EPA/ROD/R08-96/128
1996

EPA Superfund
Record of Decision:

ROCKY MOUNTAIN ARSENAL (USARMY)
EPA ID: CO5210020769
OU 04
ADAMS COUNTY, CO
12/19/1995

<IMG SRC 0896128>
<IMG SRC 0896128A>

Rocky Mountain Arsenal
Offpost Operable Unit
Final Record of Decision
Rocky Mountain Arsenal
Commerce City, Colorado

Harding Lawson Associates

REQUESTS FOR COPIES OF THIS DOCUMENT
SHOULD BE REFERRED TO THE PROGRAM MANAGER
FOR ROCKY MOUNTAIN ARSENAL
AMXRM-PM, COMMERCE CITY, COLORADO 80022

This document complies with the
National Environmental Policy Act of 1969,

ROCKY MOUNTAIN ARSENAL - COMMERCE CITY, COLORADO - 80022-2190

Rocky Mountain Arsenal
Offpost Operable Unit
Final Record of Decision
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared for

Program Manager for Rocky Mountain Arsenal
Building 111, Rocky Mountain Arsenal
Commerce City, Colorado 80022-2180

HLA Project No. 21905 402010
Contract No. DAAA05-92-D-0003
Delivery Order No. 0005

THIS DOCUMENT IS INTENDED TO COMPLY WITH THE NATIONAL EVIRONMENTAL POLICY ACT OF 1969.

THE INFORMATION AND CONCLUSIONS PRESENTED IN THIS REPORT REPRESENT THE OFFICIAL POSITION OF THE DEPARTMENT OF TIHE ARMY UNLESS EXPRESSLY MODIF1ED BY A SUBSEQUENT DOCUMENT. THIS REPORT CONSTITUTES THE RELEVANT PORTION OF THE ADMINISTRATIVE RECORD FOR THIS CERCLA OPERABLE UNIT.

December 19, 1995

<IMG SRC 0896128A1>

CONTENTS

DECLARATION
STATEMENT DS-1

1.0 SITE NAME, LOCATION, AND DESCRIPTION.....1-1

1.1 Environmental Setting.....1-2

1.2 Geology.....1-2

1.3 Hydrogeology.....1-3

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES.....2-1

2.1 Operational History.....2-1
2.2 Previous Investigations.....2-2
2.2.1 U.S. Environmental Protection Agency Study Area.....2-2
2.2.2 U.S. Department of the Investigation.....2-3

2.3 Boundary Containment Systems.....2-4
2.3.1 North Boundary Containment System.....2-5
2.3.2 Northwest Boundary Containment System.....2-6
2.3.3 Irondale Containment System.....2-6

2.4 Interim Response Actions.....2-7
2.4.1 Offpost Interim Response Action.....2-7

2.5 History of CERCLA Enforcement Activities.....2-8

3.0 HIGHLIGHT'S OF COMMUNITY PARTICIPATION.....3-1

4.0 SCOPE AND ROLE OF THE OFFPOST OPERABLE UNIT.....4-1

5.0 SUMMARY OF SITE CHARACTERISTICS.....5-1

5.1 Sources of Contamination.....5-1

5.2 Nature of Contamination.....5-1

5.3 Contamination Migration Pathways.....5-2

5.4 Extent of Contamination.....5-3
5.4.1 Groundwater.....5-3
5.4.2 Surface Water.....5-4
5.4.3 Stream-bottom Sediments.....5-5
5.4.4 Surface and Subsurface Soil.....5-5
5.4.5 Biota.....5-6

5.5 Potential Routes of Human and Environmental Exposure.....5-7

6.0 SUMMARY OF SITE RISKS.....6-1

6.1 Human Health Risks.....6-2
6.1.1 Identification of Chemicals of Concern.....6-2
6.1.2 Exposure Assessment.....6-3
6.1.2.1 Offpost Study Area Exposure Assessment Zones.....6-3
6.1.2.2 Offpost Study Area Potential Exposure Points.....6-5
6.1.2.3 Potential Exposure Pathways and Routes.....6-6
6.1.2.4 Estimation of Chemical Intake.....6-8
6.1.3 Toxicity Assessment.....6-8
6.1.4 Risk Characterization.....6-9

6.1.4.1 Carcinogenic Risks.....6-9
6.1.4.2 Noncarcinogenic Effects.....6-10

6.2 Estimation of Potential Ecological Effects.....6-11
6.2.1 Method.....6-11
6.2.2 Results 6-13

6.3 Conclusion.....6-14

7.0 DESCRIPTION OF GROUNDWATER REMEDIATION ALTERNATIVES.....7-1

7.1 Common Elements of Alternatives.....7-4

7.2 Identification of Groundwater Alternatives: North Plume Group.....7-6
7.2.1 Alternative N-1: No Action.....7-6
7.2.2 Alternative N-2: Continued Operation of the North Boundary Containment System With Improvements as Necessary.....7-6
7.2.3 Alternative N-4: Offpost Groundwater Intercept and Treatment System....7-7
7.2.4 Alternative N-5: Expansion of the Offpost Groundwater Intercept and Treatment System.....7-10

7.3 Identification of Groundwater Alternatives: Northwest Plume Group.....7-12
7.3.1 Alternative N-1: No Action 7-12
7.3.2 Alternative NW-2: Continued Operation of the Northwest Boundary Containment System With Improvements as Necessary.....7-13

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES.....8-1

8.1 Comparative Analysis of Remedial Alternatives.....8-2
8.1.1 Overall Protection of Human Health and the Environment.....8-3
8.1.2 Compliance With Applicable or Relevant and Appropriate Requirements....8-4
8.1.3 Long-term Effectiveness and Permanence.....8-5
8.1.4 Reduction in Toxicity, Mobility, or Volume.....8-6
8.1.5 Short-term Effectiveness.....8-6
8.1.6 Implementability.....8-7
8.1.7 Cost.....8-9
8.1.8 State Acceptance.....8-10
8.1.9 Community Acceptance.....8-11

8.2 Conclusions of the Comparative Analysis of Alternatives.....8-11

9.0 IDENTIFICATION OF THE SELECTED REMEDY.....9-1

9.1 Alternative N-4: Offpost Groundwater Intercept and Treatment System.....9-1

9.2 Alternative NW-2: Continued Operation of the Northwest Boundary Containment System with Improvements as Necessary.....9-3

9.3 Additional Components of the Selected Remedy.....9-5

9.4 Cost of Selected Remedy.....9-6

9.5 Limitations.....9-6

9.6 Criteria for Shutting Down Boundary and Offpost. Containment Groundwater Systems.....9-7

10.0 STATUTORY DETERMINATIONS.....10-1

10.1 Consistency with the Statutory Requirements of CERCIA in Section 121.....10-1
10.1.1 Protection of Human Health and the Environment.....10-1
10.1.2 Compliance With Applicable or Relevant and Appropriate Requirements.....10-2

10.1.3 Cost Effectiveness.....10-3
10.1.4 Utilization of Permanent Solutions to the Maximum Extent Practicable.....10-4

10.2 Consistency with the National Contingency Plan.....10-4

10.3 Summary.....10-5

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES.....11-1

12.0 GLOSSARY.....12-1

13.0 BIBLIOGRAPHY.....13-1

TABLES

6.1 Offpost Operable Unit Groundwater Chemicals of Concern
6.2 Offpost Operable Unit Surface-Water Chemicals of Concern
6.3 Offpost Operable Unit Sediment Chemicals of Concern in First Creek
6.4 Offpost Operable Unit Soil Chemicals of Concern
6.5 Summary of Land-Use Scenarios and Exposure Routes by Zone
6.6 Reference Doses and Slope Factors for Chemicals of Concern
6.7 Summary of Reasonable Maximum Exposure Carcinogenic Risks by Zone and Exposure Route
6.8 Summary of Adult Reasonable Maximum Exposure Noncarcinogenic Hazard Indices by Target Organ and Exposure Assessment Zone
7.1 Containment System Remediation Goals for the Offpost Groundwater Intercept and Treatment System
7.2 Containment System Remediation Goals for the North Boundary Containment System
7.3 Containment System Remediation Goals for the Northwest Boundary Containment System
7.4 Groundwater Alternatives for the North and Northwest Plume Groups
8.1 Summary of the Detailed Analysis and Ranking of Groundwater Alternatives for the North Plume Group
8.2 Summary of the Detailed Analysis and Ranking of Groundwater Alternatives for the Northwest Plume Group
9.1 Estimated Costs of the Offpost Operable Unit Selected Remedy
10.1 Summary Evaluation of Chemical-specific and Other Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit
10.2 Summary Evaluation of Action-specific Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit
10.3 Summary Evaluation of Location-specific Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit

FIGURES

1.1 Rocky Mountain Arsenal Operable Units and Offpost Study Area
2.1 Locations of Contaminant Source Areas
5.1 Contaminant Migration Pathways
6.1 Offpost Study Area Exposure Assessment Zones
6.2 Site Conceptual Model for the Offpost Study Area
6.3 Ecological Site Conceptual Model for the Offpost Study Area
7.1 Alternative N-4 Remedial System Components
7.2 Alternative N-5 Remedial System Components
9.1 Offpost Area of Revegetation

APPENDIXES

A RESPONSIVENESS SUMMARY
B INSTITUTIONAL CONTROLS
C WELL CLOSURE CRITERIA

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Rocky Mountain Arsenal
Offpost Operable Unit
Commerce City, Adams County, Colorado

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Rocky Mountain Arsenal (RMA)
Offpost Operable Unit (OU) in southern Adams County, east of Commerce City, Colorado, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Environmental Policy Act (NEPA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for the Offpost OU, and this document explains the basis and purpose of the selected remedy for the Offpost OU.

ASSESSMENT OF THE SITE

The Offpost Study Area risk assessment showed that even without remedial action, the baseline cumulative cancer risks from contamination in surface water, soil, sediment, air, and groundwater are within the acceptable cancer risk range established by the U.S. Environmental Protection Agency (EPA). However, several site-specific factors suggest that remedial alternatives for groundwater should be developed. These site-specific factors are: (1) groundwater contributes a maximum of 2 x 10-4, or approximately 75 percent of the total carcinogenic risk, (2) maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs), and Colorado Basic Standards for Groundwater (CBSGs) are exceeded for some groundwater contaminant , and (3) hazard indices (H1s) for children exceed 1.0 in Zones 2, 3, and 4. Although the hazard indices exceed 1.0 in Zones 2, 3, and 4, the bulk of the HI value is contributed through an assumed domestic use of alluvial groundwater, which is not presently occurring and under this remedy is not intended to occur in the future. The elevated HIs occur only when considering the contribution of groundwater. Therefore, groundwater contamination is the focus of this decision document.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The Offpost OU is one of two OUs at RMA. The Onpost OU addresses the contamination within the 27 square miles of RMA. The Offpost OU addresses groundwater contamination north of RMA that migrated (1) before the RMA boundary groundwater extraction and treatment systems were installed,
and (2) around the boundary systems prior to recent improvements. The selected remedy described in this Record of Decision (ROD) will permanently address contaminants at the site through treatment to reduce the toxicity, mobility, or volume of contaminant . Groundwater containment system remediation goals are based on the risk assessment and on federal Safe Drinking Water Act MCLs, proposed MCLs, nonzero MCLGs, and CBSGs. Action levels also meet those state drinking water standards found to be applicable or relevant and appropriate requirements (ARARs).

The major components of the selected remedy are as follows:

Operation of the Offpost Groundwater Intercept and Treatment System

- Removal of contaminated groundwater from the alluvial and the weathered upper portion of the Denver Formation (hereafter called the unconfined flow system WSJ) north of the RMA boundary in the First Creek and northern paleochannels using groundwater extraction wells

- Treatment of the organic chemicals of concern (COCs) present in the groundwater using carbon adsorption

- Recharge of treated groundwater to the UFS using wells and trenches

Natural attenuation of inorganic chloride and sulfate concentrations to meet applicable standards for groundwater in a manner consistent with the Onpost remedial action Continued operation of the North Boundary Containment System (NBCS) and the Northwest Boundary Containment System (NWBCS) - In addition, the Irondale Contaminant System (ICS) will continue to operate, as required, for onpost contaminant consistent with the frondale Interim Response Action (IRA). These containment systems will be operated to the requirements of Section 2.7 of the FFA, the Agreement for a Conceptual Remedy for the Cleanup of the Rocky Mountain Arsenal (Conceptual Remedy Agreement), and the onpost ROD, when it is signed. Cessation may occur as provided in Sections 35.3 and 35.4 of the FFA and paragraph 20 of the Conceptual Remedy Agreement.

Improvements to the NBCS, NWBCS, ICS, and the Offpost Groundwater Intercept and Treatment System as necessary

Long-term groundwater monitoring (including monitoring after groundwater treatment has ceased to assure continued compliance with the groundwater containment system remediation goals)

Five-year site reviews

Exposure control/provision of alternate water supply as follows:

- As of the date of the Onpost ROD, and based on a .392 parts per billion (ppb) detection limit, the U.S. Army will use the last available quarterly monitoring results to determine the DIMP plume footprint.

- As part of the Onpost ROD, the U.S. Army and Shell Oil company will pay for the extension of, and hook-up to, the current distribution system for all existing well owners within the DIMP plume footprint referenced above.

- Existing domestic well owners outside of the DIMP plume footprint as of the date of the Onpost ROD where it is later determined that levels of DIMP are eight ppb or greater (or other relevant CBSG at the time) will be hooked up at the U.S. Army and Shell Oil Company's expense to the SACWSD distribution system or provided a deep well or other permanent solution.

- For new domestic wells with DIMP levels of eight ppb or greater (or other relevant CBSG at the time), the Offpost ROD institutional controls will provide that the U.S. Army and Shell Oil Company will pay for hook-up to the distribution system or provided a deep well or other permanent solution.

- Any user of a domestic well within the Offpost Operable Unit that contains groundwater contaminants derived from RMA at concentrations that exceed the greater of the remediation goals in Tables 7.1 through 7.3 or the ARARs in Table 10.1 will be provided an alternative water supply. Bottled water will be provided for cooking and drinking until a permanent alternative water supply is provided. Permanent alternative water supplies could include installation of a deep uncontarninat d well or connection to a municipal potable water-supply system. This commitment applies to both users of existing domestic wells and users of wells that are lawfully drilled in the future.

Institutional controls to prevent the use of groundwater exceeding remediation goals.

Closure of poorly constructed wells within the Offpost Study Area that could be acting as migration pathways for contaminants found in the Arapahoe Aquifer.

The U.S. Army and Shell Oil Company agree to continue monitoring and to complete an assessment of the NDMA plume by June 13, 1996, using a 20 ppt method detection limit.

The U.S. Army and Shell Oil Company agree to prepare a feasibility study of potential actions,

both onpost and at the boundary, or adjacent to the boundary in order to achieve NDMA remediation goals at the RMA boundary and to use 7.0 ppt PRG or a certified analytical detection level readily available at a certified commercial laboratory (currently 33 ppt).

The U.S. Army and Shell Oil Company agree to revegetate approximately 160 acres located in the southeast portion of Section 14 and the southwest portion of Section 13 as depicted in Figure 9.1. Revegetation wi1l involve tilling and seeding. No sampling will be conducted before or after revegetation. Fxisting soil risks in the are to be revegetated fall within EPA's establish acceptable risk range and revegetation is not necessary. However, the U.S. Army and Shell Oil Company agree to the revegetation program as part of the offpost settlement.

The Army will treat any contaminated extracted groundwater prior to discharge or reinjection so that it meets the current water quality standards established in the Colorado Basic Standards for Groundwater and the Colorado Basic Standards and Methodologies for Surface Water.

As part of the Onpost remedy, the U.S. Army and Shell Oil Company will pay for and provide, or arrange for the provision, of 4000 acre-feet of water to SACWSD.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy may result in hazardous substances remaining in the groundwater of the Offpost OU for more than five years, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to adequately protect human health and the environment.

<IMG SRC 0896128A2>

DECISION SUMMARY FOR THE RECORD OF DECISION

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Rocky Mountain Arsenal (RMA) National Priorities List (NPL) site is comprised of two Operable
Units (OUs): Onpost and Offpost. As shown in Figure 1 .1, the Offpost Study Area occupies approximately 27 square miles in southern Adams County, Colorado, and lies north of the Denver metropolitan area and east of Commerce City, Colorado. The Offpost Study Area is defined as the area southeast of the South Platte River, north of Both Avenue, southwest of Second Creek, and north of the north and northwest boundaries of RMA. Additionally, the Offpost Study Area includes the surface waters of O'Brian Canal and Burlington Ditch as they extend northeast from Second Creek to Barr Lake and the surface waters of First Creek and Barr Lake. The Offpost OU (also shown in Figure I ~ 1) is defined by the RMA Federal Facility Agreement (FFA) as that portion of the Offpost Studv Area where hazardous substances, pollutants, or contaminants from RMA are found and are ,subject to remediation. The Offpost OU encompasses rural residential, agricultural, and commercial and industrial areas located north and northwest of RMA.

Areas within the Offpost OU are used for rangeland, dryland farming, and irrigated farming with some rural residential areas and scattered areas of intensive agricultural use. Parts of the Offpost OU are currently zoned and developed for commercial/industrial activities. Commerce City, located west of RMA, is the only urban area in the immediate vicinity of the Offpost OU and has recently annexed lands within the Offpost OU.

On the basis of an evaluation of planning information provided by the Adams County Planning Commission, it is projected that areas of commercial, industrial, and urban residential land use will increase in the Offpost OU (Adams County Planning Commission, 1987). Rural residential (including agricultural) land use is expected to decrease in the Offpost OU because anticipated increases in property values are expected to preclude increased traditional crop and livestock production land use, including hobby farming as discussed in the Airport Environs Plan (Adams County, City of Aurora, City of Brighton, City of Commerce City, 1990).

1.1 Environmental Setting

The topography of the Offpost Study Area consists of stream-valley lowlands separated by gently rolling uplands. The maximum local topographic relief in the Offpost Study Area is approximately 100 feet. The elevation above mean sea level ranges from approximately 5140 feet at the northern and northwestern boundary of RMA to approximately 5030 feet at the South Platte River.

Cropland and rangeland provide habitat for numerous animal species. Lake and wetland areas at Barr Lake provide feeding, breeding, and roosting areas for waterfowl and endangered species, including the bald eagle. The climate of the Offpost Study Area is characterized by sunny, semiarid conditions.

The regional surface drainage is to the northwest toward the South Platte River. Surface water originating south of RMA, on RMA, or in the Offpost Study Area flows toward the South Platte River. Two major canals, O'Brian Canal and Burlington Ditch, and several smaller ditches flow from southwest to northeast between RMA and the South Platte River. O'Brian Canal receives some drainage from the Offpost Study Area and RMA where the canal intercepts First Creek. Burlington Ditch may receive surface water inf-requently from First Creek.

1.2 Geology

Sediment at the land suxface in the Offpost Study Area consists of unconsolidated alluvial and eolian deposits. The composition of the unconsolidated sediment varies from clays to coarse gravels, and the thickness varies from less than 10 feet to approximately 100 feet. The thickest deposits of unconsolidated sediment occur in paleochannels: eroded into the underlying Denver Formation.

The Denver Formation consists of 250 to 300 feet of interbedded shale, claystone, siltstone, and sandstone, with a regional dip of 1/2 to 1 degree to the southeast. The presence of paleochannels in the Denver Formation surface impacts groundwater flow in the unconsolidated sediment and the

upper weathered portion of the Denver Formation. Three such paleochannels, the First Creek, northern, and northwestern paleochannels, are present in the Offpost Study Area. Coarse, unconsolidated materials commonly found within these paleochannels provide preferential pathways for groundwater movement. Groundwater contaminant plumes that have historically migrated across the RMA boundaries to the Offpost OU contain the highest concentrations of contaminants in and near these paleochannels. The Arapahoe Formation lies beneath the Denver Formation at depths of 230 to 300 feet at the RMA north boundary and has a regional dip of 1/2 to 1 degree to the southeast. The formation consists of 400 to 700 feet of interbedded conglomerate, sandstone, siltstone, and shale. The upper portion of the Arapahoe Formation consists predominantly of 200 to 300 feet of blue to gray shale with some conglomerate and sandstone beds. The lower portion consists largely of sandstone and conglomerate with less prevalent beds of shale. The lower portion is a source zone for many water-supply wells in the area. A thick, impermeable claystone unit is variously assigned to the lower Denver formation and the upper Arapahoe Formation. The claystone unit is called the "Buffer Zone" and is approximately 50-ft. thick. This unit further isolates the underlying Arapahoe aquifer from any localized contamination in the Denver confined flow system. The Arapahoe Formation is the oldest geologic unit present beneath the Offpost Study Area that was investigated during the Offpost Remedial Investigation program.

Alluvial and eolian deposits form the ground surface in the Offpost Study Area. The Denver Formation and Arapahoe Formation are not present at the ground surface anywhere in the Offpost Study Area.

1.3 Hydrogeology

The two principal water-bearing units in the Offpost Study Area that have been impacted by contaminants originating from RMA are the unconsolidated alluvial deposits and the underlying Denver Formation. The hydraulic properties of these two units, including hydraulic conductivity, porositv, and associated groundwater flow velocities, are distinctly different. The low permeability of the Denver Formation and upper Arapahoe Formation limit contaminant transport into the lower Arapahoe Formation. Hydraulically, the two units generally behave as two distinct hydrostratigraphic units: the unconfined flow svstem (UFS) and the confined flow system (CFS).

The UFS includes groundwater present in the unconsolidated materials overlying the Denver Formation, the weathered upper portion of the Denver Formation, and, where the Denver Formation is missing near the South Platte River, the weathered upper portion of the Arapahoe Formation. The CFS includes the deeper portions of the Denver Formation and the underlying Arapahoe Formation. On the basis of an evaluation of the distribution of contaminant plumes in the Offpost Study Area, the UFS is considered the principal migration route for groundwater contaminants from RMA to the Offpost Study Area, although some contaminants are present in the CFS. Although low-level contamination may be present in isolated portions of the Denver Formation CFS, this formation has low productivity as a groundwater resource.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Operational History

Congress established RMA in 1942. The United States acquired land included within the boundaries of the Arsenal for chemical weapons manufacturing, constructed a base, and commenced Army weapons production and ancillary activities in 1943. From 1945 to 1950, RMA distilled available stocks of mustard, demilitarized several million rounds of mustard-filled shells and incendiary munitions, and test-fired mortar rounds filled with smoke and high explosives. Also, many different types of obsolete World War II ordnance were destroyed by detonation or burning.

After the conclusion of World War II, selected surplus facilities were leased to nongovernment entities as warehouses and for the manufacture of agricultural chemicals. Colorado Fuel and Iron (CF&I) leased facilities at RMA in 1946. Julius Hyman & Company (Hyman) first leased facilities in 1947 and succeeded to the CF&I leasehold interest, with some modifications and additions in 1949. Shell Oil Company (Shell) acquired a majority interest in Hyman in 1952 and operated the plant as the Julius Hyman Company until 1954, when the operation became the Shell Chemical Company -Denver Plant.

RMA was selected as the site for construction of a facility to produce Sarin, a nerve agent. The facility was completed in 1953, with the manufacturing operation continuing until 1957 and the

munitions-filling operations continuing until late 1969. From 1970 until 1984, the primary operation at RMA was the disposal of chemical warfare material. Disposal practices included incinerating TX anticrop agent and mustard agent explosive components and destroying Sarin and related munitions casings by caustic neutralization.

Chemicals were introduced to the RMA environment primarily by the burial or surface disposal of solid wastes, discharge of wastewater to basins, and leakage of wastewater and industrial fluid from chemical and sanitary sewer systems. Munitions were destroyed and disposed in trenches. Wastewater generated by the U.S. Department of the Army (Army) and private industry in the South Plants and North Plants areas was discharged to a series of unlined evaporation and holding basins (Basins A, B, C, D, and E) and to asphalt-lined Basin F at various times throughout the history of RMA operations. The locations of these source areas are shown in Figure 2.1.

The Primary areas that have contributed to groundwater contamination at RMA include (1) former manufacturing facilities, (2) former waste storage basins, (3) solid waste disposal areas, (4) the chemical sewer system, (5) locations within the rail classification yard, and (6) the motor pool area.

2.2 Previous Investigations

From 1975 to the present, numerous groundwater monitoring programs have been conducted at RMA, both onpost and offpost, by the Army. The U.S. Environmental Protection Agency (EPA) has also conducted several offpost investigations. The Army designed and implemented monitoring programs to monitor regional groundwater and surface-water quality. The Army also designed and implemented the boundary system monitoring program to support the operation of the boundary groundwater containment systems.

2.2.1 U.S. Environmental Protection Agency Study Area

Several organic chemicals were detected in South Adams County Water and Sanitation District (SACWSD) wells in 1981, as part of a random national survey of drinking water systems conducted bv EPA. Additional sampling in 1982 and 1985 confirmed these initial findings. As a result, EPA began a remedial investigation/feasibility study (RI/FS) of an area west of RMA and south of the Offpost Study Area (Figure 1.1).

RMA was suspected as one of the possible sources of contaminants in the EPA study area because of RMA's historical waste disposal practices. To mitigate the groundwater contamination problem, the Army and EPA built a water-supply system for SACWSD. Further investigation by EPA's Field Investigation Team indicated that source areas in addition to RMA contributed to groundwater contamination detected within the EPA study area. Groundwater monitoring wells installed on the Chemical Sales Company (CSC) property have since identified CSC as a significant source of groundwater contamination in the EPA study area. Recent investigations by EPA and the Army have detected the presence of a trichloroethene plume entering RMA at Section 9, Township 3S, Range 67W along the southern boundary of RMA, as described in the Western Tier Report, the Stapleton Airport Environmental Assessment (Camp Dresser & McKee, Inc., 1993), and the CSC ROD (EPA, 1991a, 1991b, 1992). (Ebasco Services, Inc., 1988),

2.2.2 U.S. Department of the Army Investigation

Because chemicals were detected in the Offpost Study Area, the Army initiated a regional hydro-geologic surveillance program requiring the quarterly collection and analysis of samples from more than 100 onpost and offpost wells and surface-water stations. The program was carried out under the direction of the RMA Contamination Control Program, estabhshed in 1974 to ensure compliance with federal and state environmental laws. The objectives of the program were to (1) evaluate the nature and extent of contamination and (2) develop response actions to control contaminant migration. Potential and actual contaminant sources were assessed, and contaminant migration pathways were evaluated.

From 19 75 to the present, numerous groundwater monitoring programs have been conducted at RMA. The Army designed and implemented the 360 Degree Monitoring Program to monitor regional groundwater and surface water. The Army designed and implemented a boundary system monitoring program to support the operation of the boundary groundwater containment systems. Studies conducted at RMA to assess groundwater and surface-water conditions are discussed below.

The RMA Offpost Contamination Assessment Report (CAR) (Environmental Science and Engineering, Inc. [ESE], 1987a) incorporated data from several studies to define the concentrations and distribution of offpost contamination north and northwest of RMA. The scope of the CAR investigation was intended to address critical data gaps required to evaluate a comprehensive set of multimedia exposure pathways.

