficiently, using data and methodologies appropriate for the site and resources involved. This Assessment Plan was prepared in accordance with the NRDA regulations promulgated by the DOI at 43 CFR § 11.31.

Under DOI's NRDA regulations, the Trustees must elect to perform a Type A or Type B NRDA [43 CFR § 11.33]. Type A assessments use "simplified procedures that require minimal field observation" [43 CFR § 11.33(a)]. Type A procedures are inapplicable in this case because they are designed to address minor releases of short duration resulting from a single event. Further, the DOI has promulgated Type A regulations only for coastal/marine or Great Lakes environments [43 CFR §§ 11.33, 11.34]. Thus, Type A procedures cannot be used at the Arsenal. The Trustees will use the Type B provisions.

1.6.3 Assessment Phase

Under the DOI Type B procedures, three parts comprise the assessment:

- 1. **Injury Determination Phase.** The first phase of the assessment determines whether injury to the natural resources has occurred and whether the injury has resulted from the release of hazardous substances.
- 2. **Quantification Phase.** The second phase quantifies the injuries and the reduction of services provided by the natural resources. Services provided by various resources may include such things as habitat for wildlife and drinking water for the public.
- 3. **Damage Determination Phase.** In the third phase, the monetary compensation for injury is calculated. This phase is based upon the RCDP that, among other things, describes possible alternatives for restoration or replacement of the injured natural resources and their related services. All damages ultimately recovered by RPs must be spent to restore, replace, or acquire equivalent natural resources.

1.6.4 The Report of Assessment

Upon completion of the assessment, the Trustees will prepare a Report of Assessment, which will include the results of analyses performed during assessment. It will also include the Trustees' Restoration Plan. Like this Report, the Assessment Plan will be provided to stakeholders for public comment.

Based on the final Report, the Trustees can make a demand on the RPs for NRDs. If the demand is accepted or some compromise is negotiated, or if the Trustees prevail at trial, any recoveries will be placed in a special account to fund restoration projects, and the Trustees may revise their Restoration Plan to be sure that it can be implemented with the damages recovered. Sometimes RPs choose to conduct appropriate restoration projects themselves instead of paying damages, or a settlement may include both restoration and monetary components. The Trustees can also

recover the reasonable costs of performing an NRDA as part of their NRD claim. Examples of reasonable and necessary costs are set forth in 43 CFR § 11.60(d).

1.7 Coordination

1.7.1 Coordination with response agencies and activities

Coordination with response agencies is desirable to avoid duplication, reduce costs, and achieve dual objectives where practical. The Remedial Investigation (RI) for the Arsenal was completed in 1992. The RODs, setting forth the final remedies for the off-post and on-post areas, were finalized in 1995 and 1996, respectively. The completion of remedial actions, excluding the continued treatment of groundwater, is currently anticipated in 2010.

In preparing the PASD, the Trustees relied on existing data from the remedial process and, based upon preliminary review, intend to rely extensively on those data in conducting the NRDA. Extensive field sampling and studies in addition to those already conducted for the Remedial Investigation/Feasibility Study (RI/FS) and other cleanup purposes are currently not envisioned.

While the Trustees intend to use the existing response agency data from the site, an extensive data set from the RI does not preclude the need for injury assessment, and the implemented remedial actions do not preclude the existence of past and ongoing NRDs. Damages have been incurred since the passage of CERCLA, as provided in the DOI regulations [43 CFR § 11.15(a)(1)]. In addition, because the remediation alone will not achieve full restoration of injured natural resources and the services provided by those resources, damages will continue to be incurred after the implemented remedy is complete in 2010.

1.7.2 Coordination with co-Trustees and responsible parties

The State Trustees formally invited the Army and Shell to participate in the State's NRDA. The Trustees sent a Notice of Intent to perform an NRDA to Shell and the Army with the PASD in February 2007. Shell and the Army have indicated a desire to be involved. The Army also indicated that it will conduct its own PASD. The Trustees and the RPs have shared information in the context of settlement negotiations and in anticipation of a formal assessment. The State Trustees will continue to work with the RPs and federal co-trustees in implementing this Assessment Plan.

1.8 Fundamental Terms and Concepts

Individuals familiar with the cleanup process under Superfund and at the Arsenal may not be as conversant with the NRD process. To aid in the public's review of this Assessment Plan, key terms are defined below. In addition, a list of acronyms is provided at the front of this document, and a glossary of uncommon terms is provided at the end. The terms and concepts defined below will recur in subsequent chapters dealing with injury and damage calculations.

Baseline refers to the conditions that would have existed in the assessment area had the release of hazardous substances not occurred [43 CFR § 11.14 (e)]. This is not the same as "pre-release" conditions because disturbances to the assessment area might have decreased resource services without the release of hazardous substances. For example, if a release were to occur in an area with ongoing development, the Trustees should evaluate the probable condition of the resource assuming development occurred.

Damages is the amount of money needed to satisfy a claim in court. In the context of NRDs, that amount includes the cost to perform an NRDA and to restore injured natural resources to baseline conditions. The amount also includes compensation for interim losses. NRDs continue to accrue until restoration and replacement projects result in the complete recovery of resources or services to baseline conditions. "Residual damages" is a term used to describe any damages that remain after remediation is complete.

Injury is a measurable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource resulting either directly or indirectly from exposure to a release of a hazardous substance, or exposure to a product of reactions resulting from the release of a hazardous substance [43 CFR § 11.14(v)]. Definitions of injuries to specific natural resources are provided in the NRDA regulations at 43 CFR § 11.62, and are included in Chapters 5 to 7 as each injured resource is discussed.

Interim losses refer to injuries (and associated service losses) that accrue until injured resources and the services they provide are returned to baseline conditions. The start date for calculating interim losses is either the time of release or December 1980 (following enactment of CERCLA), whichever comes later.

Response actions refer to activities taken to reduce threats from contaminants to acceptable levels. Short-term actions are generally termed *removals*, and long-term, final response actions are considered *remedial actions* [42 USC § 9601(23) and (24)]. Short-term response actions include initial response actions such as spill containment; long-term actions include permanent treatment or containment of contamination, and revegetation of disturbed areas. Under CERCLA, remedial actions must be protective of human health and the environment.

Restoration refers to actions undertaken to return injured resources and the services they provide to baseline conditions, and additional actions to compensate for interim losses of natural resources and their services. For example, restoration of riparian habitat along a stream might increase the number of birds that use the habitat for food or shelter. Restoration actions can take place off-site, away from the assessment area, or on-site, if the restoration actions improve the condition of the injured resources above levels necessary to satisfy cleanup goals. The term *restoration* may refer to direct restoration of injured resources, replacement of injured resources, or acquisition of the equivalent of such resources.

Service flows refer to the services provided by a resource over time. For example, remediation and restoration activities can increase the service flows provided by a resource.

Services are the "physical and biological functions performed by the resource, including the human uses of those functions" [43 CFR § 11.14 (nn)]. Habitat services include, for example, the provision of food and shelter for all kinds of animals, nutrient cycling, contaminant filtering, and aesthetic and recreational services for humans.

1.9 Public Review and Comment

The Assessment Plan will be available for public comment for 30 days following publication of a notice of availability in newspapers of statewide circulation. It can be accessed at http://www.cdphe.state.co.us/hm/rma.htm. An extension to the public comment period may be granted if requested and found to be reasonable and appropriate. Questions can be directed to vicky.peters@state.co.us or 303-866-5068; or jeff.edson@state.co.us or 303-692-3388. Comments can also be sent to:

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The Assessment Plan may be modified in the future. If a significant modification is made, the revised Plan will be provided to the public for comment.