The potential for contamination of private wells was investigated in the mid-1980s during the Consumptive Use (CU) Studies, Phases I, II, and III. The CU Phases I and II studies addressed the Offpost Study Area. In the CU Phase III study, the Army conducted an inventory of privately-owned drinking water wells in an area bound by East 80th Avenue on the south, East 96th Avenue on the north, the South Platte River on the west, and RMA on the east. The objectives of the CU Phase III study were as follows:

Locate all shallow domestic wells (less than 100 feet) in the Offpost Study Area.
Sample a representative number of the located wells.
Assess the groundwater quality of the shallow alluvial aquifer.

The Army developed the Comprehensive Monitoring Program (CMP), a long-term multimedia monitoring program designed to provide data to facilitate evaluation of response actions, in the mid-1980s, Sample collection under the CMP commenced in 1987 and is continuing as the Groundwater Monitoring Program (GMP). An RI was initiated in 1985 by the Army in the Offpost Study Area. The primary objectives of the Offpost RI were as follows:

Collect additional data to refine the current understanding of groundwater flow and surface-water patterns and the nature and extent of contaminants offpost of RMA.
Evaluate the potential for chemical migration to the Offpost Study Area in various environmental media, such as groundwater, surface water, sediment, air, and biota.

Following completion of the RI, it was apparent that additional data were needed before evaluation and selection of a remedial alternative could occur. Therefore, a second RI was initiated in 1988 to collect additional data for groundwater, surface water, soil, sediment, and biota (plants and animals). The results of the second RI are reported in the Offpost Operable Unit Remedial Investigation, Final Addendum (HLA, 1992b).

2.3 Boundary Containment Systems

Concurrent with and as a result of the EPA and Army investigations, the Army constructed three boundary containment systems (the North Boundary Containment System [NBCS], the Northwest Boundary Containment System [NWBCS], and the Irondale Containment System fICS] at the north, northwestern, and western boundaries of RMA, respectively) to minimize offpost discharge of RMA chemicals via groundwater. The locations of these containment systems are shown in Figure 1.1. All three systems currently intercept and treat contaminated groundwater and recharge treated water to the LTFS.

2.3.1 North Boundary Containment System

The NBCS is just south of the RMA north boundary in Sections 23 and 24. The NBCS consists of 11) a system of extraction wells that remove contaminated groundwater from the UFS, (2) a soil-bentonite barrier that impedes migration of contaminated groundwater to the Offpost Study Area, (3) a carbon-adsorption treatment system that removes organic contaminant from extracted groundwater, and (4) a system of recharge wells and trenches that return treated groundwater to the UFS.

The NBCS pilot system became operational in 1978. The pilot system was expanded approximately 1400 feet to the west and 3840 feet to the east in 1981 during the second phase of construction. Several improvements have been made to the NBCS since 1981: ten recharge trenches were added to the west end of the system and became operational in December 1988, and five additional recharge trenches were added to the east end of the system in 1990. Currently, the soil-bentonite barrier is 6740 feet long, approximately 3 feet wide, and varies in depth from 20 feet at the western end to more than 40 feet along the eastern extension. The barrier is anchored in the Denver Formation.

Review of groundwater contaminant distribution patterns indicates that the NBCS is having a

significant effect on the distribution of organic compounds in the Offpost Study Area. Monitoring program data indicate that contaminant concentrations downgradient of the NBCS are decreasing. Activated carbon is being used to effectively remove the organic contaminants from the extracted groundwater to meet containment system remediation goals. Organic contaminant concentrations are generally below certified reporting limits (CRLs) in system effluent.

2.3.2 Northwest Boundary Containment System

The NWBCS is along the northwest boundary of RNIA in the southeast quarter of Section 22. Constructon of the NWBCS began in 1983, and the system became operational in 1984. The NWBCS originally consisted of (1) 15 extraction wells, (2) a soil-bentonite-barrier approximately 1600 feet in length, (3) a carbon adsorption treatment system, and (4) a system of 21 downgradient recharge wells. The carbon adsorption system was designed to intercept and remove dibromochloropropane and other organic compounds from a plume of contaminated groundwater originating onpost.

Contaminant bypass was observed at the southwest and northeast ends of the NWBCS in 1988. An interim resonse action (IRA) to improve the NWBCS was initiated in 1989. In April 1990, the NWBCS Improvements IRA was divided into two phases: NWBCS Short-term Improvements IRA and NWBCS Long-term Improvements IRA. Under the NWBCS Short-term Improvements IRA, which was completed in 1991, the existing slurry wall was extended 665 feet to the northeast to prevent contaminant bypass, and two additional extraction wells were added at the northeast end of the extraction well alignment. Three additional extraction wells and four additional recharge wells were installed in Section 27, southwest of the NWBCS in August 1991. The NWBCS Long-term Improvements IRA is being used to assess the NWBCS and its short-term improvements by reviewing groundwater monitoring data.

2.3.3 Irondale Containment System

The ICS, which became operational in 1981, is at the southern end of the RMA northwest boundary within Section 33 and consists of (1) a hydraulic control system of extraction and recharge wells, and (2) a carbon adsorption treatment system. The ICS was originally developed to intercept the migration of dibromochloropropane (DBCP) at the RMA boundary. There have been no downgradient detections of DBCP after the first two years of operation. The majority of the area downgradient of the ICS is contained within the EPA study area, although portions of the downgradient area are within the confines of the Offpost Study Area. Therefore, the design and operation of the ICS was not included in the evaluation of alternatives; however, the continued operation of the ICS, as required, for onpost contaminants consistent with the Irondale ERA remains an integral part of the Army's offpost contaminant reduction program to meet onpost cleanup goals defined in the Irondale IRA. Cessation of operation of the ICS will be in accordance with paragraphs 35.2 and 35.4 of the FFA and paragraph 20 of the Conceptual Remedy Agreement.

2.4 Interim Response Actions

As part of the Army's compliance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and as described in the FFA, the Army has instituted several IRAs that have been performed concurrently with the ongoing onpost and offpost RI programs. IRAs, which are designed to be compatible with the final remedy, are actions taken before the signing of the Record of Decision (ROD) and are expedited remedial measures to contain, remove, or treat wastes before the final remedy is selected. Numerous IRAs have been implemented to mitigate contamination both onpost and offpost. As indicated in the previous sections, some portions of the boundary containment systems have been constructed as IRAs. The Offpost IRA is discussed in the following section.

2.4.1 Offpost Interim Response Action

The Offpost IRA addresses groundwater contaminant migration north of RMA and downgradient of the NBCS along two primary contaminant pathways, defined by the First Creek and northern paleochannels.

Evaluation and selection of the collection and treatment system components that comprise IRA A, referred to as the Offpost Groundwater Intercept and Treatment System, began in 1988. The

Offpost Groundwater Intercept and Treatment System Decision Document (HIA, 1989) presents the basis for system placement to address remediation of contamination in alluvial groundwater in the First Creek and northern paleochannels. The system was designed to intercept and extract contaminated groundwater from the UFS, treat the groundwater for organics, and recharge treated water to the UFS. Construction of the Offpost Groundwater Intercept and Treatment System began in November 1991 and was completed in June 1993. Groundwater extraction is accomplished through a network of extraction wells. The organic contaminants in extracted groundwater are treated using activated carbon adsorption, and the treated water is then recharged to the UFS using a combination of recharge wells and trenches.

The Offpost Groundwater Intercept and Treatment System was designed to be flexible and to be compatible with the final remedy, consistent with EPA guidance and the FFA.

2.5 History of CERCLA Enforcement Activities

Most of RMA was added to the National Priorities List (NPL) in 1987; Basin F was added in 1989. As such, RMA is subject to compliance with CERCLA (also known as Superfund). A facility is subject to compliance with CERCLA when a release or a threat of a release of hazardous substances from the facilitv has occurred and when response costs have been incurred. In some cases, the potentially responsible parties (PRPs) either cannot respond or cannot be found, so funding for the response comes from the government fund called Superfund. At RMA, the Army and Shell were identified as PRPs and are funding the cleanup.

On February 1, 1988, a proposed Consent Decree was filed in the case of U.S. v. Shell Oil Company with the U.S. District Court in Denver, Colorado. A modified version of the Consent Decree was filed on June 7, 1988. The Consent Decree was entered by the U.S. District Court on February 12, 1993.

On February 17,1989, an FFA was executed by the Army, Shell, EPA, the U.S. Department of the Interior (DOI), the U.S. Department of Justice (DOJ), and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). The FFA sets forth the procedures to be followed by the Organizations (i.e., signatories to the FFA) to cooperate in the assessment, selection, and implementation of response actions resulting from the release or threat of release of contaminants from RMA. The FFA designates the Army as the lead agency.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community participation opportunities were provided during the remedy selection process to fulfill the requirements of CERCLA Sections 113(k)(2)(B)(i-v) and 117.

The RI, RI Addendum, Endangerment Assessment/Feasibility Study (EA/FS), and Proposed Plan for the Offpost OU were released to the public on March 21, 1993. The documents were made available to the public in the Administrative Record (located at the Joint Administrative Record Document Facility at the west entrance to RMA at 72nd Avenue and Quebec Street), in an information repository maintained at the EPA Docket Room in Region VIII, and at the Adams County, Aurora, Commerce City, Denver, Lakewood, Montbello, and Thornton Public Libraries. The notice of availability for these four documents was published in the Denver Post and Rocky Mountain News newspapers.

An expanded Community Relations outreach was implemented to ensure community members had the opportunity to comment on the Proposed Plan for the Offpost OU. Community outreach started in January 1993 with the announcement that all documents supporting an impending Proposed Plan were available for review in local libraries. A direct mailing to more than 1200 local citizens was made.

In March 1993, a press release was made and a legal notice was published announcing that a public meeting was scheduled for April 28, 1993, at Dupont Elementary school, Commerce City, Colorado, to address the Proposed Plan. A separate letter was sent to citizens informing them of the documents availability in the libraries. The letter also included a brief fact sheet summarizing the Proposed Plan. Originally, the public meeting was scheduled for April 21, 1993, at RMA. The Army received requests to hold the meeting on a different day and offpost. Because of these factors and Earth Day events in Denver for April 21, the meeting was moved to April 28, 1993.

A Media Day was held the day of the public meeting to provide local media information on the Army's proposal. Both print and video media representatives attended.

Knowing the importance of the public meeting, the announcement was expanded to include display advertising in 12 local and weekly newspapers in the Denver metropolitan area. This was in addition to the normal press release and Media Day event.

As a result of comments received at the public meeting concerning the official comment period, the Army published a legal notice and sent letters to citizens announcing that the comment period was extended to June 21, 1993.

At the April 28, 1993, public meeting, representatives from the Army, EPA, and the State of Colorado answered questions regarding issues at the site and the remedial alternatives under consideration. Responses to comments received during the public comment period are included in the Responsiveness Summary, which is part of this ROD (Appendix A). This decision document presents the selected remedial action for the RMA Offpost OU in Adams County, Colorado, chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and with the NEPA, and, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this site is based on the Administrative Record for the Offpost OU.

Additionally, settlement discussions involving municipalities, local health departments, special districts, and citizen groups were held from late 1994 until April 1, 1995, to discuss the final remedies for both Onpost and Offpost OUs. The Draft Final ROD (December 7, 1993) was revised taking into account comments presented by the public, local communities, and the Parties.

4.0 SCOPE AND ROLE OF THE OFFPOST OPERABLE UNIT

Three RMA boundary containment systems currently intercept, treat, and recharge groundwater at the RMA north, northwest, and west boundaries. These boundary systems, along with the physical boundaries of RMA, provide a logical delineation between OUs. Therefore, the FFA divided the work into the following two OUs:

> Onpost OU: Media requiring remediation within the Onpost Study Area (within RMA boundaries)
>
> Offpost OU: Media requiring remediation within the Offpost Study Area (outside RMA boundaries)

The Offpost OU addresses contamination in the groundwater north and northwest of RMA. As discussed in Section 6.0 of this ROD, groundwater contamination in the UFS poses the principal potential threat to human health because of the risks from possible exposure to groundwater. Although health risks are possible, the estimated risk levels are within the acceptable risk range established by EPA. The purpose of the remedy is to (1) reduce groundwater contaminant concentrations, (2) reduce risk to human health and the environment, and (3) reduce the potential human exposure to contaminated UFS groundwater.

The potential risks to ecological receptors were also evaluated. Wildlife are not exposed to contaminated groundwater; therefore, there are no risks to wildlife from the groundwater exposure. Wildlife exposures to soil and surface water and potential livestock exposure to contaminated groundwater were evaluated. However, the potential risks associated with these exposures were shown to be negligible. Therefore, the selected remedy for the Offpost OU addresses the reduction of potential human exposure to contaminated UFS groundwater.

5.0 SUMMARY OF SITE CHARACTERISTICS

Six media were evaluated in the RI for the Offpost Study Area: groundwater, soil, surface water, sediment, air, and biota. Each medium was evaluated in the Offpost EA with respect to (1) the nature and extent of contamination and (2) potential exposure pathways and associated risk to humans and the environment. A map delineating the boundaries of the Offpost Study Area is included as Figure 1.1. The site characteristics are more fully described in the Offpost Operable Unit Remedial Investigation Report (ESE, 1988a) and the Offpost Operable Unit Remedial Investigation, Final Addendum (HLA, 1992b).

5.1 Sources of Contamination

As described in Section 2.1, chemicals were introduced to the RMA environment primarily by the buxial or surface disposal of solid wastes, discharge of wastewater to basins, and leakage of wastewater and industrial fluid from chemical and sanitary sewer systems. Chemicals migrated to the Offpost Study Area primarily by shallow (i.e., shallow or unconfined) groundwater and airborne pathways. Contaminant transport in the shallow or unconfined groundwater has been controlled by construction of the boundary containment systems and improvements to these systems (completed as IRAs) Offpost Study Area surface water was contaminated primarily by the natural interaction with offpost groundwater. Offpost Study Area surface soil was contaminated by the deposition of airborne contaminants, non-RMA-related agricultural application of pesticides, and irrigation practices. Agricultural sources of pesticides are discussed in the Final Offpost RI Addendum (HLA, 1992b). Air monitoring data indicate that the air pathway does not contribute to human exposure.

5.2 Nature of Contamination

Several chemicals of concern (COCs) are present in offpost groundwater, surface water, sediment, and soil (see Tables 6.1 through 6.4). COCs include organochlorine pesticides (OCPs), halogenated aliphatics, aromatic hydrocarbons, diisopropylmethyl phosphonate (DIMP), sulfur-containing organic chemicals, arsenic, and dissolved salts.

The COCs exhibit great variability in their mobility and persistence in environmental media. OCPs are less mobile than the other COCs and more persistent, tending to associate with soil and sediment and to biomagnify in the food chain. Most of the remaining COCs are mobile in groundwater, and the aromatics and aliphatics are volatile in surface water. The fate properties of the COCs tend to determine their distribution in the Offpost Study Area. All COCs were detected in groundwater, but the more mobile chemicals are more widely distributed. The OCPs are virtually the only COCs detected at concentrations above background levels in soil and sediment. The volatile compounds were not significantly elevated above background levels in surface water and, in fact, were rarely detected.

5.3 Contamination Migration Pathways

The RI programs have shown that there are three groundwater migration pathways in the Offpost Study Area. These migration pathways (shown in Figure 5.1) are referred to as the northern paleochannel, due north of the RMA north boundary; the First Creek paleochannel, paralleling First Creek to the northwest from the RMA north boundary; and the northwest paleochannel, northwest of the RMA northwest boundary. The northern and First Creek paleochannels compose the North Plume Group, and the northwest paleochannel composes the Northwest Plume Group. These two plume groups encompass an area of approximately 590 acres in the Offpost Study Area. The alluvial flow system transports most of the contamination in paleochannels characterized by coarser sediment. Some of the groundwater traveling through the First Creek paleochannel discharges to First Creek, probably seasonally, resulting in transfer of contaminants to First Creek.

Figure 5.1 also presents the offpost surface-water features. The primary surface-water pathway is First Creek, which flows northwest from the northern RMA boundary. First Creek empties into O'Brian Canal, which flows northeast and empties into Barr Lake. Burlington Ditch, which parallels O'Brian Canal, also flows into Barr Lake. The majority of the surface-water contamination is located in First Creek, with some contamination in O'Brian Canal downstream of the confluence with First Creek and Burlington Ditch. Barr Lake has not been shown to be contaminated with RMA-related chemicals greater than naturally occurring background levels.

In addition to the contaminant migration pathways of groundwater and surface water, prevailing winds transport onpost surface soil to offpost locations, and sediment provides a potential contaminant source for aquatic species.

5.4 Extent of Contamination

Varying levels of contamination exist in the following five media in the Offpost OU: groundwater, surface water, stream-bottom sediment, surface and subsurface soil, and biota. More detailed discussions of the offpost contaminant concentrations, along with figures showing concentration distributions are found in Sections 3.0, 4.0, 5.0, and 6.0 of the Final Offpost RI

Addendum (HLA, 1992b).

5.4.1 Groundwater

Table 6.1 presents the groundwater COCs and the exposure point concentrations used in the Endangerment Assessment. The most widespread RMA-related groundwater COC in the Offpost Study Area is DIMP, which is present in the UFS at varying concentrations in a band from the west end of the NWBCS to the east end of the NBCS, and from the RMA north and northwest boundaries to the South Platte River. The other primary contaminants present in the offpost UFS are chloroform, chlorobenzene, trichloroethene, tetrachloroethene, dibromochloropropane (DBCP), dieldrin, endrin, dicyclopentadiene (DCPD), arsenic, chloride, fluoride and sulfate.

The highest concentrations of DIMP observed in the past three years are in the First Creek paleochannel. Concentrations of DIMP are lower in the northern paleochannel and lower still in the northwestern paleochannel. The maximum concentrations of DDVIP in the Offpost Study Area have decreased by approximately 50 percent over the past 10 years. The NBCS is currently operating and has been operated in the past to remove multiple contaminants. DIMP concentrations are being reduced to less than 8 ppb. Cut-off of groundwater contaminants at the NBCS and recharge of the treated groundwater has resulted in the observed decrease in DIMP concentrations specifically, as well as the other contaminants found offpost.

The highest contaminant levels downgradient from the NBCS occur upgradient of the O'Brian Canal. Certain volatile compounds such as chlorobenzene, chloroform, trichloroethene, and DBCP have been detected at low concentrations downgradient from the canals, but well-defined plumes do not exist in this area and these detections may be anomalous. Semivolatile organic compounds such as dieldrin and other OCPs are present almost exclusively upgradient of the canals. Maximum concentrations of the OCPs (i.e., aldrin, isodrin, chlordane, 2,2-bis[p-chlorophenyl]-1, 1-dichloroethene[DDE], and 2-bis[p-chlorophenyl]-1,1,1-trichloroethane [DDT] generally occur in the First Creek paleochannel within 500 to 1000 feet of the NBCS. Only sporadic and isolated occurrences of OCPs are observed northwest of the RMA northwestern boundary.

Contaminants found downgradient from the NWBCS are primarily chlorobenzene, chloroform, DIMP, and dieldrin. The highest concentrations of chloroform occur downgradient of the RMA boundary. Detections of chlorobenzene near the NWBCS may be anomalous. In 1989, semivolatile compounds such as dieldrin and possibly DIMP appeared to have bypassed the NWBCS at the northeast and southwest ends. Subsequently, the NWBCS IRA was initiated that included improvements and operational changes to correct the bypass. Recent modifications to the NBCS and NWBCS, in addition to the remedial action selected in this ROD, are expected to further reduce contaminant levels downgradient of the RMA boundaries.

5.4.2 Surface Water

Table 6.2 presents the surface water COCs and the exposure point concentrations used in the Endangerment Assessment. The principal organic compounds identified in Offpost Study Area surface-water samples are DIMP and dieldrin. In general, the highest concentrations of the organic and Inorganic analytes were detected in First Creek. DIMP concentrations in First Creek were highest in the area 100 to 200 feet upstream of O'Brian Canal where groundwater discharges to First Creek. DIMP was not detected in Burlington Ditch or O'Brian Canal upstream of the confluence with First Creek. DIMP was detected in Barr Lake in only one of 20 samples collected from 1985 to 1990 and was not detected in the duplicate sample collected at the same time. This one detection is anomalous and not considered representative of conditions at Barr Lake.

The highest concentrations of arsenic were detected in First Creek near the northern RMA boundary. These detections are likely associated with discharge from the onpost sewage treatment plant. Mercury and arsenic were detected in surface water in O'Brian Canal upstream of the confluence with First Creek, suggesting that sources of these contaminants other than RMA probably exist. Some contaminants identified in O'Brian Canal and Burlington Ditch may originate from the diversion of treated sewage effluent from Denver.

5.4.3 Stream-bottom Sediments

Table 6.3 presents the sediment COCs and the exposure point concentrations used in the Endangerment Assessment. The most commonly detected contaminants in stream-bottom sediment in the

Offpost Study Area were dieldrin, arsenic, and mercury. The highest concentration of dieldrin was found in First Creek immediately north of the northern RMA boundary. Additional contaminants were detected in O'Brian Canal and Burlington Ditch upstream of the confluence with First Creek, suggesting that sources of these contaminants other than RMA probably exist such as diversion of treated sewage effluent from Denver.

5.4.4 Surface and Subsurface Soil

Table 6.4 presents the soil COCs and the exposure point concentrations used in the Endangerment Assessment. Approximately 100 soil samples were collected as part of the RI Addendum investigation and were analyzed for OCPs, arsenic, and mercury. Dieldrin was the most frequently detected OCP (in approximately 90 percent of the samples) with a maximum concentration located approximately 100 to 200 feet north of the northern RMA boundary. DDT, DDE, aldrin, endrin, and chlordane were detected less frequently.

The distribution of OCPs in Offpost Study Area soil appears to correlate with the dominant wind patterns at RMA. The greatest number and highest contaminant concentrations are observed in samples collected immediately north of the northern RMA boundary, consistent with the prevalent wind direction of south to north. Isolated elevated concentrations of OCPs observed between the northern RMA boundary and O'Brian Canal may be the result of local residential and/or commercial use of pesticides and not related to migration from RMA. Anomalously high concentrations of dieldrin, DDE, and DDT were also detected approximately 1.5 miles northwest of RMA. These detections are considered to be agricultural-related and not RMA-related because the area is currently and has historically been a farming community.

The uneven distribution of arsenic and mercury in Offpost Study Area surface soil suggests that the occurrence of these inorganic contaminants is not related to RMA activities.

5.4.5 Biota

The RI Addendum biota monitoring program provided additional data to assess the potential impacts on plants and animals in the Offpost Study Area. During the RI Addendum study, biota samples were analyzed for aldrin, dieldrin, endrin, DDE, DDT, DBCP, arsenic, and mercury. Dieldrin, the contaminant most often found in Offpost Study Area biota (36 percent of samples), was detected in cattle, chicken, fish, earthworm, deer mouse, prairie dog, and pheasant samples. Arsenic and mercury were detected less frequently (19 and 14 percent, respectively). DDE was detected only once, and aldrin, endrin, DDT, and DBCP were not detected in any biota samples from the Offpost Study Area. Contaminants identified in the Offpost Study Area biota survey are similar to those found onpost, although the concentrations detected in the Offpost Study Area biota are considerably lower than concentrations detected in the onpost biota.

The Offpost Study Area is known to contain suitable habitat for endangered species such as the bald eagle. A nesting pair of eagles was identified during offpost assessment activities. Contaminants (mercury, dieldrin, and DDE) were detected in a bald eagle egg collected in 1988 from a nest at Barr Lake. According to the U. S. Fish and Wildlife Service, the concentrations of these contaminants were typical of bald eagle egg contamination throughout the United States.

5.5 Potential Routes of Human and Environmental Exposure

Based on the current land uses in the Offpost Study Area, a review of local city and county planning and zoning ordinances, and consultation with local planning authorities, three primary land uses were considered in estimating the risks to human health. These land uses are urban residential, rural residential, and commercial and industrial. The exposure routes and pathways considered for the Offpost Study Area include the following:

- Ingestion of groundwater
- Ingestion of soil
- Ingestion of sediment
- Ingestion of vegetables
- Ingestion of dairy products
- Ingestion of eggs
- Ingestion of meat
- Ingestion of surface water

Inhalation of volatile chemicals in groundwater
Inhalation of dust
Dermal contact with soil
Dermal contact with sediment
Dermal contact with surface water
Dermal contact with groundwater

6.0 SUMMARY OF SITE RISKS

The risks estimated in the EA and summarized in this section are baseline risks corresponding to current conditions and are, therefore, pre-remediation risk estimates. Implementation of the selected remedy presented (Section 9.0) will lower the potential risks. The estimated maximum cumulative potential cancer risk to humans in the Offpost Study Area is 3 x 10-4 (or 3 in 10,000 people) on the basis of the reasonable maximum exposure (RME) risks presented in the Final EA (Volume III, Section 4.0, and Volume IV, Appendix G). This estimated potential risk level is within the acceptable risk range established by EPA (1 x 10-6 to 5 x 10-4; letter from EPA to Army dated February 21, 1992). A cancer risk estimate of 3 in 10,000 indicates an upperbound estimate of risk. Actual cancer risks are likely to be below this level and may be as low as zero. These carcinogenic risks are usually termed "excess lifetime cancer risks," which means there is an increased chance of an Individual developing cancer over 70 years of exposure to the carcinogenic chemicals in excess of the normal cancer rate. The background cancer rate determined by the American Cancer Society is about 1 in 3.

Because the Offpost Study Area cumulative risk is less than the upper risk level established by EPA, remedial action in the Offpost Study Area is not required. The Army, nevertheless, recognizes that several site-specific factors suggest that remediation of the groundwater is preferable to no action in the Offpost OU. These site-specific factors are: (1) groundwater contributes a maximum risk of 2 x 10-4, or approximately 75 percent of the total carcinogenic risk, (2) maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs), and Colorado Basic Standards for Groundwater (CBSGs) are exceeded for some groundwater contaminants, and (3) hazard indices (HIs) for children exceed 1.0 in Zones 2, 3, and 4. Although the estimated child hazard indices exceed 1.0 in Zones 2, 3, and 4, the bulk of the HI value is contributed through an assumed domestic use of alluvial groundwater, which is not presently occurring in the Offpost OU. Treatment of groundwater to the containment system remediation goals will reduce (1) the total estimate risk to less than 1 x 10-4 and toward 1 x 10-6 and (2) the HIs to less than 1.0 in Zones 2, 3, and 4. Soil, surface water, and sediment do not require remediation because of the low risk attributable to these media. Air was not identified as a medium of concern on the basis of air monitoring data and initial risk screening.

Protection of biota was evaluated through development of ecological exposure criteria for the protection of species potentially at risk. The ecological assessment indicated that the potential for adverse ecological effects is minimal.

6.1 Human Health Risks

Human health risks in the Offpost Study Area were calculated in four steps: identification of COCs, exposure assessment, toxicity assessment, and risk characterization. It should be noted that many of the exposures evaluated do not currently exist and therefore do not represent existing exposures.

6.1.1 Identification of Chemicals of Concern

A data set consisting of groundwater, surface water, sediment, soil, air, and biota data collected between 1985 and 1991 was used to evaluate which chemicals were of concern to human health and the environment. A trend of declining contaminant concentrations in groundwater since 1985 was noted in portions of the Offpost Study Area, particularly near the north boundary of RMA and downgradient of the NBCS. This trend is due to the operation and improvement of the boundary systems and natural attenuation processes. Considering this trend, only the most recent groundwater data (i.e., from 1989 through 1991) were used to estimate groundwater exposure point concentrations.

Data for the other media were also considered, and only the data resulting from analytical methods sensitive enough to detect low concentrations were used. Data were also compared

statistically with background concentrations consistent with EPA guidance presented in Risk Assessment Guidance for Superfund (EPA, 1989a). Statistical procedures included the Wilcoxon rank sum test and the Method 4 Proportions. These procedures are discussed in Section 1.2 of the Final Offpost EA/FS (HLA, 1992a).

The primary criterion for identifying COCs was that the chemical concentrations at locations of expected maximum concentration (i.e., near the RMA borders) must be significantly greater than concentrations found at background locations (i.e., no RMA-related contamination present). By applying statistical methods, Offpost Study Area contaminant concentrations were compared to background concentrations at reference locations. If statistical analysis indicated that Offpost Study Area concentrations were significantly higher than the background concentrations, the presence of the chemical in the Offpost Study Area was considered to be RMA-related and the chemical was designated as a COC This procedure was followed for each environmental medium. Tables 6.1 through 6.4 list the COCs for groundwater, surface water, sediment, and soil, respectively. The exposure point concentration associated with each COC is also shown in the tables.

To select COCs for biota (plants and animals), analytical data obtained from the onpost biota RI were compared to background chemical concentrations available in the scientific literature. This procedure was less precise but nonetheless indicated that two chemicals (dieldrin and arsenic) may be elevated, although in low concentrations, in the tissues of animals located in the Offpost OU.

6.1.2 Exposure Assessment

6.1.2.1 Offpost Study Area Exposure Assessment Zones

The Offpost Study Area is a large, heterogeneous area with a variety of characteristics that can affect exposure levels. Specifically, distinct zones of the Offpost Study Area exhibit different exposure concentrations of COCs in groundwater, surface water, and surface soil, including hot spots where contaminant levels are higher than the average for the entire Offpost Study Area. In addition, population density, land use, and water use varies throughout the Offpost Study Area. Therefore, to avoid diluting or averaging contaminant concentrations over the entire Offpost Study Area, the Offpost Study Area was subdivided into six zones (Figure 6.1) with different exposure conditions. The primary factor used to define the exposure zones was the pattern of COC concentrations in groundwater. The six zones, and the land use and populations evaluated within each zone, are described below.

Zone 1 is an area with relatively low levels of COCs in groundwater and surface soil. Rural residential land use, which includes consumption of homegrown vegetables, milk, meat, and eggs, is the current and potential future population characteristic.

Zone 2 is an area of relatively high levels of COCs in groundwater, low levels of COCs in surface soil, and no permanent surface-water features. A rural residential land-use scenario, identical to Zone 1, was evaluated.

Zones 3 and 4 are similar. Zone 3 is an area of relatively high levels of pesticide COCs in groundwater, surface water, and surface soil. Zone 4 is an area of relatively high levels of COCs in groundwater and surface water, but relatively low levels of COCs in surface soil. Both Zones 3 and 4 have recently been purchased by Shell Oil Company and are expected to be unoccupied at least until completion of offpost remediation. Plans for improvement of 96th Avenue as an access road for the new Denver International Airport may result in predominantly commercial and industrial land use in these zones. An urban residential land use for Zones 3 and 4 is considered possible and was selected for evaluation because this land use would result in higher exposures than the current land use. Urban land use assumes that exposure to meat, dairy, and eggs would not occur, but that local planting and consumption of vegetables are possible.

Zone 5 is an area with moderate levels of COCs in groundwater and relatively low levels of COCs in surface soil. A commercial and industrial land use for Zone 5 was evaluated. Zone 5 is zoned for industrial use over the majority of its area, is currently developed for industrial use, and is projected as industrial land use for the future.

Zone 6 is an area with moderate levels of COCs in groundwater and relatively low levels of COCs in surface soil. Because farm residences currently exist in Zone 6, a rural residential land use was evaluated that is identical to the land use (rural residential) in Zones 1 and 2.

6.1.2.2 Offpost Study Area Potential Exposure Points

There are several potential exposure points in the Offpost Study Area. The most significant routes of exposure have already been mitigated by exposure controls in areas with the highest groundwater COC concentrations (e.g., the UFS is no longer used in Zones 3 and 4). Exposure to COCs in surface soil has also been mitigated by relocating residents from the area near the intersection of 96th Avenue and Peoria Street where soil contaminant concentrations are highest. Additionally, the Army and Shell Oil Company have agreed to till and revegetate approximately 160 acres located in the southeast portion of Section 14 and the southwest portion of Section 13 in accordance with Paragraph 22 of the Conceptual Remedy Agreement (see Figure 9.1). Shell Oil Company and the U.S. Army believe that existing soil risk in the revegetated area falls within EPA's established acceptable risk range and that remediation is not necessary. However, Shell Oil company and the U.S. Army agree to the revegetation program as part of the remedy.

Concentrations of surface-water contaminants were higher in First Creek than other surface-water bodies during 1986 through 1990, creating a potential exposure point for nonhuman receptors and a direct-contact human pathway associated with wading. First Creek does not support a recreational fishery: Barr Lake is the most likely point of human exposure to bioaccumulated residues in fish tissue. Because COCs are not elevated in Barr Lake, with the exception of a single DIMP detection that was not verified in duplicate or later sampling events, consumption of contaminated fish was not evaluated.

6.1.2.3 Potential Exposure Pathways and Routes

An exposure pathway consists of four elements: (1) a source and mechanism of release, (2) a transport medium, (3) a point of potential contact with the contaminated medium, and (4) an exposure route, such as ingestion, at the contact point.

The Site Conceptual Model (Figure 6.2) presents the potential exposure pathways identified in the Offpost Study Area. The Site Conceptual Model also indicates which exposure routes were quantitatively evaluated for risk. Because of the variations in land use and the presence or absence of surface water in the six zones, not all exposure routes are applicable to all zones. Table 6.5 summarizes the exposure zones by land-use category and identifies the exposure routes quantified in each zone.

Inhalation Route

On the basis of risk screening evaluations conducted according to EPA guidance, the release of volatile chemicals from groundwater used in the home for all purposes (e.g., showering, dishwashing, laundry, toilets) was determined to result in potentially significant exposures by the inhalation route. Therefore, inhalation of volatile chemicals resulting from domestic use was quantified. Other potential sources of exposure, such as the inhalation of contaminated dust particles, and inhalation of vapors resulting from volatilization from underlying groundwater, were found to be very minor contributors to the overall exposure potential.

Dermal Route

Dermal contact with surface soil is likely and was quantified for all potential land uses. Dermal contact with sediment in First Creek was quantified. Dermal contact with sediment of Barr Lake is not feasible, considering the depth of the water and the prohibition of swimming.

Dermal contact with surface water in First Creek was quantified. However, dermal contact with canal water is expected to be unlikely and, in the worst case, infrequent; therefore, dermal contact was not quantified for the canals. Direct contact recreation is prohibited in Barr Lake; therefore, the dermal contact pathway was not quantified for Barr Lake.

Dermal contact with groundwater used domestically is likely. However, dermal intake during showering is approximately 0.15 percent of the intake resulting from ingestion of groundwater. Potential exposures from direct ingestion and inhalation will be much higher than from dermal

contact. Therefore, the dermal intake resulting from domestic use was not quantified. EPA guidance (EPA, 1989a) allows for certain pathways to be eliminated from evaluation if other pathways have much higher exposure.

Ingestion Route

Incidental ingestion of surface soil is likely under all potential land uses; therefore, this pathway was quantified. Incidental ingestion of First Creek sediment is possible in association with wading or recreational activities; therefore, this pathway was also quantified.

Cattle and other livestock raised for human consumption may bioaccumulate COCs from (1) surface water or groundwater used for watering livestock, (2) forage grown in contaminated surface soil or irrigated by contaminated surface water or groundwater, and (3) direct ingestion of soil while grazing. This pathway was quantified, using cattle as the representative species for development of a bioaccumulation model. Additionally, bioaccumulation resulting in dieldrin contamination of chicken eggs was quantified in the EA.

Vegetable crops grown for human consumption may contain COCs because of uptake of COCs from contaminated surface soil and surface water or groundwater for irrigation. Ingestion of vegetable crops was quantified.

Although ingestion of the shallow groundwater is unlikely, this exposure pathway was quantified. It has been conservatively assumed that ingestion of untreated alluvial groundwater might occur even though there is insufficient water in portions of the UFS contaminated above groundwater containment system remediation goals to supply a municipal water system.

6.1.2.4 Estimation of Chemical Intake

Analytical data from each media within each of the six exposure assessment zones (Section 6.1.2.1) was identified. Exposure point concentrations were selected such that they represent an RME concentration. The RME exposure point concentrations were calculated as the upper 95 percent confidence limit on the arithmetic mean of the data. The RME values for the COCs in each media are presented in Tables 6.1 through 6.4. Exposure point concentrations were combined with standard EPA intake assumptions and variables to estimate the intake of each COC by each exposure route.

To estimate the exposure point concentration for food products (e.g., meat, eggs, vegetables), several models were used to estimate the plant and animal uptake of a chemical from soil or water and the resultant concentration in the edible portion of the plant or animal. All of the uptake and partitioning coefficients were selected so that the resultant COC concentration in the food would also represent an RME value. A complete discussion of the plant and animal chemical uptake models is provided in the Offpost EA/FS.

6.1.3 Toxicity Assessment

The toxicity of chemicals is evaluated in terms of carcinogenic and noncarcinogenic effects. Cancer slope factors and reference doses are used to evaluate potential risks posed by the exposure to carcinogenic and noncarcinogenic chemicals, respectively.

EPA-established slope factors for inhalation and ingestion exposures to COCs are presented in Table 6.6. The slope factor for a given compound is multiplied by the estimated intake to obtain the carcinogenic risk estimate. The individual risks from each compound in a particular exposure pathway are then summed to obtain an estimate of the overall carcinogenic risk for each pathway and for all pathways combined.

The reference doses (RfDs) used in the EA for inhalation and ingestion exposures are presented in Table 6.6. The estimated intake is divided by the RfD for a given compound to obtain its hazard quotient (HQ). For each exposure pathway, chemicals were segregated by their target organ. For each target organ group, the HQs for each chemical were then summed to obtain a hazard index (HI) for each pathway and for all pathways combined. When the HQ and/or the HI exceed 1.0, there may be concern for potential noncarcinogenic health effects.

6.1.4 Risk Characterization

Following the estimation of exposure point concentrations and chemical intakes, the slope factors and RfDs are used to estimate carcinogenic risks and the potential for noncarcinogenic effects. The following sections discuss the results of this procedure.

6.1.4.1 Carcinogenic Risks

Table 6. 7 summarizes the estimated current carcinogenic risks corresponding to existing exposures by exposure assessment zone and exposure route. The total carcinogenic risks range from 1 x 10-4 to 3 x 10-4 (1 to 3 in 10,000) in Zones 1 through 4, 3 x 10-5 (3 in 100,000) in Zone 5, and 7 x 10-5 (7 in 100,000) in Zone 6. The total carcinogenic risks for each of the six exposure assessment zones are within the acceptable risk range established by EPA. The hypothetical risks in Zones 3 and 4 are highly conservative in that they are based on an urban residential land-use scenario and there are no humans currently living in Zones 3 and 4. Additionally, the risks estimated for a portion of Zone 1 and Zone 2 are not current risks, because residents in these areas do not use UFS groundwater for domestic use. Because there are no current residents in Zones 3 and 4, and the current residents in Zone 5 have water supplies other than shallow wells, the estimated risks from residential use in these zones are conservative because they do not represent existing exposures.

Groundwater usage (either domestic and/or agricultural) is the primary contributor to carcinogenic risk, accounting for 45 to 99 percent of the total risk estimated for each zone. This indicates the major role of the groundwater-related exposure pathways. Risks related to chemicals in soil are less than 1 in 10,000 (1 x 10-4), and the risks resulting from the surface-water and sediment exposure pathways are less than 1 in 100,000 (1 x 10-5). Because of the importance of the groundwater pathway, the remediation of groundwater will have the greatest effect in reducing potential offpost risks.

Dieldrin contributes the most to the total carcinogenic risk, followed by arsenic, chloroform, and atrazine. All of the estimated risks from dieldrin are conservative in that the dieldrin concentrations were considered to be constant throughout the exposure period (30 years). The natural reduction in dieldrin concentrations over time was not considered. Additionally, not all of the total carcinogenic risks for each zone are attributable to RMA activities. Background concentrations of dieldrin in soil attributable to agricultural practices may contribute up to 50 percent of the total carcinogenic risk in some zones based on a background concentration for dieldrin of approximately 8 mg/kg. Naturally occurring arsenic in groundwater may be responsible for a risk of approximately 4 in 100,000 (4 x 10-5) . based on a background concentration of arsenic m' groundwater of approximately 3 :g/l.

6.1.4.2 Noncarcinogenic Effects

As presented in Section 6.1.3, HIs are derived by comparing the estimated daily chemical intake to the estimated acceptable intake. Acute, or short-term, effects were evaluated for children because children would have the highest chemical intake per body weight and would be expected to be the most sensitive to the chemical. The EA concluded that there is a low potential for adverse health effects in children from hypothetical short-term exposures to dieldrin in groundwater in Zones 2, 3, and 4. The HI exceeds 1 in Zones 2, 3, and 4, with a maximum HI of 4 in Zone 3. Dieldrin is the primary contributor to the HI.

HIs were also estimated for long-term exposures for both children and adults. The risk characterization presented in the EA found that, with the exception of ingestion of DIMP in groundwater in Zone 4, no single chemical or exposure pathway resulted in an HI greater than 1. HIs were also calculated on the basis of target organ effects and the mechanism of toxic action. For children, both liver and central nervous system (CNS) toxicants were found to exceed an HI of 1. For liver toxicants, the HI exceeds 1 in Zones 2, 3, and 4, with a maximum HI of 2 in Zone 2, predominately attributable to inhalation and ingestion of chloroform. The HI for CNS effects exceeds 1 in Zones 2 and 4, with a maximum HI of 3.7 in Zone 4. The primary contributors to the estimation of CNS effects are DIMP and manganese. Direct ingestion of groundwater and ingestion of vegetable crops irrigated with groundwater are the two primary exposure pathways for DIMP and manganese.

Adult future HIs are all less than the child HIs. Table 6.8 summarizes the adult HIs segregated by target organ. When segregated for liver toxicants, the highest HI is 1.3 in Zone 3. The HI for CNS effects also exceeds 1.0, where DIMP is the major contributor to an HI of 2.4 in Zone 4.

6.2 Estimation of Potential Ecological Effects

6.2.1 Method

An Offpost Study Area ecological risk assessment was performed to evaluate potential adverse effects to the environment and nonhuman receptors as a result of potential exposure to chemicals migrating from onpost sources. The two natural ecosystems occurring in the Offpost OU are terrestrial and aquatic. Figure 6.3 presents the ecological site conceptual model and presents the potential exposure pathways quantified. The chemicals selected for evaluation of potential effects on the terrestrial and aquatic receptors were limited to RMA-related chemicals found in surface water, surface soil, and sediment. Chemicals identified in groundwater were used to evaluate agricultural receptors (e.g., crops, livestock) because of the potential for exposure through irrigation and livestock watering. The chemicals evaluated for potential ecological effects were aldrin, arsenic, dieldrin, endrin, DDE, DDT,and mercury.

Two methods of exposure were evaluated: direct exposure and biomagnification. Direct exposure is a result of contact with the original source of the chemical (e.g., ingestion of surface water or soil, ingestion of groundwater, or fish swimming in contaminated surface water). Biomagnification occurs when the tissue concentrations of a chemical increase with progression up the food chain. Over time, the concentrations of chemicals in tissues may reach a level detrimental to the organism's health.

The evaluation of ecological effects via direct exposure is analogous to the evaluation of human effects. Direct toxicity was evaluated by comparing the estimated daily intake of a receptor to the estimated toxicity reference value for a receptor. The toxicity reference values are similar to human RfDs in their derivation and use. These toxicity reference values were animal- and chemical-specific values, or, in the case of aquatic life, federal Ambient Water Quality Criteria values established to protect aquatic life.

To evaluate the potential effects of biomagnification, the estimated tissue concentrations resulting from biomagnification were compared to residue concentrations known to be without deleterious effects. Only the top indicator species were selected to evaluate the effects of biomagnification. These species were the bald eagle, great blue heron, and mallard duck.

In coordination with the U.S. Fish and Wildlife Service, it was agreed that screening levels, developed to ensure compliance with enforceable remediation levels, would meet the requirements of the federal Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. These screening levels were not exceeded in the Offpost OU. These levels are presented in the Final Offpost Operable Unit Endangerment Assessment/Feasibility Study in Table 3.3.3-1 (Toxicity Reference Values for Avian and Terrestrial Vertebrate Species of Concern Identified at Rocky Mountain Arsenal) of Volume II and Table H5-1 (Maximum Allowable Tissue Concentration [MATC] Values for the Offpost EA Ecological Assessment) of Appendix H in Volume IV. If the screening levels are exceeded or effects are observed in the future, enforceable remediation levels will be developed consistent with CERCLA, the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

Potential effects on wetlands and critical habitats were also evaluated. This assessment is presented in Appendix B of the Final Offpost EA/FS (HLA, 1992a). The U.S. Fish and Wildlife Service (USFWS) National Wetlands Office identified approximately 300 acres of wetlands along First Creek from the north boundary of RMA to O'Brian Canal. Potential effects of construction of the Offpost Groundwater Intercept and Treatment System included temporary dewatering during excavation of recharge trenches and pipelines near First Creek.

6.2.2 Results

Underwater aquatic life was evaluated on the basis of direct toxicity by comparing water concentrations to aquatic reference concentrations. Chlordane, dieldrin, fluoride, and DDT appeared to present a potential for an adverse effect to aquatic life in First Creek. However, because First Creek is dry much of the year and does not support a stable and ongoing fish population, adverse effects to aquatic life are expected to be minimal. Because of interaction between groundwater and First Creek, remedial actions taken to reduce the concentration of COCs north of the NBCS will also reduce concentrations of COCs in First Creek.

Agricultural life was evaluated in Zones 1, 2, and 6 (rural residential). The results of the direct toxicity evaluation indicated no potential adverse impacts to poultry from soil contaminants or to cattle from ingestion of contaminated soil and groundwater.

The ecological risk assessment concluded that for anirn als in the terrestrial and aquatic food webs, there is minimal potential for adverse effects. However, the Army and Shell Oil Company have agreed to till and revegetate approximately 160 acres located in the southeast portion of Section 14 and the southwest portion of Section 13 (see Figure 9.1). Shell Oil Company and the U.S. Army believe that existing soil risk in the revegetated area falls within EPA's established acceptable risk range and that remediation is not necessary. However, Shell Oil Company and the U.S. Army agree to the revegetation program as part of the remedy.

Construction of the Offpost Groundwater Intercept and Treatment System was coordinated with USFWS to minimize the potential impacts on wetlands and habitat. Although the wetlands area has been slightly altered because of construction of roads in the area, the wetlands still exist, dewatering is no longer occurring, and the amount of recharged groundwater is equal to the amount of extracted groundwater, thereby maintaining the stability of the wetlands area.

6.3 Conclusion

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a potential threat to public health, welfare, or the environment.

7.0 DESCRIPTION OF GROUNDWATER REMEDIATION ALTERNATIVES

An FS was conducted to develop and evaluate remedial alternatives for the Offpost OU. The first task performed during the FS was to identify media that require remedial action and correspondingly require development and evaluation of remedial alternatives. Risks calculated in the EA were compared to acceptable risk levels established by EPA in the NCP and other guidance. The Army has closely followed EPA guidance and the National Contingency Plan (NCP) regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, then the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 FR, 8718).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risks toward the 10-6 level. Using conservative assumptions, including several exposure pathways that do not currently exist, the maximum cumulative cancer risk in the Offpost OU was estimated to be 3 in 10,000, which is within the acceptable risk range established by EPA.

Although the maximum offpost cumulative carcinogenic risk is below the acceptable risk level, remediation of groundwater is preferable to no action for the following reasons:

Groundwater concentrations exceed National Primary Drinking Water Standards maximum contaminant levels (MCLs) and CBSGs in some areas of the Offpost OU.

Groundwater is the greatest contributor to cancer risk and contributes a maximum risk of 2 in 10,000 (or approximately 75 percent) to the cumulative risk in zones 2, 3, and 4.
Evaluation of potential noncarcinogenic health effects indicate that HIs calculated for groundwater contaminant concentrations in zones 2, 3, and 4 are slightly greater than 1.0.

Soil, surface water, sediment, and air contribute maximum cancer risks less than 1 in 10,000 in zones 1 through 6. Soil, surface water, sediment, and air do not require remediation because of

the low risks contributed by these media to the total risk. Remedial alternatives were developed and evaluated to address contaminated groundwater in the Offpost OU North and Northwest Plume Groups. Additionally, as part of the Conceptual Remedy Agreement, the Army and Shell Oil Company have agreed to till and revegetate approximately 160 acres located in the southeast portion of Section 14 and southwest portion of Section 13.

Remedial alternatives for groundwater were developed by (1) establishing groundwater containment system remediation goals (2) identifying the areas of groundwater exceedances of containment system remediation goals and (3) assembling combinations of remedial process options into remedial alternatives.

Containment system remediation goals (Table 7.1., 7.2, and 7.3 were established on the basis of chemical-specific applicable or relevant and appropriate requirements (ARARs), health-based criteria (HBC), exposure factors, and the statutory requirements stated in Section 121 of CERCLA. ARARs were used as groundwater containment system remediation goals for contaminants with promulgated standards, and HBC based on a risk of 1 x 10-6 calculated using RME assumptions were used for carcinogens without ARARs. A risk level of 1 x 10-6 was selected to correspond to the point of departure as defined in the NCP. The promulgated standards adopted as containment system remediation goals for Offpost OU groundwater include MCLs and CBSGs. In addition, containment system remediation goals for several contaminants with promulgated standards were adjusted downward to reduce risk corresponding to the containment system remediation goals. For some analytes, the certified reporting limit (CRL) or the practical quantitation limit (PQL) are higher than the containment system remediation goal. The CRL and PQL represent the lower practical limit for quantitation.

Attainment of the groundwater containment system remediation goals developed for the site will reduce the estimated total hypothetical cancer risks to less than 1 x 10-4 toward the 1 x 10-6 level. Because the total cancer risk assumes that all chemicals are present in groundwater at all locations, and since groundwater contamination is variable throughout the OU, the estimated risk reduction may be greater. Attainment of the groundwater containment system remediation goals developed for the site will also reduce HIs discussed in Section 6.1.4.2 to below 1.0 for all target organ groups and receptors. Again, variability in contaminants present in groundwater may increase the estimated risk reduction from that estimated by extrapolating directly from the risk assessment.

Groundwater requiring remediation in the Offpost Study Area was identified by comparing ground-water containment system remediation goals to the areal extent of groundwater contamination. Groundwater containment system remediation goals are exceeded for the carcinogens arsenic, chloroform, DBCP. tetrachloroethylene, trichloroethylene, and dieldrin. Groundwater containment system remediation goals are also exceeded for the noncarcinogens chlorobenzene, dicyclopentadiene, and DIMP. The area of groundwater exceeding containment system remediation goals (and thus the Offpost OU) encompasses approximately 590 acres of the Offpost Study Area.

Groundwater alternatives were developed and evaluated using two groundwater models. The models simulated groundwater flow and contaminant transport for the North and Northwest Plume Groups. Groundwater modeling was used for the following purposes: developing conceptual designs for sizing and locating groundwater extraction, recharge, and treatment systems; estimating future contaminant transport; evaluating the relative merits of remediation alternatives; and estimating the time required to clean up the contaminated groundwater. Because of the approximate nature and inherent uncertainties of the models, none of the model results should be interpreted as an accurate prediction of future conditions. The predicted remediation time frames are estimates. Accordingly, estimated remediation time frames were only used to assess the relative effectiveness of the groundwater alternatives.

Remedial alternatives were initially screened on the basis of effectiveness, implementability, cost, and attainment of ARARs. The alternatives passing the initial screening were then evaluated on the basis of nine criteria required by the NCP. In addition to remedial alternatives, the NCP requires that a No Action alternative be considered at every site. The No Action alternative serves primarily as a point of comparison for other alternatives.

A total of six alternatives for the North Plume Group and four remedial alternatives for the Northwest Plume Group were developed for analysis. Following the initial screening analysis in the FS, four remedial alternatives for the North Plume Group (N-1, N-2, N-4, and N-5) and two

remedial alternatives for the Northwest Plume Group (NW-1 and NW-2) remained for evaluation during the detailed analysis of alternatives. These alternatives are described below with the original alternative numbering sequence from the FS report.

7.1 Common Elements of Alternatives

All of the alternatives developed included the following elements:

Groundwater and surface-water monitoring: Samples will be collected periodically from groundwater monitoring wells and surface-water locations throughout the Offpost Study Area and analyzed to assess changes in groundwater and surface-water quality during and after remediation.

Site review: In accordance with CERCLA, a site review will be conducted at least every five years until groundwater containment system remediation goals are achieved to assure that human health and the environment are protected during and after remediation. The site review will use monitoring program data to assess whether additional remedial action would be warranted.

Table 7.4: Groundwater Alternatives for the North and Northwest Plume Groups

	Alternative*	Process Options	Paleochannel	Extractions Wells (total number)	Recharge Wells and trenches (total number/ total length)	Flow Rate (gpm)	Remediation Timeframe (years)	Treatment Facility Location	Residuals Generated
North Plume Group									
N-1	No action	Monitoring site reviews	FC, N	None	None	N/A	Unknown	N/A	None
N-2	Continued operation of the NBCS with improvements as necessary	NBCS operation (soil-bentonite barrier, carbon adsorption)	FC, N	No additional	No additional	240	15 to 30+	NBCS	No additional
N-4	Offpost Intercept and Treatment System	Carbon adsorption NBCS operation	FC N	5 12	6 trenches/1500 foot	180 300	15 to 30	T2S, R67W, Sec. 14, NE 1/4 Sec.	Spent carbon
N-5	Expansion of the Offpost Intercept and Treatment System	Carbon adsorption NBCS operation	FC N	7 13	10 trenches/ 2700 feet 2 trenches/600 feet	240 330	10 to 20	T2S, R67W, Sec. 14, NE 1/4 Sec.	Spent carbon
Northwest Plume Group									
NW-1	No action	Monitoring site reviews	NW	None	None	N/A	Unknown	N/A	None
NW-2	Continued operation of the NWBCS with improvements as necessary	NWBCS operation	NW	No additional	No additional	850	3 to 8	NWBCS	No additional

FC First Greek
gpm Gallons per minute
N/A Not applicable
N Northern
NBCS North Boundary Containment System
NW Northwest
NWBCS Northwest Boundary Containment System

* All alternatives include groundwater monitoring and site reviews.

Table 8.1: Summary of the Detailed Analysis and Ranking of Groundwater Alternatives for the North Plume Group

Criteria	Alternative N-1 No Action	Alternative N-2 Continued Operation of the North Boundary Containment System With Improvements as Necessary	Alternative N-4 Offpost Intercept and Treatment System	Alternative N-5 Expansion 1 to Interim Response Action A
Overall protection of human health and the environment	This alternative would not provide protection of human health and the environment.	This alternative provides limited overall protection of human health and the environment by preventing migration of contaminants from RMA to the Offpost Study Area north of the NBCS. Potential risk associated with groundwater in the North Plume Group would decrease over time.	This alternative reduces potential risk and provides protection of both human health and the environment by remedia- North Plume Group groundwater and groundwater migrating from RMA to the Offpost Study Area.	This alternative reduces potential risk and provides protection of both human health and the environment by remediating North Plume Group groundwater and groundwater migrating from RMA to the Offpost Study Area.
Compliance with ARARs	This alternative is not expected to achieve chemical-specific ARARs.	Chemical-specific ARARs would be attained in approximately 15 to 30-plus years, as estimated by groundwater modeling.	Chemical-specific ARARs would be attained in approximately 15 to 30 years, as estimated by groundwater modeling.	Chemical-specific ARARs would be attained in approximately 10 to 20 years, as estimated by groundwater modeling.
Long-term effectiveness and permanence	This alternative would not reduce the residual risk associated with groundwater exposure pathways.	This alternative would reduce residual risk associated with North Plume Group groundwater by preventing contaminant migration at the NBCS and continuing recharge of treated groundwater to flush contaminants in the North Plume Group.	This alternative would reduce residual risk associated with North Plume Group groundwater, through operation of the NBCS and the Offpost Intercept and Treatment System and improvements to both systems as necessary.	Through treatment, this alternative would reduce residual risk associated with North Plume Group groundwater through operation of the NBCS, the Offpost Intercept and Treatment System, and the Expansion 1 system.
Reduction of mobility, toxicity, or volume	This alternative would not employ any treatment process options and would not reduce toxicity, mobility, or volume of groundwater within the North Plume Group or groundwater migrating from RMA to the Offpost Study Area.	This alternative would reduce toxicity, mobility, and volume of groundwater migrating from RMA to the Offpost Study Area.	Through treatment, this alternative would reduce toxicity, mobility, and volume of groundwater within the North Plume Group and groundwater migrating from RMA to the Offpost Study Area.	Through treatment, this alternative would reduce the toxicity, mobility, and volume of groundwater within the North Plume Group and groundwater migrating from RMA to the Offpost Study Area.

Table 8.1 (Continued)

Criteria	Alternative N-1 No Action	Alternative N-2 Continued Operation of the North Boundary Containment System With Improvements as Necessary	Alternative N-4 Offpost Intercept and Treatment System	Alternative N-5 Expansion 1 to Interim Response Action A
Short-term effective-ness	Because no remedial action would be performed, there would be no short-term impacts. There would be no implementation period.	There would be no short-term impacts because the NBCS is already operating. There would be no implementation period.	Community and workers were protected by adhering to standard health and safety practices. The implementation period is complete and the system is fully operational.	Community and workers would be pro-tected during construction through adhering to standard health and safety practices. The implementation period would be approximately 14 months.
Implementability	Technical feasibility would be high. The administrative feasibility would be low.	This alternative is readily implementable. Technical and administrative feasibility would be high.	This alternative is readily Implementable. Technical and administrative feasibility would be high.	This alternative is readily Implementable. However, the construction would be conducted in two time Periods due to the design phase for the expansion. Technical and administrative feasibility would be high.
Estimated cost	Total Capital Cost = $ -0- Total Long-term O&M Cost = $4.1 to 6.0 million Total Present Worth Cost = $4.1 to 6.0 million	Total Capital Cost = $ -0- Total Long-term O&M Cost = $39.6 to 32.5 million Total Present Worth Cost = $30.6 to 32.5 million	Total Capital Cost = $16.7 million Total Long-term O&M Cost = $39.8 to 46.4 million Total Present Worth Cost = $56.5 to 63.1 million	Total Capital Cost = $19.4 million Total Long-term O&M Cost = $36.9 to 43.6 million Total Present Worth Cost = $56.2 to 63 million

ARAR Applicable or relevant and appropriate requirement
NBCS North Boundary Containment System
O&M Operation and maintenance
RMA Rocky Mountain Arsenal

Table 8.2: Summary of the Detailed Analysis and Ranking of Groundwater Alternatives for the Northwest Plume Group

Criteria	Alternative NW-1 No Action	Alternative NW-2 Continued Operation of the Northwest Boundary Containment System With Improvements as Necessary
Overall Protection of Human Health and the Environment	This alternative would not provide protection of human health and the environnment.	This alternative would provide protection of human health and the environment by preventing migration of contaminants from RMA to the Offpost Study Area north of the NWBCS. Potential risks associated with the Northwest Plume Group groundwater would be substantially reduced through continued operation of the NWBCS and improvements as necessary.
Compliance With ARARs	This alternative is not expected to achieve chemical-specific ARARs.	This alternative is expected to meet or exceed chemical-specific ARARs in approximately three to eight years, as estimated by groundwater modeling.
Long-term Effectiveness and Permanence	This alternative would not reduce the residual risk associated with potential groundwater exposure pathways.	This alternative would reduce residual risk associated with groundwater within the Northwest Plume Group through preventing contaminant migration at the NWBCS and recharging treated groundwater to flush contaminants in the Northwest Plume Group.
Reduction of Toxicity, Mobility, or Volume	This alternative would not employ any treatment process options and would not reduce the toxicity, mobility, or volume of groundwater within the Northwest Plume Group or groundwater migrating from RMA to the Offpost Study Area.	This alternative would reduce toxicity, mobility, and volume of groundwater migrating from RMA to the Offpost Study Area. Groundwater contaminant concentrations would be reduced within the Northwest Plume Group by flushing provided by recharge of treated water at the NWBCS.
Short-term Effectiveness	Because no remedial action would be performed, there would be no short-term impacts. There would be no implementation period.	There would be no short-term impacts. There would be no implementation period.
Implementability	The technical feasibility would be high. The administrative feasibility would be low.	This alternative is readily implementable. Technical and administrative feasibility would be high.
Estimated cost	Total Capital Cost = $ -0- Total Long-term O&M Cost = $0.6 to 1.3 million Total Present Worth Cost = $0.6 to 1.3 million	Total Capital Cost = $ -0- Total Long-term O&M Cost = $12.4 to 13.1 million Total Present Worth Cost = $12.4 to 13.1 million

Table 8.2 (continued)

ARAR	Applicable or relevant and appropriate requirement
NWBCS	Northwest Boundary Containment System
O&M	Operation and maintenance
RMA	Rocky Mountain Arsenal

Table 9.1: Estimated Costs of the Offpost Operable Unit Selected Remedy

Cost Component	Alternative N-4	Alternative NW-2a
Capital Costs		
Monitoring well system	$ 908,000	NA
Offpost Intercept and Treatment	4,593,000	NA
System extraction/recharge system		
Treatment facility	4,106,000	NA
Startup costs	341,000	NA
Indirect costs	6,715,000	NA
Total estimated capital costs	$ 16,663,000	$0
Annual Operation and Maintenance Costs		
Groundwater monitoring	$ 352,000	$ 134,000
Site reviews	150,000	150,000
North and northwest boundary system operations	1,724,000	769,000
Offpost Intercept and Treatment	522,000	NA
System facility O&M		
Offpost Intercept and Treatment		
System carbon replacementb		
0 to 3/5 years	817,000	NA
3/5 years to system shutdown	227,000	NA
Total estimated Annual O&M Costs		
0 to 3/5 years	$ 4,618,000	
3/5 years to system shutdown	$ 4,028,000	$ 1,053,000
	Nonconservativec	Conservativec
Total remedy costs	$ 68,911,000	$ 76,143,000

DIMP Diisopropylmethyl phosphonate
NA Not applicable
O&M Operation and maintenance

a. There are no capital costs for Alternative NW-2 because the remedial systems are currently operational.
b. The carbon usage rate is assumed to decrease over time as a result of expected decreases in influent DIMP concentration. The duration of time before a decrease in carbon usage rate is expected to occur within three to five years.
C. A range of total costs has been estimated on the basis of the range of expected remediation time frames as estimated by the groundwater model results.

Table 10.1: Summary Evaluation of Chemical-specific and Other Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate Requirement	Comment
Chemical-specific ARARs				
Safe Drinking Water Act	40 CFR Part 141	Establishes primary MCLs for public water-Supply systems.	No/Yes	Groundwater in the vicinity of the site is being used or may be used as a Source of water for public water system or private supply wells. Therefore, those primary MCLs that are more stringent than the Colorado Primary Drinking Water Regulations (because Colorado has primary enforcement authority) are relevant and appropriate.
	40 CFR Sections 141.50 and 141.51	Establishes MCLGs (nonenforceable health goals) for public water systems.	No/Yes	Groundwater in the vicinity of the site is being used or may be used as a source of water for a public water system or private supply wells. Therefore, in accordance with the NCP, nonzero MCLGs are considered to be relevant and appropriate.
Other ARARs				
Colorado Basic Standards for Groundwater; Colorado Basic Standards and Methodologies for Surface Water	5 CCR 1002-8 Section 3.11.0 et seq.; Section 3.1.0 et seq.	Establishes statewide standards for waters of the state.	Yes/No	State standards that are more stringent than federal standards are considered applicable.

Table 10.2: Summary Evaluation of Action-specific Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit

Standard, Requirement Criteria, or Limitation	Citation		Applicable/ Relevant and Appropriate Action-specific Requirement	Comment
Federal ARARs				
Safe Drinking Water Act	42 USC Sections 300b to 300h-7			
- Underground Injection Control Regulations	40 CFR Parts 144 to 147	Establishes standards for construction and operation of injection wells/trenches	Yes/No	Applicable if reinjection wells/trenches are used for discharge of treated water; relevant and appropriate if some other method of reinjection is used. Under the provisions of 40 CFR 144.13(L), EPA has determined that the reinjection wells/trenches used in conjunction with the barrier treatment system do not endanger underground sources of drinking water. The level of treatment prior to reinjection, offpost alternative water supplies, and other remedies are sufficient to meet the requirements of the UIC program.
Colorado Air Quality Standards	CRS Sections 25-7-101 to 25-7-806			
- Odor Emission Regulations	Colorado Air Quality Control Regulation No. 2	Sets limits on emission of odorous air contaminants	Yes/No	Applicable to remedial action for the Offpost OU.

ARAR	Applicable or relevant and appropriate requirement
CFR	Code of Federal Regulations
CRS	Colorado Revised Statues
OU	Operable unit
EPA	U.S. Environmental Protection Agency
UIC	
USC	United States Code
Voc	Volatile organic compound

Table 10.3: Summary Evaluation of Location-specific Applicable or Relevant and Appropriate Requirements for the Offpost Operable Unit

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate Location-specific Requirements	Comment
Federal ARARs				
Executive Order 11988 - Flood Plain Management	40 CFR Part 6, Appendix A	Directs federal agencies to avoid long- or short-term impacts associated with occupancy and modification of a floodplain.	Yes/No	Requires a 500-year floodplain to be identified and considered in scoping any remedial actions.
Executive Order 11990	40 CFR Part 6, Appendix A	Minimizes the destruction, loss, or degradation of wetlands.	Yes/No	Requirements associated with this order would be applicable to any remedial actions that could affect the existing wetlands.

ARAR Applicable or relevant and appropriate requirement
CFR Code of Federal Regulations

<IMG SRC 0896128A3>
<IMG SRC 0896128A4>
<IMG SRC 0896128A5>
<IMG SRC 0896128A6>
<IMG SRC 0896128A7>
<IMG SRC 0896128A8>
<IMG SRC 0896128A9>
<IMG SRC 0896128B>
<IMG SRC 0896128B1>
<IMG SRC 0896128B2>

Appendix A

RESPONSIVENESS SUMMARY

PREFACE

This appendix contains the Army's responses to comments and new relevant information submitted in regard to the Proposed Plan, the Remedial Investigation, the Endangerment Assessment/Feasibility Study, and the selected remedy for the Offpost Operable Unit at Rocky Mountain Arsenal. Comments were received from the State of Colorado, U.S. Environmental Protection Agency Region VIII, city and county governments, environmental action groups, and private citizens.

A glossary of acronyms used in Appendix A is provided at the end of the Appendix A Introduction.

RESPONSIVENESS SUMMARY FOR THE ROCKY MOUNTAIN ARSENAL

Offpost Operable Unit

The Program Manager for Rocky Mountain Arsenal (PMRMA) solicited comments; regarding the U.S. Department of the Army's (Army's) findings in the Offpost Operable Unit Proposed Plan and the Endangerment Assessment/Feasibility Study (EA/FS) during a public comment period from March 21, 1993 through June 21, 1993. Both the Proposed Plan and the EA/FS were made available to the public for the entirety of the public comment period. These documents were available at various city and county libraries in the area as well as at the U.S. Environmental Protection Agency (EPA) Region VII librarv. These documents, as well as the complete administrative record, were also available at the RMA Joint Administrative Record Document Facility. A public meeting was held in Commerce City, Colorado, on April 28, 1993. to present and discuss the Proposed Plan and the EA/FS report with citizens and public officials. This Responsiveness Summary has been prepared to respond to written questions or concerns received by the Army during the public comment period.

The public meeting was held at the Dupont Elementary school in Commerce City, Colorado, on April 28, 1993 from 7:00 p.m. to approximately 11:00 p.m. Those in attendance included representatives from the Army, the Army's contractor (Harding Lawson Associates), EPA, State of Colorado (State), Tri-County Health Department, city and county officials, public interest groups, and citizens. Also, a Court Reporter and Notary Public reported the proceedings of the meeting in a stenographic transcript, available for review in the site administrative record. An agenda was prepared for the meeting and provided to attendees along with a copy of the Proposed Plan. A copy of the State's concerns regarding the Proposed Plan was also made available to attendees. The Army presented a review of the Superfund process, a video of the existing Offpost Groundwater Intercept and Treatment System, a brief review of the history of the Offpost Study Area, a review of the endangerment assessment results, a description of the alternatives evaluation process, information on the remedy selection process, and a presentation of the preferred alternative.

History of Community Relations Activities

The Remedial Investigation (RI), RI Addendum, EA/FS, and Proposed Plan for the Offpost OU were made available to the public in the Administrative Record (located at the Joint Administrative Record Document Facility at the west entrance to RMA at 72nd Avenue and Quebec Street), in an information repository maintained at the EPA Docket Room in Region VIII, and at the Adams County, Aurora, Commerce City, Denver, Lakewood, Montbello, and Thornton Public Libraries. The notice of availability for these four documents was published in the Denver Post and Rocky Mountain News newspapers.

An expanded Community Relations outreach was implemented to ensure community members had opportunity to comment on the Proposed Plan for the Offpost OU. Community outreach started in January 1993 with the announcement that all documents supporting an impending Proposed Plan were available for review in local libraries. PMRMA sent a direct mailing of the announcement to more than 1200 local citizens.

In March 1993, a press release was made and a legal notice was published announcing that a

public meeting was scheduled for April 28, 1993, at Dupont Elementary School, Commerce City, Colorado, to address the Proposed Plan. A separate letter was sent to citizens informing them of the documents availability in the libraries. The letter also included a brief fact sheet summarizing the Proposed Plan.

Originally, the. public meeting was scheduled for April 21, 1993, at RMA. The Army received requests to hold the meeting on a different day and offpost. Because of these factors and Earth Day events in Denver for April 21. the meeting was moved to April 28, 1993.

A Media Day was held the day of the public meeting to provide information on the Army's proposal to a local media. Both print and video media representatives attended.

Recognizing the importance of the public meeting, PMRMA expanded the meeting announcement to include display advertising in 12 local and weekly newspapers in the Denver metropolitan area in addition to the normal press release and Media Day event.

The remainder of this Responsiveness Summary will consist of Army responses to written questions and comments received during the public comment period. Specific questions, comments, and replies received during the public meeting may be reviewed in the meeting transcript.

Since 1989, all remedial investigation activities at the RMA have been performed in accordance with a Federal Facility Agreement (FFA) signed by the Army, EPA, Shell Oil Company, U.S. Department of the Interior, U.S. Department of Justice, and the U.S. Agency for Toxic Substances and Disease Registry. By signing the FFA, these parties were made part of all decision processes at the Rocky Mountain Arsenal. It is significant to note that the State elected not to sign the FFA, thereby declining involvement in the Offpost Operable Unit decision-making processes. However, during the development of the Offpost EA/FS, the State has been involved in the entire process and provided comments on the RI, EA/FS, and Proposed Plan to the Army. Accordingly, the Army has provided responses to these comments as they have been received (e.g., Volume VIII of the Final Offpost Operable Unit EA/FS).

Responses to comments are presented in the following order, based on the originator of comment: the State of Colorado, Region VIII EPA, city and county governments, the Farmers Reservoir and Irrigation Company, environmental action groups, and citizen comments. Three sets of comments from the State are addressed in this Responsiveness Summary. The first two sets were received by the Army prior to the official comment period on the Proposed Plan, and the third was received during the public comment period.

In the following comments and responses, text printed in italics is verbatim text of comments received regarding the Proposed Plan and EA/FS as received from the commentor. The response from the Army follows each comment. This format is followed for the State of Colorado, Region VIII EPA, and the Farmers Reservoir and Irrigation Company.

For responses to comments received from city and county governments, and from environmental action groups, a copy of the comments as received by the Army is provided followed by a response to each issue raised, numbered as appropriate.

This Appendix is organized as follows:

Section	Topic
A-1	Responses to State of Colorado Comments dated February 19, 1993
A-2	Responses to State of Colorado Comments dated March 16, 1993
A-3	Responses to State of Colorado Comments dated June 21, 1993
A-4	Responses to Region VIII U.S. EPA Comments
A-5	Responses to City and County Government Comments Tri-County Health Department Commerce City City of Brighton City of Thornton City and County of Denver Adams County

	City of Aurora
A-6	Responses to Farmers Reservoir and Irrigation Company Comments
A-7	Responses to Environmental Action Group Comments
	Sierra Club
	Citizens Against Contamination
	Arsenal Action Alliance
	Colorado Pesticide Network
	Environmental Information Network
	Denver Audubon Society
	We the People
	League of Women Voters
	Denver Region Greens
A-8	Responses to Citizen Comments

GLOSSARY

ADI	Acceptable daily intake
ARAR	Applicable or relevant and appropriate requirement
Army	U.S. Department of Army
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient water quality criteria
BDL	Below detection limit
CBSG	Colorado Basic Standards for Ground Water
CBSM	Colorado Basic Standards and Methodologies for Surface Water
CCR	Code of Colorado Regulations
CDH	Colorado Health Department
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	Chemical of concern
CRL	Certified reporting limit
CRS	Colorado Revised Statutes
DIMP	Diisopropyl methylphosphonate
EA/FS	Endangerment Assessment/Feasibility Study
EA	Endangerment assessment
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
FEL	Frank effect level
FFA	Federal Facility Agreement
FR	Federal Register
FRICO	Farmers Reservoir and Irrigation Company
FS	Feasibility study
HA	Health advisory
IBCS	Irondale Boundary Containment System
IMPA	Isopropyl methylphosphonic acid
IRA	Interim response action
IRIS	Integrated Risk Information System
kg	Kilogram
l/day	Liters per day
LOAEL	Lowest observed adverse effect level
MATC	Maximum allowable tissue concentration
MCL	Maximum contaminant level
mg/kg/day	Milligrams per kilogram per day
mg/l	Milligrams per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	No observed adverse effect level
OSWER	Office of Solid Waste and Emergency Response
OU	Operable unit
PMRMA	Program Manager for Rocky Mountain Arsenal
ppb	Parts per billion
ppm	Parts per million
PQL	Practical quantitation limit
PRG	Preliminary remediation goal
RA	Risk assessment
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RfD	Reference dose
RI	Remedial investigation
RMA	Rocky Mountain Arsenal
RME	Reasonable maximum exposure
ROD	Record of Decision
SQI	Submerged quench incinerator
TBC	To be considered
TCE	Trichloroethene,
TCHD	Tri-County Health Department
TRV	Toxicity reference value
UF	Uncertainty factor
USATHAMA	United States Army Toxic and Hazardous Materials Agency

USC	United States Code
USFWS	U.S. Fish and Wildlife Service
:g/l	Micrograms per liter
UST	Underground storage tank

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO STATE OF COLORADO COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
FEBRUARY 19,1993

GENERAL COMMENTS

Comment No. 1. DIMP Contamination in Groundwater:

The State continues to disagree with the Army's use of 600 parts per billion (ppb) as a safe level of DIMP in groundwater.

The Army plans on remediating only areas of groundwater with concentrations of DIMP in excess of 600 ppb. The State believes that DIMP at much lower concentrations may pose a threat to human health. For that reason, the State, since 1990, has been providing free bottled water for approximately 600 residents with DIMP in their wells. The State is concerned, furthermore, that a portion of a plume of DIMP may have already passed the offpost intercept system constructed by the Army, leaving high concentrations of this chemical, possibly greater than 600 ppb, unremediated.

Response

The U.S. Environmental Protection Agency (EPA) developed the Health Advisory for diisopropyl methylphosphonate (DIMP) in 1999 on the basis of an extensive review of more than 30 existing toxicology studies involving a variety of animal species. EPA's Office of Drinking Water re-reviewed the Health Advisory, in light of the State's concern, and concluded on March 28, 1990, that "the existing Health Advisory values and the basis for the values represent the best scientific position for the protection of human health.

In accordance with EPA's Risk Assessment Guidance for Superfund (RAGS), the Army used EPA's Health Advisory and information contained in the Integrated Risk Information System (IRIS) to evaluate risk to human health.

The Offpost Groundwater Intercept and Treatment System is located in areas of highest contaminant concentrations. The Army is aware that concentrations of DIMP greater than 600 parts per billion (ppb) have been reported north of the Offpost Groundwater Intercept and Treatment System. In that regard, the offpost remedial action groundwater monitoring prograrn will be coordinated with the three existing groundwater monitoring programs active in the Offpost Study Area. These three programs are (1) the Groundwater Monitoring Program, (2) the Interim Response Action A monitoring program, and (3) the private well monitoring program. Additionally, in the area north of the Offpost Groundwater Intercept and Treatment System where DIMP has been reported to exceed 600 ppb, three monitoring wells will be replaced and three new monitoring wells will be installed. Replacement wells are being installed for three wells originally in the monitoring network that were found to be damaged or destroyed. Two new monitoring wells will be installed downgradient of the First Creek Pathway, and one new monitoring well will be installed downgradient of the northern Pathway. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells win be used to further define the extent of contamination greater than the Remediation goals in this area and assist in determining whether modifications to the design of the Offpost Groundwater Intercept and Treatment System are necessary.

The State continues to be concerned with the Army's Use of 700 parts per billion (ppb) as a safe level of IMPA in groundwater.

The State is concerned that the Army has not adequately characterized IMPA contamination in the offpost groundwater. An understanding of where IMPA exists in groundwater, both onpost and offpost, has been hindered because of a lack of an acceptable Army analytical methodology. In addition, the State believes that IMPA at a much lower concentration than 700 ppb, the acceptable level recommended by EPA, may pose a threat to human health.

Response

On the basis of toxicity information summarized in EPA's isopropyl methylphosphonic acid (IMPA) Health Advisory and the IRIS database, there is no information to indicate that IMPA concentrations lower than 700 ppb may pose a threat to human health.

It is highly unlikely that toxicologically significant concentrations of IMPA will occur in groundwater because the abiotic formation of IMPA from DIMP occurs under alkaline conditions in the presence of heat. IMPA is primarily formed as a biological metabolite of DIMP and excreted in the urine. The toxicological data on the metabolism of DIMP indicates that the formation of IMPA is part of the metabolic elimination process and not a bioactivation reaction. IMPA is a very polar metabolite that is most likely readily eliminated in the urine rather than reabsorbed by the kidneys and redistributed throughout the body.

The EPA reference dose for IMPA was based on a simple IMPA subchronic study; however, EPA indicates in IRIS that the DIMP database can be used to support the toxicological conclusions regarding IMPA because more than 90 percent of the ingested DIMP is rapidly (within 24 hours) converted to IMPA. EPA states that the DIMP studies showed that DIMP was relatively nontoxic to all species. Additionally, because DIMP is rapidly and mostly metabolized to IMPA, it is reasonable to conclude that the DIMP administered to mammals in the studies was metabolized to IMPA; therefore, the absence of effects from DIMP also may be considered to indicate an absence of effects from IMPA.

Analytical data collected to date in the Offpost Study Area for IMPA has not indicated that IMPA is present at or above the certified reporting limit (CRL) in groundwater or tap water samples. The Army's current CRL for IMPA is 25 ppb. From 1989 through 1992, the IMPA analytical method used by the Army for analysis of groundwater and tap water had a.CRL of 100 ppb. In 1993, following additional method development, the CRL was reduced to 25 ppb. The 1993 reporting limit of 25 ppb is 28 times less than the EPA health advisory concentration of 700 ppb. For this reason, the Army believes it has adequately characterized the extent of IMPA in the Off post Study Area in a manner sufficient to conclude that potential health effects from IMPA are minimal.

The Army has vigorously pursued the development of more sensitive methods for the identification of IMPA in RMA groundwater. The Army is currently unaware of a standard EPA method capable of attaining a reliable reporting limit near 6 ppb, the concentration proposed by the State.

The Army has reviewed the State's evaluation of IMPA toxicity and will be providing additional comments.

The State believes that the cleanup of groundwater to the north of the Arsenal can be achieved in a more timely manner without a significant increase in costs.

The Army evaluated six different alternatives for the northern plume group, and four different alternatives for the northwest plume group. For the northern plume group, the Army estimates that it will take 15 to 30 years to clean up the groundwater. The State believes that the Army significantly underestimated the actual time necessary to clean the groundwater in this area to a safe level. In addition, the Army screened out an alternative that, according to the Army's groundwater model, would have lessened their estimated remediation time to 10 to 20 years, because it would have required an additional year to implement. This alternative, called N-5 in the Proposed Plan, would actually cost less than the Army's selected alternative, N-4 since it would not have to be operated as long.

The State contends that a more aggressive alternative is preferable because it would take a shorter time period to remediate the groundwater plume, and is therefore more cost effective. The State is waiting for additional information from the Army prior to making a proposal as to how a more aggressive remediation of groundwater could be achieved.

Response

The Army selected Alternative N-4 instead of Alternative N-5 primarily because Alternative N-4 includes potential future modifications, only if such modifications are found to be necessary based on actual operating data, to the Offpost Groundwater Intercept and Treatment System. Selection of Alternative N-5 instead of Alternative N-4 will not necessarily provide a more cost

effective alternative because of a slightly shorter estimated remediation timeframe. The Army based its assessment of the relative differences between the groundwater alternatives and estimates of remediation timeframes on groundwater models that are very general in nature; thus, the estimated remediation timeframes should not be construed as precise predictions. Use of actual full-scale operating data is preferable to selecting additional components for the Offpost Groundwater Intercept and Treatment System using the more speculative modeling data (i.e., Alternative N-5).

The Army is committed to efficient operation of the Offpost Groundwater Intercept and Treatment System and will evaluate operating data to assess the need for system modification. Similar to the onpost boundary treatment systems, it is difficult to assess whether the installation of additional wells will provide more efficient operation without collecting full-scale operating data for the Offpost Groundwater Intercept and Treatment System. The Army has included an intensive monitoring component as part of the preferred alternative, Alternative N-4, in the Proposed Plan. This intensive monitoring program will, allow the collection and subsequent interpretation of performance data for the full-scale operation of both the Offpost Groundwater Intercept and Treatment System and the onpost boundary systems. The data will be used to assess the need for any improvement to the systems and will provide increased accuracy in assessing contaminant cleanup. Acquisition of this operational data is preferable to adding extraction wells and recharge trenches without the benefit of operational data, because additional data are required to assess the necessity and placement of any additional extraction wells or trenches. If operational data supports the conclusion that the cleanup timeframe can be shortened without a significant increase in long-term costs, modifications to Alternative N-4 will be implemented. By taking this approach, improvements to the system will be more effective than improvements made based on computer modeling data.

The State's contention that a more aggressive alternative is preferable because it would shorten remediation timeframes and thus would result in a more cost-affective alternative relies on the use of modeling data to make the assessment. The Army proposes to use actual operations data from Alternative N-4 to make the same assessment. Modification of the Offpost Groundwater Intercept and Treatment System, if necessary, would be based on field operations and monitoring data.

Comment No. 4. Selection of the Appropriate Risk Level:

The State is concerned that the Army's selected risk level for excess cancer incidence in the offpost is not protective and is contrary to federal law. In addition, the Proposed Plan does not state what level of health protection will he achieved.

The regulations that implement the Superfund law, the National Contingency Plan (NCP), state that a remediation plan should be designed to prevent excess risk to human health greater than approximately one in a million (l x 10-6). This number, or cancer risk level, is called the point of departure. EPA, because risk levels are sometimes difficult to predict, and because remediation is sometimes impractical, has allowed the risk level to be approximately one in ten thousand (l x 10-4) in certain instances. At the Rocky Mountain Arsenal, the Army is assuming that a risk level of 5 in ten thousand (5 x 10-4), or one in two thousand is acceptable, even though it has made no showing that the NCP's point of departure could not be achieved. Because the risk level is higher than the acceptable risk level provided for in the NCP, the Army has been able to avoid cleanup soils in parts of the offpost operable unit.

Response

The Army has closely followed EPA guidance and the NCP regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4 , but rather, the acceptable risk range can extend to 5 x 10-4 . The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range. The Army's goal, through operation of the Offpost Groundwater Intercept and Treatment System, is to further reduce offpost risk toward the 10-6 level.

Potential risk attributable to soil is a maximum of 8 x 10-5. This risk would only be realized for a population exposed at reasonable maximum exposure (RME) levels for all pathways. Because this scenario is unlikely and because maximum cancer risks are within the EPA risk range, offpost soil does not require remediation.

Comment No. 5. Acknowledging the State Groundwater Regulations as Local Standards:

The state disagrees with the Army's decisions to omit State environmental regulations when defining cleanup levels.

Under CERCLA, Stale environmental laws and regulations which set standards for cleanup, fulfill certain statutory criteria, and are more stringent than the comparable federal standards, must be used as the appropriate cleanup standards at Superfund sites. The Colorado Basic Standards for Groundwater have been acknowledged as the appropriate cleanup standard at other Superfund sites in Colorado. In fact, the Army itself has recognized these regulations as the governing standards for Interim Response Actions at the Rocky Mountain Arsenal. For the Offpost Operable Unit, however, the Army has refused to use the Colorado regulations as a remedial standard. It is important to the State of Colorado that our laws and regulations be obeyed. The State therefore maintains that Colorado law must be recognized as providing appropriate cleanup standards for the Offpost Operable Unit at the Rocky Mountain Arsenal.

Response

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirements (ARARs) criteria under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP. After extensive discussion with all the parties, the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health. In most cases, the treatment goals for the offpost and boundary treatment systems exceed the drinking water standards.

CERCLA expressly provides that state standards can be ARARs at a site. However, only those standards that are more stringent than federal requirements may be considered. In addition, the state standards must be promulgated (i.e., the requirement must be of general applicability and legally enforceable). Finally, the requirements must be identified in a timely manner by the particular state (40 Code of Federal Regulations [CFR] Section 300.400[g][4]).

Regulations promulgated pursuant to the Colorado Water Quality Control Act, Colorado Revised Statutes (CRS) Sections 25-8-101, et seq., establish standards for groundwater (5 Code of Colorado Regulations [CCR] 1002-8, Section 3.11.0). A key aspect of the regulation is that Tables 1 through 4 standards are not automatically applicable to groundwater (Section 3.11.7[A]), but apply only if the aquifer has been classified in accordance with Section 3.11.4.

Most aquifers in the state are unclassified. Consequently, the Water Quality Control Commission (Commission) promulgated the interim narrative standard (Section 3.12.5) for five specified aquifer systems to avoid degradation of water quality prior to aquifer classification. Each of the five identified aquifers must meet the standards in Tables 1 through 4 or the ambient quality as of October 30, 1991, if it was less restrictive, until the aquifers are classified and numerical standards are adopted.

The Commission promulgated a second group of groundwater standards that are applied differently than the standards in Tables 1 through 4. These statewide standards (Section 3.11.5[C]) include water quality standards for radioactive materials and interim standards for organic pollutants (Table A), including chloroform. Table A standards differ from the standards in Tables 1 through 4 in an important way: Table A standards are automatically applicable to all state groundwater (Section 3.11.7[A]). The Commission recognized that the automatic application of Table A standards can lead to unnecessarily overprotective and technically impracticable results at contaminated sites and added exceptions to the regulation for remediation activities at CERCLA sites, Resource Conservation and Recovery Act (RCRA) sites, and underground storage tank (UST) sites. The CERCLA exception, Section 3.1 l.5(C)(5)(a), states the following.

> Nothing in this regulation shall be interpreted to preclude...[a]n agency

> responsible for implementation of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, et seq., as amended, from selecting a remedial action and a point of compliance that are more or less stringent than would be achieved by compliance with the statewide numerical standards established in this subsection, or alternative site specific standards adopted by the Commission, when a determination is made that such a variation is authorized pursuant to the applicable provisions of CERCLA.

Sections 3.11.5(C)(5)(b) and (c) provide similar exceptions for corrective actions under RCRA Subtitle C (hazardous waste treatment, storage, and disposal facilities) and Subtitle I (UST sites), respectively.

Section 3.11.5(C)(5) is internally consistent only if the Commission intended not to impose the interim organic standards in Table A as cleanup standards. According to the regulations, the interim organic standards automatically apply on a statewide basis, except at CERCLA, RCRA, and UST sites where "certain federal regulatory determinations regarding groundwater quality would not be superseded by the Commission's standards" (Section 3.11.10[B]). In promulgating the Table A exceptions, the Commission recognized that implementing agencies are more familiar with site-specific conditions and are in a better position to determine the appropriate cleanup standards. By not imposing unnecessarily stringent application of the Table A standards, the Commission sought to show "explicit deference to certain federal regulatory programs, which may apply different standards" (Section 3.11.10[H]).

The Army concludes that the CBSG interim organic standards are not ARARs for several reasons. The CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA that are more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

Comment No. 6. Future Land Use

The State believes that the Army failed to consider all reasonable land uses, and therefore exposure pathways, when it defined risks to human health.

The NCP requires the Army to consider current and reasonable potential land use in evaluating the risk to human health and the environment posed by contamination. The Army has decided that zones 3 and 4 of the operable unit should be analyzed assuming an urban residential scenario. The land in question is currently unoccupied because it is owned by Shell Oil Company. It was being used a rural residential property before Shell bought it, and is presently zoned for rural residential use. The Army justifies its classification of this property by relying on future land use projections which have been made by Adams County. The State contends that the rural residential scenarios should be used since it is currently permitted and there is no assurance that the land will not be used in this manner in the future. This is important because using the urban residential scenario results in elimination of exposure pathways of consumption of homegrown meat, milk, and eggs in estimating risk, thereby allowing the Army to leave higher levels of contamination in the soils.

Response

The land use designations and plans were established by the appropriate jurisdictional agencies, not by EPA or the Army, and were used to establish land use scenarios for use in the risk

assessment within each risk assessment zone. Evaluation of current zoning regulations, discussions with local planning officials, examination of future land use master plans for the city and county, and visual surveys were used to establish land use scenarios. These designations are supported by established zoning, planning maps, and planning documents. The future land use scenarios used by the Army in the risk assessment are highly conservative. For example, the rural residential scenario used in zones 1, 2, and 6 includes all pathways contributing substantially to potential risk, even though most of the total population is not exposed to the agricultural exposure pathways described in the risk assessment. Shell Oil Company purchased the land in zones 3 and 4 for Army use in constructing the Offpost Groundwater Intercept and Treatment System. It is not presently occupied; therefore, the current zoning designation as rural residential is not applicable. Given the probability of the realignment and widening of 96th Avenue, future development along 96th Avenue will likely be commercial/industrial or urban residential. The Army selected an urban residential land use for the risk evaluation as this would result in more conservative (e.g., higher) estimated risks than the likely commercial/industrial land use.

Comment No. 7, Institutional Controls:

The State is concerned that people unaware of the contamination problems may purchase property and be exposed to unacceptable risks.

The Proposed Plan does not include active remediation of soils or groundwater in Zones 2. 3, or 4. Groundwater contamination in these areas exceeds state and federal cleanup level. Shell Oil Company owns portions of these areas. the rest is privately owned. The State is concerned that there is nothing to prevent people from developing land in these areas, and sinking domestic wells, which would contain contaminated groundwater. The State, although preferring active remediation in these areas, maintains that institutional controls such as deed and well restrictions must be imposed to ensure that people will not be exposed to unacceptable risk in the future.

Response

Institutional controls have been added as a component of the selected remedy. Appendix B of the Record of Decision (ROD) provides an evaluation of the institutional controls available and their applicability. See the response to State Comment No. 4 regarding remediation of soil in the Offpost Study Area.

Comment No. 8. Human Health Risk Characterization

The State has several concerns with how the Army defined potential risks to human health.

The State has several concerns with the method the Army has used to evaluate risk to human health in the offpost. Several pathways, which the State considers important, were not considered in evaluating risk; for example, dermal absorption of contaminated groundwater during bathing or showering, inhalation of dust, incidental ingestion of surface water during wading, and ingestion of fruits grown in contaminated soil or irrigated with contaminated groundwater. The State also has concerns with the fact that the Army concluded that only dieldrin posed a risk to people eating eggs from chickens raised in the offpost operable unit. This conclusions was based on the sampling of only one egg. The State believes that these are insufficient data from which to draw such a conclusion. And perhaps most importantly, that Army ignored data presented to it by the State regarding soil ingestion rates and pica behavior (children who eat dirt), which that this behavior should be evaluated in assessing risk caused by contaminants in soil.

Response

The Army considered all of the exposure pathways listed by the State and, on the basis of EPA guidance presented in RAGS, the pathways were eliminated from further evaluation in the risk assessment. The Army presented the human health risk assessment pathways to EPA, the U.S. Fish and Wildlife Service (USFWS), Shell Oil Company, and the State for discussion. After identifying all potential complete exposure pathways, the Army followed EPA guidance in RAGS (page 6-17) to select those pathways to be evaluated further in the exposure assessment. Guidance allows for the elimination of some complete pathways if there is sound justification,

such as:

1. The exposure resulting from the pathway is much less than that from another pathway involving the same medium at the same exposure point.

2. The potential magnitude of the exposure from the pathway is low.

3. The probability of the exposure occurring is very low, and the risks associated with the occurrence are not high.

The Army did consider dermal absorption of contaminated groundwater during bathing or showering (see page II-2-61, Volume 11 of the Endangerment Assessment [EA]); however, this pathway's contribution to the overall intake and risk was considered to be very small when compared to the intake of groundwater contaminants via ingestion and inhalation. The inhalation of dust is addressed on pages II-2-59 and II-2-60, Volume II and Appendix B, Volume IV of the EA. The conservative screening level model of exposure to dust presented in Appendix B indicated that the contact rate via this route is very small compared to incidental direct soil ingestion. The incidental ingestion of surface water was considered (see page II-2-63 of the EA). However, it is highly unlikely that this route for exposure would be a significant contributor to the overall risk because of the low frequency of occurrence, ingestion rate, and concentration of contaminants in surface water. The ingestion of homegrown fruit was considered (see page II-2-62 of the EA); however, for the purpose of the offpost risk assessment, tomatoes were considered as a vegetable. Fruit production is such a minor contributor to the agricultural economy of the area that fruit production statistics are not kept by local agricultural economists. Therefore, fruit ingestion was not evaluated. Intake via the consumption of eggs was only evaluated for dieldrin because dieldrin was the only contaminant detected in the egg sample.

The Army has previously responded to the State's request that soil ingestion rates related to pica behavior be considered. The Army followed EPA's guidance in RAGS to evaluate the soil ingestion pathway and the soil ingestion rate. The rate used accounts for both outdoor soil and indoor dust ingestion by children and is considered by EPA to represent an upperbound value (a conservative value that is highly unlikely to result in an underestimation of risk). EPA is aware of the information presented by the State. EPA guidance specific to CERCLA risk assessments is the most reliable and authoritative source for the soil ingestion exposure parameter.

Comment No. 9. Ecological Risk Characterization

The state does not agree with how the Army defined Potential risks to vegetation and Wildlife offpost of the Arsenal.

The State continues to have significant concerns with the methodology used by the Army in defining ecologically based cleanup levels. The State contends that the Army has made assumptions based on insufficient data and that the Ecological Risk Assessment will likely allow levels of contamination to remain in the offpost that may not be protective of biota.

Response

The State has not presented any evidence to support its contention that assumptions made for the ecological risk assessment (RA) will result in levels of contamination remaining in the Offpost Study Area that may not be protective of biota. The Army presented the ecological RA assumptions and approaches to the USFWS, EPA, Shell Oil Company, and the State at meetings throughout the ecological RA study period. The Army considered these meetings and subsequent feedback critical because of the lack of formalized EPA guidance on conducting a dose-based ecological assessment. The Army believes that the findings of the ecological RA are protective of wildlife because many aspects of the approaches used to estimate potential effects are more conservative than other hazard assessment methodologies currently followed by EPA and other agencies. Because the approaches to conducting an ecological RA are continually being developed, the assumptions and parameters used by the Army for the final ecological RA were thoroughly discussed with the parties and modified throughout the ecological RA process, and the best available methodology and professional judgement were used. The USFWS participated in the ecological RA process and supported the final methodologies used to evaluate the potential

ecological hazards.

Comment No. 10, Hot Spots in Soils:

The State is concerned that the Army has not met the burden of proof that contaminated soils off the Arsenal are not RMA related.

The soil sampling program identified several spots in zones 3 and 4, and along Buckley road, where concentrations of dieldrin, a pesticide, exceeded the Army's proposed cleanup goals. These "hot spots" were eliminated from remediation based on the Army's assumption that these concentrations were due to agricultural practices, and it was therefore not responsible. There are no data indicating the source of these contaminants in the EA/FS. The State requests additional sampling in the area, so that is can better determine if the Army's assumptions are correct.

Response

The Army did not base conclusions regarding the assessment of soil contamination on the potential for contamination attributable to agricultural practices in certain offpost areas.

The Army used a large amount of onpost and offpost surface soil data to interpret Rocky Mountain Arsenal (RMA)-related soil contamination. The combination of onpost and offpost data demonstrates that detected concentrations of contaminants offpost are attributable to windblown transport from RMA and to offpost activities, including agricultural application of pesticides. Further, risks corresponding to offpost soil concentrations are within EPA's acceptable risk range. As discussed in response to the State's Comment No. 4, remediation of offpost soil is not required.

Comment No. 11. Contamination of Barr Lake:

The State is concerned that the Proposed Plan does not include remediation of surface water and sediments.

The Army has decided not to actively remediate surface water in the offpost operable unit. First Creek, which flows from the Rocky Mountain Arsenal to O'Brian Canal and ultimately into Barr Lake, is contaminated with RMA-related chemicals. The Army's position is that First Creek will be cleaned over time, as uncontaminated groundwater flows into it, and flushes out the contamination. This could take several decades. During this period of time, small quantities of contamination will continue to flow into Barr Lake. The State believes that the First Creek water should be remediated, so that no further degradation of Barr Lake occurs.

Response

Remediation of offpost groundwater will reduce contaminant concentrations in First Creek. Surface-water monitoring will continue as part of the offpost monitoring plan. A surface-water monitoring program has been included as a component of the selected remedy. An offpost implementation document will be prepared following approval of the ROD.

Comment No. 12, Closing Poorly Constructed Domestic Wells

The state remains concerned with the continued migration of Contaminated groundwater into the deeper aquifer.

The Stale has identified approximately 20 domestic wells that are either in poor condition, or are screened through more than one aquifer. These wells are responsible for allowing RMA contamination to migrate to the Arapahoe Formation, a deeper aquifer. The Proposed Plan does not address these wells. The State has repeatedly requested that the Army close these wells to prevent further degradation of the deeper aquifers.

Response

The Army has incorporated well closure as a component of the selected remedy. The criteria for well closure are presented in Appendix C of the ROD.

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO THE STATE OF COLORADO COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
MARCH 16,1993

SPECIFIC COMMENTS

Comment No. 1, page 2. 2nd paragraph, 1st sentence

The State does not agree that the Proposed Plan is consistent with CERCLA § 121 and the National Contingency Plan (NCP). Among other issues, the Plan does not conform to ARARS, is not sufficiently protective of human health and the environment, and does not follow NCP guidance relating to institutional controls.

Response

Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) pertains to cleanup standards, specifically (1) selection of remedial actions, (2) general rules for selection of remedial actions, (3) five-year review, (4) degree of cleanup, (5) permits and enforcement, and (6) state involvement.

The Offpost Proposed Plan is fully consistent with the above-referenced CERCLA Section 121. Selection of the remedial actions described in the Proposed Plan's preferred alternative is necessary in accordance with CERCLA Section 121, is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and provides for a cost-effective response, per the requirements of item 1 above. Consistent with item 2 above, the Proposed Plan's preferred alternative is protective of human health and the environment, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. Provisions for a periodic review of site conditions are specifically incorporated into the Proposed Plan's preferred alternative per item 3 above. The Proposed Plan's preferred alternative incorporates those standards, requirements, criteria, or limitations resulting from a complete analysis of applicable or relevant and appropriate requirements (ARARs) per item 4 above. The U.S. Department of the Army (Army) has recognized all state and federal laws and regulations that meet the ARARs criteria under CERCLA. Item 5 above is met by the preferred alternative through substantive compliance with federal, state, and local permitting requirements in the implementation of remedial components. Item 6 above requires involvement of the state in decisions regarding initiation, development, and selection of remedial actions to be undertaken and, specifically, provides the opportunity for the State of Colorado (State) to review and comment on the remedial investigation (RI) and feasibility study (FS), the planned remedial action identified in the RI/FS, the engineering design, and other technical data and reports relating to implementation of the remedy. The State has had opportunity to comment on the RI/FS, technical data, and other offpost reports. In addition, item 6 above requires that the State have the opportunity to comment on the Proposed Plan for remedial action and that responses to the State's comments are provided. The State has also commented on the Proposed Plan, and the Army has provided responses. All comments and responses are part of the offpost administrative record.

The preferred alternative presented in the Proposed Plan is fully protective of human health and the environment. The components of the preferred alternative provide for reduced potential risk and protection of human health and the environment through remediation of offpost groundwater that exceeds cleanup standards. Cumulative potential risks in the Offpost Study Area are within health standards established by the U.S. Environmental Protection Agency (EPA) and will be reduced further through remediation associated with the preferred alternative. Institutional controls have been added as a component of the preferred alternative. Appendix B of the Record of Decision (ROD) provides a discussion of institutional controls that may be implemented for the Offpost Study Area.

Comment No. 2, page 2, Figure 1

This figure is misleading. It implies that the only areas of contamination in the operable unit are the groundwater plumes. There is soil and groundwater contamination in the area between the

plumes, as well as east, west, northwest and north of the plumes depicted on the map. The State is also concerned about concentrations of trichloroethylene in wells north of 88th Avenue, and west of Quebec Street. Although the Army may not be solely responsible for that contamination, and some of the contamination may be from other superfund sites within the EPA study area, there are no data in the EA/FS analyzing this contamination. The Army, as part of the offpost study, should have investigated this contamination, and the possibility that it is a result of either bypasses of the Irondale Boundary Control System, or from other sources on RMA.

Response

Figure 1 of the Proposed Plan delineates the boundaries of the Offpost Operable Unit according to the definitions provided by the Federal Facility Agreement (FFA). The FFA defines the Operable Unit as that portion of the Offpost Study Area where hazardous substances are subject to remediation. On the basis of the risk assessment, contamination present in media (e.g., groundwater, soil, surface water, sediment, air) outside the operable unit boundaries was shown to result in risk levels that meet EPA's health guidelines and within the acceptable risk range specified in the NCP.

The Army evaluated the risks associated with trichloroethene (TCE) in groundwater within the boundaries of the designated study zones. Zone 6, which is north of 88th Avenue and east of Quebec Street, had the highest exposure point concentration for TCE. However, this value, which is 4 micrograms per liter (:g/l), is below the Safe Drinking Water Act maximum contaminant level (MCL) of 5 :g/1 and near the 1 x 10-6 cancer risk level of 3 :g/l (based on a residential exposure scenario).

Comment No. 3, page 3, 1st paragraph, 6th sentence

This sentence is incorrect. This sentence should be revised to read, "...most of RMA was added to the National Priorities List in 1987." As the Army is well aware, Basin F was listed in 1989.

Response

The Record of Decision (ROD) has been revised accordingly.

Comment No. 4, page 3, 5th paragraph, 2nd sentence

The State disagrees with the statement that the areas east of the RMA are not contaminated by RMA-related chemicals. Concentrations of dieldrin as high as 99 ppb have been detected. The State has requested additional onpost and offpost soil sampling to determine if contamination was transported from the Arsenal. Additionally, although it is probably correct that RMA has not significantly contaminated the areas to the south, the statement in the Proposed Plan is misleading because it implies that sampling was conducted to support that conclusion. It would be more appropriate to state that, because of the north and northwest direction of the prevailing winds and the low concentrations along the southern tier, there is no reason to believe that areas south of RMA have been significantly affected by contamination at the Arsenal.

Response

Because of the extensive agricultural activities that have occurred in areas north and east of the Rocky Mountain Arsenal (RMA) boundaries and the application of registered pesticides that are a consequence of agricultural activities, it is not unusual to find dieldrin residues in soil. Examination of organochlorine pesticide data obtained from onpost surface soil samples does not support RMA as being the source for organochlorine pesticide transport east of RMA. In addition, five samples collected east of RMA have dieldrin concentrations ranging from nondetectable to approximately 25 parts per billion (ppb). On this basis, it is the Army's position that the one sample with dieldrin detected at 99 ppb east of RMA is not related to onsite activities. Soil samples collected at the southern boundary of RMA did not contain concentrations of contamitants above levels that pose a health risk.

Comment No. 5, page 4, Figure 2

This map is misleading. The Army should make it clear that the plumes shown are of

contamination in excess of federal ARARS, but that other areas are contaminated as well.

Response

As stated in the Proposed Plan, Figure 2 shows plume groups corresponding to locations in the Offpost Study Area where shallow groundwater contaminant concentrations exceed cleanup goals presented in the Feasibility Study (FS). The Endangerment Assessment/Feasibility Study (EA/FS) provides additional discussion regarding contaminant concentrations in the areas outside the Operable Unit.

Comment No. 6, page 5, 6th paragraph, 7th sentence

The text states that soil, surface water, and sediment are within the acceptable risk range. The risks should be specifically stated for each medium in addition to the cumulative risk for all exposures.

Response

The purpose of the Proposed Plan is to briefly summarize the risk assessment findings and to present, in some detail, the remediation alternatives to clean up the site. The inclusion of all media-specific risks and cumulative risks for all exposure pathways is beyond the recommendations set forth by EPA guidance and would result in a more complicated document. Interested individuals are referred to the EA/FS for a complete discussion of the media-specific and pathway -specific risks.

Comment No. 7, page 6, 2nd bullet, Site Review

The text should be clarified that the five year review is required under CERCLA § 121(c), because hazardous substances, pollutants, or contaminants will be left in place. The public should be informed that the purpose of this review is to ensure that the remedy remains sufficiently protective of human health and the environment. In addition, the remedy may be amended at that time, if EPA decides that the remedy is not sufficiently protective.

Response

The State's comment that contaminants will be left in place is misleading in that active remedial measures that result in contaminant removal and treatment are the primary components of the preferred alternative. As stated in the reference section of the Proposed Plan, a site review will be performed to ensure that human health and the environrnent are protected during and after the remediation.

Comment No. 8, Page 6, 4th bullet, Continued Operation

This bullet implies that the remedy selected is an offpost remedy. In fact, this is the onpost remedy.

Response

The continued operation of the onpost boundary systems to meet the offpost cleanup standards is an integral component of the offpost preferred alternative.

Comment No. 9, Dam 6, Alternative N-1

The State disagrees with the presentation of the ""no-action" alternative described by the Army. "No action," as defined by NEPA and incorporated in CERCLA. means maintenance of the status quo. 40 CFR 300.430(a)(6) states that, among other alternatives, the lead agency must develop *[t]he no-action alternative, which may be no further action if some removal or remedial action has already occurred at the site." (55 Fed. Reg. 8849, March 8. 1990; emphasis added.) This alternative is not, as the Army states, a shutdown and dismantling of preexisting remedial measures. A true "no action alternative," as envisioned by the NCP, would include continued operation of the boundary control systems without modifications or additions. See State's comments on EA/FS, December 13, 1991 at pages 4-5.

Response

The Army has included in its evaluation of offpost alternatives both a no-action alternative (NW- 1 and N- 1) and a no further action alternative (NW-2 and N-2), as defined by the State. The no further action alternative presented in the EA/FS meets the NCP requirement specified at 40 Code of Federal Regulations 430(e)(6).

Comment No. 10, page 8, Definitions of Criteria

The State disagrees with the statements regarding State Acceptance. The Army is disingenuous when it implies that the State's positions on the proposed remedy are unknown. The State's views on the selected remedy and other issues have been conveyed in extensive comments on prior drafts of the EA/FS. The NCP provides, moreover, that as part of the Proposed Plan the lead agency shall assess "(1) The state's position and key concerns related to the preferred alternative and other alternatives; and (2) State comments on ARARs or the proposed use of waivers" NCP § 300.430(a)(iii)(9)(H). In addition, the Proposed Plan shall "provide a summary of any comments received from the support agency." NCP § 300.430(f)(2)(iii); emphasis added. The Army has failed to include these matters in the Proposed Plan.

Response

The NCP, Section 430(e)(9)(iii)(H), states:

> State Acceptance. Assessment of state concerns may not be completed until comments on the RI/FS are received but may be discussed, to the extent possible, in the proposed plan issued for public comment. (emphasis added).

Because many of the issues regarding the EA/FS and the preferred alternative were still being discussed between the Army, EPA, and the State at the time the Proposed Plan was issued, the Army believed that these issues should be resolved before making a definitive statement regarding State acceptance. A handout detailing the State's concerns was provided at the public meeting, and the State was provided time to present its concerns orally at the public meeting.

Comment No. 11, Tables 2 and 3

The State requests that all of the action alternatives be contained within these summaries.

Response

Consistent with EPA guidance, the Army has included those alternatives passing initial screening of alternatives conducted in the FS. Alternatives that did not pass initial screening are presented in the EA/FS.

Comment No. 12, Glossary

The following term should be redefined:

a. Federal Facility Agreement: The definition was corrected in the body of the text, but remains incorrect in the Glossary. The FFA formalizes the parties' responsibilities for cleanup at RMA. The framework is set by CERCLA and the NCP.

Response

The definition of the FFA has been corrected in the ROD.

Comment No. 13, Glossary

The following word should be defined:

a. Contamination: The Army appears to use the word solely to mean levels of contamination above federal ARARs. The dictionary defines contamination as "the state of being impure or corrupt." The Army is therefore implying to the public that the"uncontaminated" areas are clean. In fact, the "uncontaminated" areas are not

pristine, but are not sufficiently contaminated, according to the Army, to warrant remediation.

Response

Most of the contaminants found in the Offpost Study Area are not unique to RMA. Many of these substances have been used in crop and livestock production, including areas north and east of RMA, and others are naturally occurring. The Army frequently qualifies its use of the word "contamination" as being above or below levels that would pose a threat to human health or the environment. On this basis, no further definition is necessary.

Appendix A-3

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO STATE OF COLORADO COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

GENERAL COMMENTS

Comment No. 1 - Risk-Assessment

a. Point of Departure

The Proposed Plan states that the cumulative potential cancer risks range from 1 x 10-4 in Zone 1 to 3 x 10-4 in Zone 3. In the Final EA/FS, the Army cites an OSWER directive, dated April 22, 1991, which it claims authorizes no action at sizes that do not exceed a 10-4 risk level. The NCP, however, clearly states that EPA's preference is for remediation goals at the more protective end of the range, that is l0-6. The Army is clearly disregarding the express language of the NCP which sets the Point of Departure at 10-6. See, 40 C.F.R. §300.430(e)(2)(i)(A)(2) (1991).

This issue was specifically addressed in a letter from EPA to the Army, dated February 21, 1992. In that letter, in which the State did not concur, EPA Region VIII set down the criteria that it would consider in allowing the Army to deviate from the NCPs point of departure of 10-6. Specifically, EPA stated: "We agree that the Army would not have to develop PRGS for those media where the cumulative risk was not greater than 10-4, if, for those cases, the Army could adequately document that the 10-4 PRGs were appropriate." (Emphasis added). The Army has not been able to demonstrate that a point of departure of 10-4 is appropriate for the offpost operable unit. Among other requirements, the Army was required to show:

a) That all of the media had been evaluated so as to demonstrate "that the total additive risk does not exceed the 10-4 risk level or a hazard index of one."

b) That sample sizes for all media were sufficiently large to statistically represent the site/receptor conditions.

c) That all potential exposure routes were evaluated.

d) That sensitive subpopulations, especially pica children, had been evaluated to ensure that the risks to these groups do not exceed 10-4.

e) That all contaminants of concern (COCs) tentatively identified compounds and unknowns are evaluated and do not contribute to risk or hazard.

The Army has failed to comply with the requirements contained in EPA's letter. For example, the hazard index exceeds one in three of the six zones and part of Zone 1. In Zone 4, the long term exposure HI is 4, four times the EPA accepted limit. Potential exposure routes were not fully evaluated: for example, all COCs except dieldrin were eliminated from consideration in the soil/egg pathway because dieldrin was the only COC found in the one egg that the Army sampled. Other pathways were excluded entirely, including dermal absorption to direct contact with groundwater, inhalation of dust, incidental ingestion of surface water during wading, and consumption of fruits grown in contaminated soil or irrigated with contaminated groundwater or surface water. The State also believes that the Army's data with respect to pica children, a sensitive subpopulation, is inadequate. See, state comments on the EA/FS, April 6, 1992 at pages 2-3. The EA has also not sufficiently considered other sensitive subpopulations such as people who might reside in the offpost area for 30 years or longer; sufferers of diabetes who are known to consume up to 8 liters a day of water; or people of predisposed sensitivity such as victims of multiple chemical sensitivity syndrome. See, state comments on the EA/FS, January 27, 1992, Comments Related to the Human Health Endangerment Assessment, at pages 2-3.

In its letter, EPA specifically noted that a number of uncertainties were not sufficiently addressed in the Risk Assessment, and that 10-6 was the required point of departure if these issues were not addressed. These concerns include lack of toxicity estimates for developmental

toxicants, no consideration of synergism1antagonism of contaminants, the fact that the monitoring data may not represent actual site conditions, and lack of consideration of the soil type and climate present offpost relative to soil ingestion rates. The State contends that these uncertainties have not been adequately addressed in the EA, and therefore use of 10-4 as the target risk level for cleanup is not appropriate.

For some zones, according to the Army, the risk is as high 3 x 10-4 not including several of the important pathways described above. This relatively high risk is not justified on the basis of technical impracticability or any other rationale. It is therefore unacceptable to the State. The State urges the Army to comply with the NCP, which sets the Point of Departure at 10-6 risk level. 40 C.F.R. §300.430(e)(2)(i)(A)(2) (1991). Only if achievement of this level is impracticable, may the Army adopt a less protective cleanup level.

Response

The Army has closely followed US. Environmental Protection Agency (EPA) guidance and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) regarding the use of the 10-4 risk threshold to assess whether Remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states

> The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 Federal Register 8718).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risk toward the 10-6 level.

In addition to the pathways retained in the risk assessment, the Army considered all of the exposure pathways listed by the State and, on the basis of EPA guidance presented in Risk Assessment Guidance for Superfund (RAGS), the latter pathways were eliminated from further evaluation in the risk assessment. The Army presented the human health risk assessment pathways to EPA, the U.S. Fish and Wildlife Service (USFWS), Shell Oil Company, and the State for discussion. After identifying all potential complete exposure pathways, the Army followed EPA guidance in RAGS (page 6-16) to select those pathways to be evaluated further in the exposure assessment. Guidance allows for the elimination of some complete pathways if there is sound justification, such as:

1. The exposure resulting from the pathway is much less than that from another pathway involving the same medium at the same exposure point.

2. The potential magnitude of the exposure from the pathway is low.

3. The probability of the exposure occurring is very low, and the risks associated with the occurrence are not high.

The Army did consider dermal absorption of contaminated groundwater during bathing or showering (see page II-2-61, Volume II of the Endangerment Assessment [EA]); however, this pathway's contribution to the overall intake and risk was considered to be very small when compared to the intake of groundwater contaminants via ingestion and inhalation. The inhalation of dust is addressed on pages II-2-59 and II-2-60, Volume II and Appendix B, Volume IV of the EA. The conservative screening level model of exposure to dust presented in Appendix B indicated that the contact rate via this route is very small compared to incidental direct soil ingestion. The incidental ingestion of surface water was considered (see page II-2-63 of the EA). However, it is highly unlikely that this route for exposure would be a significant contributor to the overall risk because of the low frequency of occurrence, ingestion rate, and

concentration of contaminants in surface water. The ingestion of homegrown fruit was considered (see page II-2-62 of the EA); however, for the purpose of the offpost risk assessment, tomatoes were considered as a vegetable. Fruit production is such a minor contributor to the agricultural economy of the area that fruit production statistics are not kept by local agricultural economists. Therefore, fruit ingestion was not evaluated. Intake via the consumption of eggs was only evaluated for dieldrin because dieldrin was the only contaminant detected in the egg sample.

The Army has previously responded to the State's request that soil ingestion rates related to pica behavior be considered. The Army followed EPA's guidance in RAGS to evaluate the soil ingestion pathway and the soil ingestion rate. The rate used accounts for both outdoor soil and indoor dust ingestion by children and is considered by EPA to represent an upperbound value (a conservative value that is highly unlikely to result in an underestimation of risk). EPA is aware of the information presented by the State. EPA guidance specific to CERCLA risk assessments is the most reliable and authoritative source for the soil ingestion exposure parameter.

The use of a water consumption rate of 8 liters per day (l/day) would not be representative of the majority of individuals in the area. The EPA does not consider worst case risk assessments to be beneficial in evaluating the overall potential risk at a site. A water ingestion rate of 2 l/day was used as the adult water ingestion rate in accordance with EPA guidance. While multiple chemical sensitivities may exist for some individuals, the evaluation of this potential effect is difficult because of the lack of comprehensive scientific information. The Army believes that the conservative uncertainties in the risk assessment more than likely account for this possible effect.

When evaluating the potential noncarcinogenic effects of chemicals of concern (COCs), the Army followed EPA guidance in identifying and segregating constituents according to their toxicological endpoints, including mechanisms of action. This categorization was done on the basis of toxicological information provided in the toxicology databases available at the time the risk assessment was conducted (e.g., EPA's Integrated Risk Information System [IRIS] and the Health Effects Assessment Summary Tables). Table 4.0-1 in the EA lists the target organ or system categories identified for the COCs evaluated. Information was unavailable from these databases on the developmental effects of these COCs. If chemical-specific information was available from these sources, it would have been used to evaluate the potential concern for developmental effects. It is possible that some information is available in the open scientific literature describing potential developmental effects; however, this information apparently has not been peer-reviewed by EPA toxicologists for inclusion in the recommended risk assessment databases. EPA specifically recommends a hierarchy of toxicological information sources to be consulted when performing a baseline risk assessment, and nonpeer-reviewed scientific sources of information are the least preferred.

The Army followed accepted practice and EPA guidance when evaluating the potential synergistic and antagonistic interactions of the COCs. Because of the infinite number of possible toxicological outcomes, most of them unknown, resulting from chemical interactions, EPA guidance recommends a cautious assumption of dose additivity for both carcinogenic and noncarcinogenic health effects. The Army applied this widely accepted practice as specified in EPA's RAGS and Guidelines for Health Risk Assessment of Chemical Mixtures. The application of dose additivity is prudent because of the lack of information on chemical mixtures in general and on the mix of chemicals present in the Offpost Operable Unit specifically.

The Army disagrees with the State's assertion that "the monitoring data may not represent actual site conditions." The State has provided no supportive evidence that the measured soil, ground-water, surface water, sediment, or air concentrations are not indeed representative of actual site conditions. Over the last decade, tens of thousands of analytical data points have been obtained from the Offpost Study Area. The Army is continuing to refine and enhance its monitoring programs to provide the most representative data for all areas under investigation. The Army is confident that it has adequately monitored and will continue to adequately monitor environmental conditions in the Offpost Study Area.

b. Hazard Index

The Final Endangerment Assessment/Feasibility Study indicates that for both chronic and

acute residential child non-cancer risks, the Hazard Index exceeds 1 in Zones 2, 3. and 4;

the Hazard Index for Zone 4 is four times the acceptable limit. In Zone 1B, the child acute Hazard Index exceeds 1. In other words, children exposed to existing contamination in the manner described in the EA would be expected to suffer adverse effects. (See Tables 4.1.1-2,-3). This is contrary to the NCP. See NCP, 40 C.F.R. §300.430(e)(2)(i)(A)(1) (1991). See also: EPA guidance, Risk Assessment Guidance for Superfund (RAGs), Volume 1. Part A which states that the Hazard Indices may not exceed 1 and still be considered consistent with the remedial goals of the NCP.

Response

The Army disagrees with the assertion that "children exposed to existing contamination in the manner described in the EA would be expected to suffer adverse effects," and that a Hazard Index of 1 represents the "acceptable limit." According to the Risk Assessment Guidance for Superfund (RAGS), exceedance of a hazard index of 1 is neither an absolute indicator of adverse effects nor an indication of probability of adverse effects. A hazard index greater than 1 does not indicate that anyone is expected to suffer adverse effects. RAGS (page 8-13) states "[w]hen the hazard index exceeds unity, there may be concern for potential health effects" (emphasis added). Similarly, the Guidelines for the Health Risk Assessment of Chemical Mixtures (51 FR 34019, September 24, 1986) state that "(t)he hazard index provides a rough measure of likely toxicity and requires cautious interpretation." The degree of concern when the hazard index exceeds 1 depends on several issues including the conservativeness of the assumptions used in the risk assessment, the likelihood of exposure occurring, and the contributions to the hazard index from specific environmental media.

The hazard index is calculated by dividing the estimated daily chemical intake by the reference dose (RfD). The hazard index is thus subject to uncertainties from the derivation of both the estimated intake and the reference dose. Therefore, it is important to understand the basis and interpretation of both the reference dose and hazard index. As defined by the EPA in the Integrated Risk Information System, Supportive Documentation, March 1987, the reference dose is:

> An estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effect during a lifetime.

The reference dose (from which the hazard indices are calculated) is similar in concept to the acceptable daily intake (ADI), the term previously used. The term ADI was changed because of the connotation that any dose above the ADI was "unacceptable." The general interpretation of the ADI, at the time of its use, was:

> A "ballpark figure" which represents a level of exposure which is not likely to result in adverse effects in humans. It is viewed as a soft estimate in that exposures somewhat higher than the ADI are generally not expected to result in adverse effects; only if the ADI is significantly exceeded would one expect such negative consequences (50 FR 46936, November 13, 1995).

The IRIS Supportive Documentation further states "(i)t is generally useful to the risk manager to have information regarding the contribution to the RfD from various environmental media." In this context, it is important to recognize two issues. First, the hazard indices summarized in the EA tables are representative of the reasonable maximum exposure (RME). As presented in the uncertainty analysis discussion in the EA, the estimated RME exposure concentrations and resultant hazard indices may be overestimated by a factor as high as 5. Secondly, although domestic use of alluvial groundwater is not a complete exposure pathway, its inclusion in the risk assessment contributes significantly to the estimated risks. For example, this pathway contributes to 56 percent of the child chronic hepatic hazard index even though it is not a current exposure pathway. Therefore, it is likely that the estimated hazard indices presented in the EA are conservative and overestimated.

The cited section of the NCP states:

> For systemic toxicants, acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety.

The methodology for the derivation of the reference dose itself contains several safety factors, and, as indicated, is associated with an uncertainty of in order of magnitude. The hazard index value of 4 is within an order of magnitude of a hazard index value of 1 and therefore should not be viewed as connoting unacceptability. Because the EPA has stated that there is uncertainty associated with the hazard index values, it is inappropriate to use a hazard index value of 1 as a definitive cutoff value.

The Army believes that the uncertainties and safety factors inherent in the derivation of the reference dose, the statements by EPA regarding the interpretation of the hazard index, the probable overestimation of the hazard index by the EA methodology, and recognition that several exposure pathways associated with the alluvial groundwater do not currently exist, indicate that the hazard index of 4 should not be viewed as absolute indicator of unacceptability. In fact, because of the conservative nature of the risk assessment, a hazard index of 4 should be viewed as supporting a conclusion of minimal risk.

RAGS, Volume 1, Part A does not state that hazard indices greater than 1 are unacceptable. Rather, page 8-16 of RAGS states that "(w)hen the total hazard index for an exposed individual or group exceeds unity, there may be concern for potential noncancer health effects" (emphasis added). On page 8-25 of RAGS, the guidance on summarizing the risk characterization efforts states that the summary should include, among other things, the magnitude of the cancer risks and noncancer hazard indices relative to the Superfund site remediation goals in the NCP.

The attainment of the hazard index goal of 1.0, like the cancer risk remediation goal of 10-6, needs to be tempered with the purpose of the goal and the site-specific and risk-assessment-specific issues reflected in the final risk estimates. In the areas where hazard index exceeds 1.0, contaminants in groundwater contribute the majority of the hazard index. Operation of the Offpost Groundwater Intercept and Treatment System will result in a reduction in the estimated hazard indices.

C. Endangerment Assessment

The State remains concerned with the methods used by the Army in defining cleanup levels that are protective of biota. We believe that levels of contamination remaining in the offpost may pose potential health threats to wildlife. The State was not allowed to participate in several dispute resolution meetings where issues such as defining maximum allowable tissue concentrations (MATCs) were discussed and formalized. In addition, on 4/19/93, the State provided the Parties with a report, "State of Colorado Proposal on How to Conduct a Site Specific Ecological Risk Assessment at the Rocky Mountain Arsenal." While the timing of this report made it difficult to incorporate into the offpost EA, a majority of the concerns and ERC methodologies identified in the report were provided to the Army orally through EA subcommittee meetings and by written comments prior to finalization of the of/post EA/FS report. To date, we have yet to receive any comments from the Army on our report. We believe this approach to defining cleanup levels protective of biota is well-justified and should be used for both the on and offpost Endangerment Assessments.

Response

The State has not presented any evidence to support its contention that assumptions made for the ecological risk assessment (RA) will result in levels of contamination remaining in the Offpost Study Area that may not be protective of biota. The Army presented the ecological RA assumptions and approaches to the U.S. Fish and Wildlife Service (USFWS), EPA, Shell Oil Company, and the State at meetings throughout the ecological RA study period. The Army considered these meetings and subsequent feedback critical because of the lack of formalized EPA guidance on conducting a dose-based ecological assessment. The Army believes that the findings of the ecological RA are protective of wildlife because many aspects of the approaches used to estimate potential effects are more conservative than other hazard assessment methodologies currently followed by EPA and other agencies. Because the approaches to conducting an ecological RA are continually being developed, the assumptions and parameters used by the Army for the final

ecological RA were thoroughly discussed with the parties and modified throughout the ecological RA process, and the best available methodology and informed professional judgement were used. The USFWS participated in the ecological RA process and supported the final methodologies used to evaluate the potential ecological hazards.

Dispute resolution meetings were open for attendance by all signatories to the Federal Facility Agreement. As indicated in the introduction to the Response to Comments, the State of Colorado declined to sign the FFA and become an official party to all proceedings and issue resolution meetings pertaining to RME activities. The Army is aware of the States comments (both verbal and written) regarding the methodologies used to conduct the ecological risk assessment. These issues were discussed at the dispute resolution meetings and agreement was reached by the involved parties. The Army believes that the final maximum allowable tissue concentrations (MATCs) agreed to by the EPA, USFWS, and Shell Oil Company are sufficient to define the cleanup levels protective of offpost biota.

Comment No. 2 - State Groundwater Concerns

a. Selected Groundwater Cleanup Alternative

The Army has chosen Alternative No. N-4, essentially continuation of an already implemented interim response action, as its preferred alternative for the offpost. The State believes that this remedy is not sufficiently justified in accordance with the selection criteria in the NCP and CERCLA and that a more aggressive groundwater cleanup alternative is appropriate. Items 1 through 3 below explain why the State does not agree with the Army's selection of Alternative N-4. The State has obtained and reviewed the groundwater model created and used by the Army to evaluate groundwater cleanup alternatives for the north and northwest plume groups, and has concluded that a more efficient alternative could be selected for the north plume group based on this analysis (see item 4).

1. Cost Considerations

Alternatives N-5 and N-6 were eliminated based mostly on the fact that they would require greater initial capital outlay than the selected alternative. This decision failed to consider the fact that the rejected alternatives would be more protective of the environment and provide a shorter remediation time frame. N-5 was eliminated even though it is more cost effective than N-4, given that its total present worth costs are actually less than N-4, since N-5 has a shorter predicted remedial time frame.

Response

The State has incorrectly stated the Army's rationale for elimination of Alternatives N-5 and N-6. As presented in the Final Offpost EA/FS report Volume VI, Section 4.2.1, Screening of Alternatives - North Plume Group, effectiveness, implementability, and cost criteria were explicitly evaluated consistent with the requirements of the NCP. In this section of the EA/FS, it was concluded that Alternatives N-4, N-5, and N-6 afford the best reduction in toxicity, mobility, and volume, the best long-term protection, and the best compliance with remediation goals. Alternative N-6 was screened out at this point on the basis of similar performance in comparison with Alternative N-5 with respect to reduction in toxicity, mobility, and volume, yet it afforded no benefit in terms of remediation timeframe (10 to 20 years) and at higher cost.

The Army selected Alternative N-4 instead of Alternative N-5 prima ily because Alternative N-4 includes potential future modifications, only if such modifications are found to be necessary based on actual operating data, to the Offpost Groundwater Intercept and Treatment System. Selection of Alternative N-5 instead of Alternative N-4 will not necessarily provide a more cost effective alternative because of a slightly shorter estimated remediation timeframe. The Army based its assessment of the relative differences between the groundwater alternatives and estimates of remediation timeframes on groundwater models that are very general in nature; thus, the estimated remediation timeframes should not be construed as precise predictions. Use of actual full-scale operating data is preferable to selecting additional components for the Offpost Groundwater Intercept and Treatment System using the more speculative modeling data (i.e., Alternative N-5).

The Army is committed to efficient operation of the Offpost Groundwater Intercept and

Treatment System and will evaluate operating data to assess the need for system modification. Similar to the onpost boundary treatment systems, it is difficult to assess whether the installation of additional wells will provide more efficient operation without collecting full-scale operating data for the Offpost Groundwater Intercept and Treatment System. The Army has included an intensive monitoring component as part of the preferred alternative, Alternative N-4, in the Proposed Plan. This intensive monitoring program will allow the collection and subsequent interpretation of performance data for the full-scale operation of both the Offpost Groundwater Intercept and Treatment System and the onpost boundary systems. The data will be used to assess the need for any improvement to the systems and will provide increased accuracy in assessing contaminant cleanup. Acquisition of this operational data is preferable to adding extraction wells and recharge trenches without the benefit of operational data, because additional data are required to assess the necessity and placement of any additional extraction wells or trenches. If operational data supports the conclusion that the cleanup timeframe can be shortened without a significant increase in long-term costs, modifications to Alternative N-4 will be implemented. By taking this approach, improvements to the system will be more effective than improvements made based on computer modeling data.

2. Cleanup Time Frames

Alternative N-4 was selected over N-5 even though the Army's own projected cleanup time frames show N-5 requiring one-third less time for groundwater remediation. The Army has cautioned that its time frames are only estimates and should be viewed as a tool for comparison between alternatives. Apparently, the Army has not used its model for the purpose for which it was designed. Estimates provided by the Army are 15-30 years for N-4 and 10-20 years for N-5. This is a substantial reduction. Based on our understanding of groundwater flow, and the contaminants of concern in the offpost, the State believes that the actual remedial time frames will be significantly longer than Army estimates, and in that case, a one-third reduction in cleanup time would be even more important in terms of protection for human health and the environment, as well as reduced cleanup costs.

Response

The Army's basis for selection of Alternative N-4 over N-5 is based on use of actual field operating data from both the North Boundary Containment System (NBCS) and the Offpost Groundwater Intercept and Treatment System in combination with an integrated set of offpost groundwater monitoring programs (as in Alternative N-4) to make decisions about the need for an Offpost Groundwater Intercept and Treatment System upgrades. This approach is fundamentally superior to the methodology structured in Alternative N-5, which would proceed with modifications to the Offpost Groundwater Intercept and Treatment System, based on groundwater modeling results alone.

The State claims that the Army should have relied on the model simulations that predict a slightly shorter cleanup time for Alternative N-5 as compared to N-4 to select an approach that would install additional wells and trenches based on modeling. The Army, however, has selected Alternative N-4 because actual field operating data can be better used to optimize any required system modifications.

3. Short-term Monitoring

The Army has stated that N-4 is superior to N-5 because N-4's short-term intensive monitoring will ".. identify any necessary improvements to the system..." First of all, short-term performance monitoring should logically be a part of any remedy to determine whether the system is functioning as planned. Second, it appears from the detailed analysis of alternatives that N-5 does include a similar monitoring scenario. In the Feasibility Study, the Army describes how performance would be monitored for both alternatives (Offpost EA/FS, Final Report, pgs. VI-5-14 and VI-5-21). Since both plans contain provisions for short term intensive monitoring, this is not a proper basis for selection of N-4 over N-5.

Response

The Army has not relied on the short-term intensive monitoring program component of Alterna-

tive N-4 in selecting Alternative N-4 over N-5. The rationale and basis for this Selection is presented in responses to parts 1 and 2 of State Comment No. 2.

In addition, the State has incorrectly stated that the referenced sections of the Final Offpost EA/FS report describe the same short-term intensive monitoring program. In fact, the State's citation, Offpost EA/FS report Vol. VI pg. 5 - 14 is in Section 5.4.1, which evaluates the remedial alternatives with respect to the criterion of overall protection of human health and the environment. The intensive short-term monitoring component of Alternative N-4 is explicitly referenced in this section, while it is not referenced for Alternative N-5. The State's second citation (Final Offpost EA/FS report Vol. VI pg. 5-21 in Section 5.4.3) contains a general reference to monitoring for both Alternatives N-4 and N-5 in the context of evaluating both alternatives and permanence. There is no reference to the short-term monitoring component for either Alternative N-4 or N-5.

4. Optimizing Selected Groundwater Remedial Alternative - Alternatives N-5A and N-5B

Though the Army states that Alternatives N-4 and N-5 are essentially equivalent, they select Alternative N-4 because: a) it is claimed to be more readily implementable, b) system modification is based on operation data, rather than modeled data, and therefore, is considered more effective, and c) the additional capital expenditures of N-5 are not justified until performance monitoring data are available. The Army's justification is based on the premise that Alternative N-5 is an enhancement to Alternative N-4. This, in part, is a fault of the range of alternatives considered by the Army during the Feasibility Study.

Using the Army's model, the State has been able to improve on N-5. Two modifications to Alternative N-5 are presented. The first modification will be referred to as Alternative 5A. The main improvement comes by relocating extraction wells closer to the center of mass of the dieldrin plume. The dieldrin plumes are located further upgradient, due to this contaminant's lower relative mobility. The simulated cleanup times indicate that dieldrin is the limiting constituent (i.e. the one taking the most amount of time to reach the cleanup goals). Therefore, the first modification focuses on this contaminant to decrease the overall remedial duration.

Alternative N-5 consists of an expansion to Alternative N-4 (IRA A). In the North Paleochannel, however, the expansion well is located very near the IRA and results in only a 15% reduction of the cleanup time for dieldrin compared to N-4. Alternative N-5A consists of modifying Alternative N-5 by relocating the extraction wells and reinjection trenches to reduce the cleanup time of the dieldrin plume by containing it within its current boundaries thereby preventing further degradation of the aquifer. Alternative N-5A uses the same number of pumping wells pumping at the same rate (30 gallons per minute). However. the number of recharge trenches is reduced from the six used for N-5 to three used for N-5A thus reducing capital costs.

Simulating Alternative N-5A with the Army's model, the State was able to decrease the time estimated to achieve ARARs for dieldrin by approximately 30% compared to the time estimated for Alternative N-5. The cleanup time for chloroform increases by about 15%. However, due to chloroform's greater mobility compared to dieldrin, the cleanup time for chloroform is still less than that of dieldrin. This decrease in the operational period, combined with lower capital costs than N-5, results in a present worth cost of alternative N-5A of $53.5 to 59.5 million compared to the present worth cost of Alternative N-4 ($56.5 to 63.1 million) and N-5 ($56.2 to 63 million). The improvement in total cost combined with the decrease in the lime of the remediation shows the benefit of Alternative N-5A.

The second modification to Alternative N-5 is referred to as N-5B. Though simulation revealed that Alternative N-5A was superior to Alternative N-5 (and N-4) since it decreased the cleanup time for dieldrin, it also resulted in a slight increase in the cleanup time for the rest of the plume, in particular, chloroform as compared to N-5. Alternative N-5B builds on N-5A by placing an additional extraction well and recharge french near the center of mass of the limiting compound for the rest of the plume, chloroform. All wells pump at 30 gpm; each injection well-pair constitutes a recharge french and receives the water from one pumping well. The addition of the extraction

well and trench near the chloroform center of mass results in a decrease in the cleanup time for chloroform (approximately 8% faster than N-5). The simulated cleanup times for dieldrin are approximately the same as cleanup times for Alternative N-5A. Based on the predicted cleanup time frames for chloroform and dieldrin in Alternative N-5B, it's possible that the downgradient portion of the Alternative (the N-5 wells and the additional N-5B well-pair) could be turned off when the chloroform plume is remediated while the upgradient portion would continue to operate.

The present worth cost of Alternative N-5B would be $53.9 to 60.0 million. The reduction in total cost compared with N-4 coupled with an even further decrease in remediation time for the chloroform plume over N-5A shows this alternative to be superior. The State will provide the Army with a more detailed description of this analysis within the next 10 days.

Response

The Army's offpost groundwater modeling study used in evaluating remedial alternatives in the Offpost EA/FS report was based on hydraulic and contaminant distribution data from the 1989/1990 time period. Since that time, significant changes in contaminant distribution have occurred, apparently resulting from recent improvements with the NBCS and the continuation of reduced contaminant concentration trends from past NBCS improvements. In addition, approximately 85 new monitoring wells have been installed offpost in the past two years. Geologic and hydraulic dam from these new wells have greatly improved the Army's hydrogeologic conceptual model offpost. Baseline groundwater sampling episodes of new and existing wells offpost prior to operating the Offpost Groundwater Intercept and Treatment System indicated smaller contaminant plumes than were present in 1999/1990. The new wells have resulted in more precise definition of the plumes. With the wealth of new information resulting from the implementation and monitoring of the Offpost Groundwater Intercept and Treatment System, it is illogical and inappropriate to base potential expansion of the Offpost Groundwater Intercept and Treatment System on data that does not include full-scale operation.

Selection of Alternative N-4 over N-5, N-5A, and N-5B is based only in part on modeling results. The State has failed to consider other factors in the selection process and the dynamic nature of the contaminant distribution offpost due to the continuing effects on contaminant distribution and concentration in the offpost from NBCS modifications. The State has also placed too much emphasis on the modeling results alone for recommending either Alternative N-5A or N-5B over Alternative N-4 . Given the fact that the Offpost Groundwater Intercept and Treatment System has been fully operational since June 1993 and a wealth of new information is becoming available for evaluating the Offpost Study Area, it makes little sense to rely heavily upon the FS modeling results for selection of the preferred alternative and ignore full-scale data. It is the Army's goal to select the most technically sound alternative. Alternative N-4 fits this goal by considering the most current information on plume distribution as a basis for potential system expansion.

b. Dieldrin Certified Reporting Limit

The Army's characterization of the dieldrin groundwater plumes is limited by its certified reporting limit (CRL) of 0.05 :g/l. This is unacceptable because it is above the state's health-based ARAR of 0.002 is:g/l. Since 1987, the State has repeatedly objected to the Army's use of its CRL methodology because it results in detection limits that are higher than EPA method detection limits and. in some instances. exceed health-based levels. This issue was again raised in the state comments on the RI/EA/FS Workplan, 1126190. The Army promised to get its CRLs down in the Final Decision Document Groundwater Intercept and Treatment System North of RME, July, 1989, pp. 37-38.

Response

First, as discussed in the response to State Comment No. 4 in this section, the Army does not consider the Colorado Basic standards for Groundwater to be chemical-specific ARARs. Secondly, Table A, Section 3.11.5(C) of the Basic Standards for Groundwater (5 CCR 1002-8), lists the standard for dieldrin as 0.002 :g/l, with a practical quantitation limit (PQL) of 0.1 :g/l. Furthermore, Section 3.11.5(C)(4) states:

Whenever the current detection level (PQL) for a pollutant is higher (less stringent) than a standard listed in Subsection 2 or 3 above, the detection level shall be used as the performance standard in regulating specific activities, The detection levels (PQL's) identified in Table A shall apply, unless and until they are modified as the result of a subsequent rulemaking hearing. (emphasis added)

Thus, the State's enforceable numerical performance standard for dieldrin in groundwater is 0. 1 :g/1 because the detection limit is higher than the health-based standard.

The most recent proposed update of EPA's pesticide method 8081 (in Proposed Update II to SW-846, 3rd edition, Revision 0, November, 1992) lists a method detection limit of 0.044 :g/l. Because the Army's CRL of 0.05 :g/l is less than the Table A PQL (0.1 :g/1) obtainable by the Colorado Department of Health, and almost identical to the proposed EPA method detection limit of 0.044 :g/l ,the Army believes its current CRL is adequate to characterize the dieldrin plume.

C. Northwest Plume

The Army has proposed no active remediation of groundwater downgradient of the northwest boundary system. Instead it is relying on flushing and dilution of the contaminants by reinjecting treated water on the downgradient (northwest) side of the boundary system. Its modeling results predict that PRGs (chloroform: 15 :g/l, dieldrin: 0.05 :g/l) will be achieved in approximately 3 to 8 years by this method. This is unacceptable because it does not consider remediation of the aquifer to state ARARs (chloroform: 6 :g/l, dieldrin: 0.002 :g./1). Moreover, water treated at the boundary is being reinjected to the aquifer at concentrations above the state ARARS. Therefore, the Army must first improve the boundary treatment process whereby the effluent concentrations are lowered to levels below the state ARARs. Additional data should be obtained to determine the leading edge of the dieldrin plume based on detection limits at or approaching the state's health-based standard of .002 :g/l. Once the plume has been adequately evaluated, the Army should evaluate containment of the dieldrin plume.

Response

As described in response to State Comment No. 4, Colorado Basic Standards for Groundwater were not found to be chemical-specific ARARs.

Treated water from the Northwest Boundary Containment System (NWBCS) being recharged meets the remediation goals set forth in the ROD.

The dieldrin plume downgradient of the NWBCS has been adequately characterized by the Army. Response to State Comment No. 2b addresses the dieldrin detection limit.

d. State DIMP Standard and the Provision of Bottled Water

The report entitled "Human Effects Assessment of Diisopropyl Methylphosphonate (DIMP)" by Edward J. Calabrese (1990 Report) has been in the possession of the Army and EPA for several years and is hereby incorporated into these comments by reference. As more fully explained in that report and as stated previously, the State cannot accept the EPA DIMP Health Advisory of 600 :g/l as being protective of human health. Therefore, we believe that the Army's remedy, which does not attempt to prevent exposures to DIMP below that level, violates section 121(b) of CERCLA and section 300.430(e)(9)(iii)(a) of the NCP which establish protectiveness as a threshold criterion for all CERCLA remedies.

To briefly summarize Dr. Calabrese's report, the State believes that the EPA DIMP Health Advisory is unsupportable because it incorrectly disregards the 1979 Aulerich reproductive study on mink in which the authors noted treatment-related deaths. EPA rejected the Aulerich study for two reasons: (1) the extrapolative relevance of mink to human toxicity estimates was unknown: and (2) the background mortality of mink confounded any findings of adverse effects in the treated groups. Both of these concerns have been thoroughly explored by Dr. Calabrese's research which has been communicated to the EPA and the Army and is reflected in the 1990 Report at pages 8-51.

Because mink have been demonstrated to be an appropriate animal model; because the control in

the Aulerich study was demonstrated to have behaved consistently with the historical control constructed from relevant studies conducted at Michigan State University, and therefore should be used: and because the mink demonstrated a clear, statistically significant dose-response relationship to DIMP, it must be adopted as the critical study from which to derive an acceptable drinking water standard. Such an approach is consistent with the rules established by EPA and set forth in its Integrated Risk Information System (IRIS) which establishes the general methodology to be used to establish reference doses or "acceptable daily intake" values and, ultimately, water quality standards. A copy of that methodology is attached. IRIS mandates that health-based standards be based on the most sensitive species investigated. Since no statistically significant adverse effects were noted in EPA's selected critical study using beagles and since mink experienced death in response to exposure to DIMP, the mink study is clearly the appropriate study upon which to base a standard. Rejection of the mink study in the face of Dr. Calabrese's compelling documentation is arbitrary and capricious.

To further explain the application of the generally accepted methodology of IRIS to the Aulerich study:

1. Identify the Lowest Observed Adverse Effect Level (LOAEL) in the appropriate animal study

   LOAELs are based upon two considerations, biological and statistical significance. As demonstrated in Dr. Calabrese's report the lowest does, 11 mg/kg/day, is the LOAEL based upon regression analysis of the data. The State agrees with Dr. Calabrese that the more appropriate statistical analysis to apply in this instance is regression, or trend analysis rather than pair-wise comparison between each dose group and the control. This is because pair-wise comparisons can mask treatment-related effects as a result of insufficient statistical power due to relatively small sample size.

2. Apply appropriate uncertainty factors (UFs)

   IRIS recognized four fundamental areas of uncertainty:

   a. LOAEL to NOAEL (no observed adverse effect level)
   b. interspecies extrapolation
   c. intraspecies variation
   d. less than lifetime study duration

   The scope of these factors is described in Dr. Calabrese's 1990 Report at pages 66-69. Each of the factors is given a default value of 10, and all of them must be applied to the LOAEL identified in the Auterichstudy.

   In addition, IRIS recognizes that problems with available data may indicate a need for further reduction of a dose in certain instances. Dr. Calabrese believes that because death is a frank effect level (FEL), not a LOAEL, the factor of 10 for LOAEL to NOAEL extrapolation is insufficiently protective, and therefore recommends an additional modifying factor of 5. The State has elected not to adopt this recommendation because, although toxicologists may legitimately disagree, it is the professional judgement of CDH that application of the other four uncertainty factors In this instance results in a sufficiently conservative exposure level.

3. Calculation of Drinking Water Equivalent Level

   Once an adjusted "NOAEL" is established it remains necessary to calculate an appropriate drinking water concentration which would ensure that exposure over a 70 year life-span would not result in an exceedance of that NOAEL. This is done based upon certain exposure assumptions adopted by EPA and explained in the 1990 Report. Dr. Calabrese has deviated from standard IRIS methodology in two respects: (1) he recommends that 65 kg, the average body weight of women, be used instead of 70 kg. which is the average of male and female body weights: (2) he recommends that surface area scaling be employed to adjust the mink dose to a human dose. Although these recommendations have merit, CDH is not adopting them at this time because they have not yet been incorporated into state and federal regulatory programs. Accordingly, based on the above descriptions, an appropriate calculation of a drinking water level

for DIMP would be:

(1) 11 mg/kg/day (LOAEL) = 0.0011 mg/kg/day 10,000

(2) 0.0011 mg/kg/day x 70 kg x 0.2 = 0.0077 mg/l = 7.7 :g/l
2 liters/day = 8.0 :g/l

(0.2 is the source contribution from groundwater)

In conclusion, selection of the Aulerich mink study as the critical study, and application of standard IRIS methodology to that study results in a drinking water equivalent level of 8 :g/l. This level should be incorporated as a remediation goal by the Army into its Proposed Plan. The treatment facility should be operated to achieve a level of no more than 8 :g/l in its effluent, and the Army should evaluate the feasibility of containing the DIMP plume where concentrations exceed 8 :g/l. Where active remediation is impracticable, the Army could ensure the protection of public health by providing an alternative water supply, and institutional controls to prevent unknowing use of the water in contaminated areas.

Response

The U.S. Environmental Protection Agency (EPA) developed the Health Advisory for diisopropyl methylphosphonate (DIMP) in 1989 on the basis of an extensive review of more than 30 existing toxicology studies involving a variety of animal species. EPA's Office of Drinking Water re-reviewed the Health Advisory, in light of the State's concern, and concluded on March 28, 1990, that "the existing Health Advisory values and the basis for the values represent the best scientific position for the protection of human health." The Army is not in violation of Section 121(b) of CERCLA and Section 300.430 (e)(9)(iii)(a) of the NCP because the DIMP standard proposed by the State has not been promulgated.

The Army contends that the EPA acted appropriately when rejecting the Aulerich mink study as the critical study on which to establish a human health drinking water advisory on the basis of extrapolative relevance to humans and the confounding influences of background mortality in mink. The Army disagrees with the State's statement that IRIS mandates that health-based standards be based on the most sensitive species tested. IRIS describes through a "concept paper" (IRIS Background Document 1A - Reference Dose (RfD). Description and Use in Health Risk Assessment) the recommended approach to select the most appropriate critical study and implies the use of informed professional judgment when making that selection, particularly when identifying the animal model that is most relevant to humans. EPA uses a panel of high-level peer scientists to make the critical study selection rather than relying on the opinions of a single individual.

The CDH apparently recognizes some of the additional flaws in the health-based DIMP standard proposed by Dr. Calabrese. The State is correct that Dr. Calabrese's application of an additional modifying factor of 5 to overall uncertainty is inappropriate as well as the use of some exposure parameters. In fact, the approach as described by Dr. Calabrese illustrates how unrealistic health-based standards are derived when guidelines recommended by EPA are followed as an arbitrary yes or no paradigm, ignoring informed professional judgment (peer review) on biological and toxicological relevance.

In accordance with EPA's Risk Assessment Guidance for Superfund (RAGS), the Army used EPA's Health Advisory and information contained in the IRIS database to evaluate risk to human health.

e. DIMP Exceedances Past the First Creek Intercept System

The State is concerned that a portion of the concentrated DIMP plume has already passed the offpost intercept system, leaving concentrations of the chemical, greater than 600 ppb, unremediated. This concern is compounded by the fact that the Army is unaware of the extent of this plume. Additional characterization of the groundwater downgradient of the intercept system is necessary. Additional alternatives should then be evaluated to attempt to capture this plume before this high concentration of DIMP contamination affects a larger number of domestic wells.

Response

The Offpost Groundwater Intercept and Treatment System is located in areas of highest contaminant concentrations. The Army is aware that concentrations of DIMP greater than 600 puts per billion (ppb) have been reported north of the Offpost Groundwater Intercept and Treatment System. In that regard, the offpost remedial action groundwater monitoring program will be coordinated with the three existing groundwater monitoring programs active in the Offpost Study Area. These three programs are (1) the Groundwater Monitoring Program, (2) the Interim Response Action A monitoring program, and (3) the private well monitoring program. Additionally, in the area north of the Offpost Groundwater Intercept and Treatment System where DIMP has been reported to exceed 600 ppb, three monitoring wells will be replaced and three new monitoring wells will be installed. Replacement wells are being installed for three wells originally in the monitoring network that were found to be damaged or destroyed. Two new monitoring wells will be installed downgradient of the First Creek Pathway, and one new monitoring well will be installed downgradient of the northern Pathway. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells will be used to further define the extent of contamination greater than the remediation goals in this area and assist in determining whether modifications to the design of the Offpost Groundwater Intercept and Treatment System are necessary.

f. The Army's Definition of the DIMP Plume

According to the Proposed Plan, "The Offpost Study Area was defined to assess potential effects of RME-related contamination beyond the RME boundary. On the basis of north and northwesterly flow directions of groundwater and surface water, the boundary of the Offpost Study Area was defined to include the area bounded by 80th Avenue, the South Platte River, Second Creek and the north and northwest boundaries of RME." The State believes the Army's definition of the Offpost Study Area is insufficient for two reasons:

First, the Army has defined the Offpost Study Area based largely on its own definition of the area extent of the DIMP plume in the alluvial aquifer. These data include only Army monitoring well data and does not take into consideration numerous domestic alluvial and Arapahoe wells that have consistently contained levels of DIMP, according to CDH data.

Second, the Offpost Study Area was geographically limited in part by the South Platte River on the west and Second Creek on the east. Historically, the South Platte River has been regarded as a hydrologic barrier which prevented contaminant plumes from migrating to the west side of the river. More recent Army data reveals DIMP contamination on the west side of the Platte present since 1989. This was confirmed in April of 1993 by two CDH samples taken west of the Platte River, near the Army monitoring well. In addition, detections of DIMP in both the alluvial and Arapahoe aquifer adjacent to Second Creek fall well outside the Army's plume interpretation, suggesting that the DIMP "plume" is not restricted by the definition of the "study area".

The State believes that the Study Area be expanded to include a larger geographic area that includes all domestic-use and monitoring wells that contain concentrations of DIMP.

Response

The delineation of the Offpost Study Area in the Federal Facility Agreement (FFA) was agreed to by EPA, Army, Shell, U.S. Department of the Interior, U.S. Department of Justice, and the Agency for Toxic Substances Disease Registry (the signatories to the FFA). Groundwater cleanup standards are not exceeded in the areas outside the Offpost Study Area; therefore, an expansion of the study area is unnecessary.

The Army has used and continues to include data from the various Army-sponsored offpost monitoring programs and the private well monitoring programs to evaluate which areas are impacted by RME contamination. All available data is used in developing the plume maps.

The Army will continue to use all available domestic use and monitoring well data and to include, as appropriate, locations outside of the Offpost Study Area in future monitoring events.

g. Degradation of the Arapahoe Aquifer

The Army does not address the continued degradation of the deeper Arapahoe Aquifer. Since 1990, testing by the Army and the Colorado Department of Health has revealed widespread contamination of this aquifer. Of the 70 wells so far tested for DIMP in this aquifer, 42 were below detection levels (BDL), 8 samples contained Trace amounts (defined as <0.5 ppb), and 20 had measurable amounts ranging from 0.5 to 39.7 ppb. This is of concern to the State because there are a large number of domestic Arapahoe wells in the Offpost area, most of which have not yet been sampled for DIMP.

On several occasions, CDH has presented to the Army evidence of wells known to be conduits of contamination from the alluvial aquifer to the Arapahoe aquifer and consequently into neighboring Arapahoe wells. For example, at a December 11, 1991 meeting, the State pointed out that well #985 (TCHD ID) was known to be completed over more than one water bearing zone consistent with completion practices of the time of its construction. Based on testing of several downgradient Arapahoe wells and their geographical location with respect to the DIMP plume in the alluvial aquifer, it was determined that well #985 was acting as a conduit for inter aquifer communication.

The State believes that the Proposed Plan must protect the integrity of the Arapahoe Aquifer. To this end, the State believes that it is essential to close, as they are identified, all wells which are known to be pathways of contamination to the deeper aquifers by evaluating each domestic well an a case by case basis, taking into account the completion history, geographic location and geology of each candidate.

The State is concerned that further degradation of the Arapahoe Aquifer violates the Colorado Basic Standards for groundwater, 5 CCR 1002-8, §3.12.5(2)(a). This interim narrative standard specifically applies to RME, which lies within the Denver Basin Aquifer system and provides that groundwater quality shall be maintained at either the ambient quality as of October 31, 1991, or the Table Value Standards. whichever is less restrictive. Since there is no table value standard applicable to DIMP, and the Army has maintained that the Arapahoe Aquifer is clean, no degradation of the aquifer is permissible under this section. In addition, further degradation must be prevented to comply with the CBSG 5 CCR 1002-8 § 3.11.5(c)(1)(b). This section requires that organic pollutants must be "maintained at the lowest practicable level."

Response

The Army has incorporated well closure as a component of the offpost selected remedy. The criteria for well closure are presented in Appendix C of the ROD.

h. Isopropy1methyl Phosphonic Acid (IMPA) in Groundwater and Surface Water

In 1990 the EPA completed a health advisory (HA) for the compound Isopropy1methyl phosphonic acid (IMPA). The EPA's HA concluded that a concentration of 700 ppb is an allowable lifetime exposure level. The Colorado Department of Health (CDH) recently finalized its review of EPA's HA to ensure that it is protective of human health. This review identified several areas of concern with the EPA's report and recommends a lifetime HA for IMPA of 6.0 ppb. CDH's review will be distributed to the Parties in the near future.

The State is concerned that based on EPA's HA of 700 ppb, the Proposed Plan may not be protective of human health and the environment. The State is primarily concerned that the Army has not adequately characterized IMPA contamination in the Of1post Study Area. The chemical characteristics of IMPA indicate that the likelihood of IMPA contamination in offpost soils is small. However, IMPA contamination in the groundwater and surface water may be inevitable due to the compound's long half-life, its low partition coefficient, and the high concentrations of IMPA detected in groundwater onpost. Moreover, it is likely, due to its similar chemical characteristics, the compound may have developed a groundwater plume typical of DIMP.

The Army has been unable to properly characterize the IMPA groundwater plume and the levels of IMPA in surface water due to its analytical detection limit. The Army's current detection limit of 150 ppb is more than 20 times the state's HA number of 6 ppb.

The State urges the Army to certify an analytical methodology that provides adequate IMPA characterization to ensure that residents in the Offpost Study Area are not exposed to unacceptable risks, If USATHAMA certification cannot be achieved in a timely manner, the Army should resort to using EPA analytical methodology in its characterization of IMPA contamination. Once the characterization of IMPA in the offpost study area has been completed, the endangerment assessment and feasibility study may need to be modified to include these data.

Response

On the basis of toxicity information summarized in EPA's isopropyl methylphosphonic acid (IMPA) Health Advisory and the Integrated Risk Information System (IRIS) database, there is no information to indicate that IMPA concentrations lower than 700 ppb may pose a threat to human health.

It is highly unlikely that toxicologically significant concentrations of IMPA will occur in groundwater because the abiotic formation of IMPA from diisopropyl methylphosphonate (DIMP) occurs under alkaline conditions in the presence of heat. IMTA is primarily formed as a biological metabolite of DIMP and excreted in the urine. The toxicological data on the metabolism of DIMP indicates that the formation of IMPA is part of the metabolic elimination process and not a bioactivation reaction. IMPA is a very polar metabolite that is most likely readily eliminated in the urine rather than reabsorbed by the kidneys and redistributed throughout the body.

The EPA reference dose for IMPA was based on a simple IMPA subchronic study; however, EPA indicates in IRIS that the DIMP database can be used to support the toxicological conclusions regarding IMPA because more than 90 percent of the ingested DIMP is rapidly (within 24 hours) converted to IMPA. EPA states that the DIMP studies showed that DIMP was relatively nontoxic to all species. Additionally, because DIMP is rapidly and mostly metabolized to IMPA, it is reasonable to conclude that the DIMP administered to mammals in the studies was metabolized to IMPA, therefore, the absence of effects from DIMP also may be considered to indicate an absence of effects from IMPA.

Analytical data collected to date in the Offpost Study Area for IMPA has not indicated that IM[PA is present at or above the certified reporting limit (CRL) in groundwater or tap water samples. The Army's current CRL for IMPA is 25 ppb, not 150 ppb. From 1989 through 1992, the IMPA analytical method used by the Army for analysis of groundwater and tap water had a CRL of 100 ppb. In 1993, following additional method development, the CRL was reduced to 25 ppb. The 1993 reporting limit of 25 ppb is 28 times less than the EPA health advisory concentration of 700 ppb. For this reason, the Army believes it has adequately characterized the extent of IM[PA in the Offpost Study Area in a manner sufficient to conclude that potential health cffcvt5 from IMPA are minimal.

The Army has vigorously pursued the development of more sensitive methods for the identification of IMPA in RME groundwater. The Army is currently unaware of a standard EPA method capable of attaining a reliable reporting limit near 6 ppb.

The Army has received the State's evaluation of IMPA toxicity and will be providing additional comments.

i. Point of Compliance

The Proposed Plan relies on intercept systems located immediately upgradient of O'Brian Canal and some distance from the RMA boundary as the remedy. The Preamble to the Proposed NCP provides that "EPA's policy is to attain ARARs and TBCs pertaining to contaminant levels...so as to ensure protection at all points of potential exposure. 53 Fed. Reg. 51440 (Emphasis added). The NCP, furthermore, clearly states that "remediation levels should generally be attained throughout the contaminated plume." EPA acknowledges, however, that an alternative point of compliance may also be protective in some circumstances. See NCP C.F.R. §300.430(f)(5)(iii)(A) (1991). The Army has not demonstrated that it will achieve protectiveness and ARAR compliance throughout the plume, nor has it made the requisite findings to support an alternative point of compliance. Therefore, the Proposed Plan is in violation of the groundwater policy set forth in the preamble to the

NCP. The State contends that ARARs must be met throughout the plume unless the Army can demonstrate technical impracticability or justify an alternative point of compliance.

Response

The Army intends to achieve the remediation goals at all points within the contaminated plume, consistent with the NCP. The groundwater modeling conducted by the Army in support of the remedial alternatives evaluation in the Offpost EA/FS report used attainment of remediation goals as a primary criterion in assessing time to cleanup for the various remedial alternatives. This information is presented in summary form in the Proposed Plan and Volume VI, Section 3.2 of the EA/FS and in detail in Volume VII, Appendix E of the EA/FS. The area of concern to the State appears to be the portion of the plume that lies between the North Boundary Containment System (NBCS) and the Offpost Groundwater Intercept and Treatment System. The NBCS has been demonstrated to be effective in reducing the contaminant concentrations at the RMA boundary to meet remediation goals. The purpose of the Offpost Groundwater Intercept and Treatment System is to extract and treat that portion of the plume that has migrated past the RMA boundary and that contains contaminants exceeding the remediation goals. The groundwater monitoring program implemented as part of the selected remedy will provide the data necessary to evaluate attainment of treatment goals within the plume and to assess and design modifications to the treatment system, if necessary.

Comment No. 3 - Land Use

a. Classification of Land Use

Zones 3 and 4 are currently zoned as agricultural/residential. This was the Predominant use until Shell Oil Company purchased the land in 1991. The Army, however, has designated the land use for these zones as urban residential. The Army justifies this classification on two grounds. According to Adams County planning documents, the expected future use is presumed to be urban. The other basis, according to the Army, is the fact that the majority of this land is presently owned by Shell Oil Company which allegedly will not sell that land except for commercial use. By assuming that the future use is urban residential, the Army has eliminated the consumption of homegrown meats. milk, and eggs from the baseline risk assessment. thereby reducing the calculated risk and avoiding remediation. The NCP provides that both current and reasonable potential exposures must be considered in the baseline risk assessment. 40 C.F.R. §300.430(d)(4) (1991). The Army has eliminated the current land use. agricultural, in its evaluation.

Land use controls should be considered as an interim response measure, or final response action where a more aggressive remedy is impracticable, but should not be considered in conducting a cumulative site baseline risk assessment. OSWER Directive 9355.0-30, dated April 22, 1991 at page 4. The Proposed Plan does not comply with this guidance or NCP Preamble language to the same effect: furthermore, it contains no provisions to ensure that agricultural/rural residential uses are not allowed to occur in the future. The State therefore maintains that the risk assessment should include the rural residential scenario, which more accurately reflects current land use.

Response

The future land use scenarios used by the Army in the risk assessment are highly conservative. For example, the rural residential scenario used in zones 1, 2, and 6 includes all pathways contributing substantially to potential risk, even though most of the total population is not exposed to the agricultural exposure pathways described in the risk assessment. Shell Oil Company purchased the land in zones 3 and 4 for Army use in constructing the Offpost Groundwater Intercept and Treatment System. It is not presently occupied; therefore, the current zoning designation as rural residential is not applicable. Given the probability of the realignment and widening of 96th Avenue, future development along 96th Avenue will likely be commercial/industrial or urban residential. Based on local agency planning documents, the Army selected an urban residential land use for the risk evaluation as this would result in more conservative (e.g., higher) estimated risks than the likely commercial/industrial land use.

The Army disagrees with the interpretation of land use designations as a type of "land use controls." The referenced OSWER Directive, on page 4 states:

(t)he cumulative site baseline risk assessment should include all media that the reasonable maximum exposure scenario indicates are appropriate to combine and should not assume that institutional controls or fences will account for risk reduction.

The future land use designation of urban residential was not presented as, nor was it intended to be interpreted as, an institutional control. Following the purchase of these properties by Shell Oil Company, the current land use is vacant, not rural residential, as no individuals currently reside in these zones. The land use designation is made only to assess the types of potential exposure pathways. These designations are made in accordance with the National Contingency Plan, which states that the baseline risk assessment must look at a reasonable future land use. The Army believes that urban residential is a reasonable future land use designation, in accordance with Risk Assessment Guidance for Superfund, one of the key factors in determining potential future land use is an evaluation of planning and zoning documents. The land use designations and plans were established by the appropriate jurisdictional agencies, not by EPA or the Army. Evaluation of current zoning regulations, discussions with local planning officials, examination of future land use master plans for the city and county, and visual surveys were used to establish land use scenarios. These designations are supported by established zoning, planning maps, and planning documents.

b. Institutional Controls

Zones 2, 3, and 4 are the most contaminated zones in the Offpost study area. Because risks from soil and groundwater contamination exceed acceptable levels in these zones, either remediation or institutional controls are necessary in order to comply with CERCLA's prescription that remedies be protective. A mere promise by a responsible party not to sell the property until the remedy is complete would not be enforceable and therefore does not ensure protectiveness. Institutional controls could be used to prevent exposure during the remediation period. For example, restrictions may need to be imposed to prevent the construction of any wells for the purpose of supplying drinking water from contaminated aquifers. The State Engineer, for instance, has the authority to deny well permits located "closer than 100 feet from the source of contaminants..." 2 CCR -2. Rule 10.2.1 (1988).

The NCP specifically encourages the use of institutional controls and deed restrictions as a supplement to "engineering controls as appropriate for short-and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants." 40 C.F.R. §300.430 (a)(1)(iii)(D). This section emphasizes, however, that institutional controls are not appropriate as a substitute for active response measures such as treatment and/or containment of source material, and remediation of groundwaters. Id.

Thus, the State continues to urge that aggressive cleanup be undertaken to comply with the prescriptions of section 121 of CERCLA, as well as the NCP. To the extent that such remedies are impracticable or do not ensure protection of human health in the interim, however. institutional controls must be adopted to supplement the selected remedy. Otherwise, the Proposed Plan will not meet the NCP's threshold criterion of protectiveness.

Response

Institutional controls have been added as a component of the selected remedy. Appendix B of the ROD provides an evaluation of the institutional controls available and their applicability.

Comment No. 4 - Applicable. Relevant and Appropriate Requirements (ARARS)

The State of Colorado has consistently identified the Colorado Basic Standards for Groundwater (CBSG), 5 C.C.R. 1002-8, Section 3.11.0 et seq., and the Colorado Basic Standards and Methodologies for Surface Water, (CBSM), 5 C.C.R. 3.1.0 et seq. as ARARs. These standards were identified in a timely manner, as is required by the NCP. Although the Army has previously recognized the CBSG as ARARs at interim response actions at the Rocky Mountain Arsenal (RME), (See footnote 2, infra. the Army has failed to acknowledge the CBSG or the CBSM as ARARs for the offpost operable unit at RME according to the of/Post Endangerment Assessment/Feasibility Study (EA/FS).1

The NCP provides that in order to be recognized as ARARs, state standards must fulfill several

requirements: they must be promulgated; they must be more stringent than the comparable federal standards; and they must be either "applicable" or "relevant and appropriate". NCP, 40 C.F.R. §300.400(g)(4) (1991). Applying these criteria to the CBSG and the CBSM, it is clear that these standards are ARARs, and that unless they are explicitly waived according to the six criteria set forth in §121(d)(4) of CERCLA, these regulations should form the basis for the cleanup of the offpost operable unit at the Rocky Mountain Arsenal.

Response

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirement (ARAR) criteria under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP. After extensive discussion with all the parties, the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health. In most cases, the treatment goals for the offpost and boundary treatment systems exceed the drinking water standards.

CERCLA expressly provides that state standards can be ARARs at a site. However, only those standards that are more stringent than federal requirements may be considered. In addition, the state standards must be promulgated (i.e., the requirement must be of general applicability and legally enforceable). Finally, the requirements must be identified in a timely manner by the particular state (40 Code of Federal Regulations [CFR] Section 300.400[g][4]).

Regulations promulgated pursuant to the Colorado Water Quality Control Act, Colorado Revised Statutes (CRS) Sections 25 - 8 - 10 1, et seq., establish standards for groundwater (5 Code of Colorado Regulations [CCR] 1002-8, Section 3.11.0). A key aspect of the regulation is that Tables 1 through 4 standards are not automatically applicable to groundwater (Section 3.11.7[A]), but apply only if the aquifer has been classified in accordance with Section 3.11.4.

1 The Army states in the EA/FS that the CBSG are not ARARs because the water near the Arsenal has not been classified. The Army ignores the fact that the Table Value Standards apply to the aquifer near the Arsenal pursuant to an interim rule which applies the Table Value Standards to all unclassified aquifers. See, CBSG, 5 C.C.R. 1002-8, §3.12.5 (1). The Army dismisses the statewide interim organic standards by stating, without further explanation, that they are not ARARs because they are ambiguous and inconsistently applied. The Army has not indicated to the State how these standards are ambiguous, or given examples of inconsistent application. The Army also states that the CBSM are not ARARs because the remedy does not discharge to surface water. This analysis fails to recognize that the CBSM are chemical-specific ARARs as well as action-specific ARARs. they are therefore used to determine whether remedial actions are necessary to protect human health and the environment from unacceptable risks due to exposures to concentrations exceeding State standards. Such an evaluation should be conducted for offpost surface water bodies.

Most aquifers in the state are unclassified. Consequently, the Water Quality Control Commission (Commission) promulgated the interim narrative standard (Section 3.12.5) for five specified aquifer systems to avoid degradation of water quality prior to aquifer classification. Each of thefive identified aquifers must meet the standards in Tables 1 through 4 or the ambient quality as of October 30, 1991, if it was less restrictive, until the aquifers are classified and numerical standards are adopted.

The Commission promulgated a second group of groundwater standards that are applied differently than the standards in Tables 1 through 4. These statewide standards (Section 3.11.5[C]) include water quality standards for radioactive materials and interim standards for organic pollutants (Table A), including chloroform. Table A standards differ from the standards in Tables 1 through 4 in an important way. Table A standards are automatically applicable to all state groundwater (Section 3.11.7[A]). The Commission recognized that the automatic application of Table A standards can lead to unnecessarily overprotective and technically impracticable results at contaminated sites and added exceptions to the regulation for remediation activities at CERCLA sites, Resource Conservation and Recovery Act (RCRA) sites, and underground storage tank (UST) sites. The CERCLA exception, Section 3.11.5(C)(5)(a), states the following:

> Nothing in this regulation shall be interpreted to preclude ... [a]n agency respon-

sible for implementation of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, et seq., as amended, from selecting a remedial action and a point of compliance that are more or less stringent than would be achieved by compliance with the statewide numerical standards established in this subsection, or alternative site specific standards adopted by the Commission, when a determination is made that such a variation is authorized pursuant to the applicable provisions of CERCLA.

Sections 3.11.5(C)(5)(b) and (c) provide similar exceptions for corrective actions under RCRA Subtitle C (hazardous waste treatment, storage, and disposal facilities) and Subtitle I (UST sites), respectively.

Section 3.11.5(C)(5) is internally consistent only if the Commission intended not to impose the interim organic standards in Table A as cleanup standards. According to the regulations, the interim organic standards automatically apply on a statewide basis, except at CERCLA, RCRA, and UST sites where "certain federal regulatory determinations regarding groundwater quality would not be superseded by the Commission's standards" (Section 3.11.10[B]). In promulgating the Table A exceptions, the Commission recognized that implementing agencies are more familiar with site-specific conditions and are in a better position to determine the appropriate cleanup standards. By not imposing unnecessarily stringent application of the Table A standards, the Commission sought to show "explicit deference to certain federal regulatory programs, which may apply different standards" (Section 3.11. 10[11]).

The Army concludes that the CBSG interim organic standards are not ARARs for two reasons. First, the CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA that are more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement.

CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

a. Promulgated

"Promulgated" State requirements include those which are enacted by State legislative bodies or adopted as regulations by State agencies pursuant to formal rulemaking proceedings, as is the case with the CBSM and the CBSG. According to the NCP, the standards must also be generally applicable, and legally enforceable. 40 C.F.R. § 300.400(g)(4) (1991).

1. Legally Enforceable:

State standards are "legally enforceable", according to the preamble to the proposed NCP if they "contain either specific enforcement provisions, or are otherwise enforceable under state law." 53 Fed. Reg. 51437-38. They must also be issued in accordance with procedural rules. 40 C.F.R. §§300.400(g)(4) and (5) (1991).

The enabling statute for the Water Quality Control Commission makes it clear that the regulations promulgated by the Commission, including the CBSG and the CBSM, are enforceable standards to be applied throughout the State of Colorado. See 25-8-102,25-8-204(4) C.R.S., (1989 Repl. Vol.). The regulations promulgated by the Commission are used not only by the Division of Water Quality Control, but also by the other "implementing agencies" such as the Office of Mined Land Reclamation, the State

Engineer, the Oil and Gas Conservation Commission, agencies responsible for RCRA enforcement, as well as by other state agencies. 25-8-202, C.R.S., (1992 Supp.).

These regulations are formally promulgated pursuant loan "on the record" administrative rulemaking proceeding. which includes notice and comment, according to the provisions of the rules of the Water Quality Control Commission and the Colorado Administrative Procedure Act. 24-4-101 et. sea., C.R.S.,(1988 Repl. Vol., and 1992 Supp.). See generally, CERCLA Compliance with other Laws Manual, Part 11, pages 7-2 through 7-4.

Response

See response to Comment No. 4, part 1, given above.

2. Generally Applicable:

The preamble to the proposed NCP explains that the term "generally applicable" means that potential state ARARs must be applicable to all remedial situations described in the requirement, not just CERCLA sites. 53 Fed. Reg. 51437-38. The CBSM and the CBSG are used as the appropriate cleanup standards in state cleanup and enforcement actions, as well as at other CERCLA sites within the State of Colorado. The regulations therefore fulfill the "general applicability" requirement set out in the NCP.2

Response

The state claims in its November 20, 1992, letter that the U.S. District Court for Colorado held that the CBSG are applicable requirements under CERCLA (Colorado v. Idarado Mining Co., 707 F. Supp. 1227 [D. Colo. 1989]). In its proper context, the case does not hold that the interim organic standards are ARARs. First, the case merely points out that the State of Colorado identified the CBSG as an ARAR in its Record of Decision (ROD). Second, the case did not address the Table A interim organic standards or the CERCLA exception in Section 3.11.5(C)(5) because those provisions were promulgated after the case was decided. Therefore, the Idarado case has very little relevance to the application of the Table A standards to the Offpost OU.

b. More Stringent

A comparison of the numeric chemical-specific standards contained in the CBSG and the CBSM, as well as the narrative standards in both regulations, reveals that in many instances the Colorado Basic Standards are more stringent than the comparable federal standards. The State has timely identified the more stringent state standards applicable to specific contaminants at the Rocky Mountain Arsenal that are to be recognized and applied as ARARS.3

2 There are numerous state compliance actions as well as CERCLA sites in which the CBSG have been used as a cleanup standard. See, letter from Paul R. Tourangeau (AGO), to Elizabeth T. Wald (EPA), dated November 20, 1992, for some of these examples. This letter is hereby incorporated into these comments by reference. EPA recently affirmed that the CBSG are ARARs at the CERCLA Wastewater Interim Response Action at the Arsenal. See, Comments on Shell's Request to Modify CERCLA Wastewater IRA ARARs, attached to letter from Connally Mears (EPA) to Charles F. Scharmann (Army), also incorporated by reference. The State does not understand how EPA can ignore the ARARs for the offpost operable unit while simultaneously recognizing these standards as ARARs at another action at the same site.

3 The chemicals for which the State standards are more stringent include: aldrin, carbon tetra-chloride, chloroform, 1,2-Dichloroethane, dieldrin and manganese.

Response

The Army disagrees with the State's contention that CBSG standards are more stringent for many of the chemicals listed by the State. These include aldrin, carbon tetrachloride, chloroform, 1,2-dichloroethane, and dieldrin. For these compounds, the Army's cleanup standards are the respective certified reporting limits (CRLs).

C. Applicable Requirements

According to the NCP, "Applicable Requirements"

means those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting law (sic) that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

40 C.F.R. §300.5 and 300.400(g)(1)(1991).

In determining if a requirement is applicable, the Proposed NCP offers some further guidance. Several jurisdictional prerequisites must be considered:

a. Who, as specified by the statute or regulation, is subject to its authority;

b. The activities the statute or regulation requires, directs or prohibits:

c. The substances or places within the authority of the requirement; and

d. The time period for which the statute is in effect.

53 Fed. Reg. 51436

The CBSG and CBSM are state standards which specifically address the majority of chemicals of concern at the Rocky Mountain Arsenal. The regulations set standards for those chemicals in groundwater and surface water, the former being the primary medium of concern in the offpost operable unit. These standards have been applied as both cleanup and anti-degradation standards, and must be complied with by any person exercising control over the relevant type of water. The regulations are currently in effect. CBSG and CBSM are therefore applicable to the Arsenal, and must be adopted as the appropriate standards for the remedial action.

The preamble to the Proposed NCP also make it clear that there is no discretion in the selection of ARARS when a standard is applicable. "Applicable requirements are identified by a largely objective comparison to the circumstances at the site; if there is one-to-one correspondence between the requirement and the circumstances at the site, then the requirement is applicable." 53 Fed. Reg. 51436-37.

Response

The Army has reviewed the regulatory language of the CERCLA exception in Section 3-11.5(C)(5)(a) and the accompanying Basis and Purpose, published by the Commission. A careful

reading of both sources indicates that the Commission did not promulgate the CBSG interim organic standards as mandatory cleanup standards, but rather as levels to be utilized by remedial authorities when appropriate.

The regulation states that it does not preclude an implementing agency (e.g., the Army) from selecting a remedial action (e.g., the selected remedy for the Offpost OU) that is less stringent than would be achieved by the interim organic standard. Further, a determination must be made that the selected remedial action is authorized by CERCLA. Several important points can be drawn from the regulation.

First, the remedial site exceptions in Section 3.11.5(C)(5) are more than merely preemption statements, In its November 20, 1992, letter, the State suggests that the provision states the obvious, that the CBSG does not preempt CERCLA. The Army agrees with the State that the Commission did not intend for the CBSG to preempt CERCLA. But that is only the starting point for interpreting the regulation. The state appears to have ignored the remainder of the regulatory language in Section 3.11.5(C)(5)(a).

Second, compliance with the CBSG interim organic standards is not required at remedial sites. The regulation does not state that the implementing agency must use the statewide standards. Instead, the regulation is written not to preclude an implementing agency from choosing to use

the statewide standards. This is a critical distinction not addressed by the State. The Commission is emphasizing that the interim organic standards are not mandatory at certain remedial sites, but can be used if the implementing agency elects to use them. The logical conclusion is that the interim organic standards do not apply automatically to CERCLA, RCRA, and UST sites, where their use is ultimately determined by the remedial authority at the site.

Third, the CERCLA waiver provision is not the sole mechanism for not implementing the CBSG interim organic standards. The regulation explicitly states that the remedial action, not a chemical-specific standard, selected by the implementing agency can be more or less stringent than a remedial action that achieves the CBSG interim organic standard. By referring to the authority of the implementing agency to select the remedy, the Commission is obviously giving the exception a broader application than just the statutory waivers in CERCLA. Rather, the Commission is leaving the decision to apply the Table A standards to the agency authorized under CERCLA to select the remedial action. This logically leads to the conclusion that the interim organic standards are not cleanup standards, but merely guidance levels that may or may not be met at CERCLA, RCRA, and UST sites where statutory standards protective of the environment are already incorporated into the remedial process.

Section 3.11.5(C)(5) is internally consistent only ff the Commission intended not to impose the interim organic standards in Table A as cleanup standards. According to the regulations, the interim organic standards automatically apply on a statewide basis, except at CERCLA, RCRA, and UST sites where "certain federal regulatory determinations regarding groundwater quality would not be superseded by the Commissions's standards' (Section 3.11.10[B]). In promulgating the Table A exceptions, the Commission recognized that implementing agencies are more familiar with site-specific conditions and are in a better position to determine the appropriate cleanup standards. By not imposing unnecessarily stringent application of the Table A standards, the Commission sought to show "explicit deference to certain federal regulatory programs, which may apply different standards" (Section 3.11.10[H]).

The Army concludes that the CBSG interim organic standards are not ARARs for two reasons. First, the CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA that are more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable, when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

d. Relevant and Appropriate

The State contends that the CBSG and the CBSM are applicable to the Rocky Mountain Arsenal offpost operable unit. Regardless. they are, at a minimum, 'relevant and appropriate." The NCP defines "relevant and appropriate" as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

40 C.F.R. §300.5(1991).

It has been suggested that the CBSG and the CBSM are not ARARs because they do not specifically state that they are cleanup standards. These standards are being used by the Water Quality Control Division, as well as by the other implementing agencies as cleanup

standards, thereby leading to the conclusion that the regulations are 'relevant and appropriate".4

4 It has also been suggested that the regulations are "merely" anti-degradation standards. This label, however, does not mean that the regulations are not ARARS. Both the NCP and EPA guidance make it very clear that anti-degradation statutes ace frequently ARARs. See, Preamble, 55 Fed. Reg. 8746, and CERCLA Compliance with Other Laws Manual: Part II, pages 7-28, and 7-30.

The NCP includes eight factors to be considered in determining relevance and appropriateness:

i. The purpose of the requirement and the purpose of the CERCLA action;

ii. The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;

iii. The substances regulated by the requirement and the remedial action contemplated at the CERCLA site;

iv. The actions or activities regulated by the requirement and the remedial action contemplated by the CERCLA action;

v. Any variances, waivers, or exemption of the requirement and their availability at the CERCLA site;

vi. The type of place regulated and the type of place affected by the release or CERCLA action;

vii. The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action;

viii. Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

40 C.F.R. 5300.400(g) (2) (1991).

An examination of these eight factors leads to the conclusion that the CBSG and the CBSM are relevant and appropriate. The media, the substances, the actions, the type of place, the use and potential use of the affected resources which are covered by the CBSG and the CBSM are identical to those at the Rocky Mountain Arsenal. These regulations are therefore "relevant and appropriate."

Thus, the CBSG and the CBSM fulfill all the prerequisites to be ARARs under the NCP. They are promulgated state standards, both generally applicable and legally enforceable; they are more stringent than the relevant federal standards; and they are applicable or relevant and appropriate. It is therefore contrary to CERCLA and the NCP to fail to identify them as ARARs and to apply the less stringent federal standards as the basis for cleanup at RMA's offpost operable unit!

5 The Army has previously raised the question of whether 5 C.C.R.1002-8, §3.11.5 (C)(5)(a), constitutes a "CERCLA exemption" from the provisions of the CBSG. That section of the CBSG merely states the obvious, that when CERCLA dictates a standard other than that prescribed in the regulations, CERCLA is not preempted by the CBSG. See Letter from Paul R. Tourangeau (AGO), to Elizabeth T. Wald (EPA), dated November 20, 1992, responding to a request for clarification of the general applicability and legal enforceability of the CBSG.

Response

See response to comment to Comment No. 4 Part c given above.

e. Secondary Maximum Contaminant Levels

The Army in its Proposed Plan has failed to acknowledge secondary MCLs as ARARs. The secondary MCLs, promulgated pursuant to the Safe Drinking Water Act, 42 U.S.C.300g-1(c) (1992), address a contaminant"(A) which adversely affect the odor or appearance of such water and consequently may cause a substantial number of the persons served by the public water supply to discontinue its use, or (B) which may otherwise adversely affect the public welfare." 42 U.S.C. 300(f)(2) (1992). The secondary MCLs, while not federally enforceable, are nevertheless relevant and appropriate as "guidelines for the States." 40 C.F.R. 143.3 (1992). The State of Colorado, moreover, has promulgated secondary drinking water standards, and incorporated those standards in the Colorado Basic Standards for Groundwater. 5 C.C.R. 1002-8, Table 2. The numeric standards contained in Colorado's regulations are the same as in the federal regulations. The State maintains that these standards are ARARs, and must be addressed by the Army in the Proposed Plan. Specifically, chloride samples since June 1992 show exceedances of the secondary standard of 250 ppm during the 3rd and 4th quarters of 1992. Likewise, fluoride and manganese data illustrate a history of exceedances of their secondary MCLs of 2 and 500 ppm, respectively.

Response

Regulations promulgated pursuant to the Colorado Water Quality Control Act, Colorado Revised Statutes (CRS) Sections 25-8- 101, et seq., establish standards for groundwater (5 Code of Colorado Regulations [CCR] 1002-8, Section 3.11.0). These regulations create a system for classifying groundwater and adopting water quality standards to protect existing and potential beneficial uses (Tables 1 through 4). Groundwater is categorized into five classifications on the basis of use (Section 3.11.4[A]). Standards specified in the regulation are then applied to the classified aquifer (Tables 1 through 4; e.g., human health standards, secondary drinking water standards, agricultural standards, and total dissolved solids [TDS] water quality standards). A key aspect of the regulation is that Tables 1 through 4 standards are not automatically applicable to groundwater (Section 3.11.7[A]), but apply only if the aquifer has been classified in accordance with Section 3.11.4. Since the offpost aquifers have not been classified by the State, Tables 1 through 4 are not automatically applicable.

The Water Quality Control Commission (Commission) also promulgated the interim narrative standard (Section 3.12.5) for five specified aquifer systems in order to avoid degradation of water quality prior to aquifer classification. Each of the five identified aquifers must meet the Tables 1 through 4 standards or the ambient quality as of October 30, 1991, if it was less restrictive, until the aquifers are classified and numerical standards are adopted. However, the Offpost Study Area does not fall within any of the five specified aquifer systems; consequently, Tables 1 through 4 (including the secondary drinking water standards in Table 2) do not apply.

Comment No. 5 - Surface Water

The Army's Offpost Proposed Plan indicates that no active remediation is planned for surface water offpost; the Army maintains that surface water will be cleaned up as a result of groundwater remediation. The Army has not provided any estimation of how long this will take; nor is any future sampling planned to verify this expected improvement of surface water quality.

According to the surface water data available for First Creek, contaminants of concern such as chlordane, dieldrin, endrin and DDT exceed the state aquatic life chronic standards. As the Army readily admits in the Offpost Endangerment Assessment/Feasibility Study Final Report, page III-5-30, "chlordane, dieldrin, fluoride and DDT appear to present a potential for an adverse effect to aquatic life in First Creek, based on a comparison of exposure point concentrations in surface water to TRV's (chronic AWQC values) for aquatic life." The State believes that these contaminants should be addressed in the Offpost Proposed Plan.

The State agrees with the position that EPA took on this issue a year ago. "The Army has not provided an objective evaluation of possible alternatives for the remediation of the contaminated surface water other than concluding that the remediation of the groundwater would remediate the surface water. The timeframe and costs for remediation of surface water are not identified, even within the context of the remediation of the groundwater, since a portion of these elements reside in the remediation costs and time frame for the Onpost OU, for which the FS has not yet been prepared." (See, letter from Connally Mears, EPA, to Kevin Blose, U.S. Army, dated May 6, 1992).

The Army has justified its failure to examine alternatives for surface water cleanup offpost mainly by stating that because First Creek is a gaining stream in the offpost area, the Creek will be eventually cleaned up as the groundwater is flushed by the North Boundary Containment System. In the Army's response to a state comment (Offpost Endangerment Assessment/Feasibility Study, Proposed Final Report, Vol. 8, pg.78) the Army states: "Groundwater interaction with First Creek surface water is known to occur in First Creek between the northern RME boundary and the confluence of First Creek with O'Brian Canal. This interaction of offpost groundwater with First Creek surface water is quite complex. Seasonal fluctuations in the water table and seasonal fluctuations in First Creek flow rate result in gaining and losing stretches of First Creek, that vary temporally. Further, slight variations in the water fable elevation and in the First Creek stream elevation along the length of First Creek result in spacial variations in stretches identified as gaining or losing independent of the season." The Army also states on pg. 76 of the same volume: "The secondary source of surface water in First Creek offpost is watershed runoff." The State agrees that remediation of groundwater should have a positive net effect on surface water quality offpost. Given the complexity of groundwater/surface water interaction offpost and the potential contribution of contamination resulting from overland flow during storm events, however, the State remains concerned with the lack of consideration given to the surface water medium by the Army. The State believes the Army should evaluate remedial alternatives in order to meet state surface water quality standards in First Creek. In addition, we urge the Army to commit to future sampling to ensure these standards are achieved.

Response

Given that the following three factors point to continuing beneficial impacts to offpost water quality, the Army is committing to an ongoing surface-water monitoring program to track the cleanup of offpost surface water: (1) remediation of groundwater should have a beneficial effect on offpost surface-water quality, (2) contaminant concentrations are lower during storm event runoff periods (Surface Water Comprehensive Monitoring Program Annual Report for 1989 [R.L. Stollar & Associates, and others, 1990]), and (3) the Army has committed to closing the onpost sewage treatment plant, thus eliminating a possible source of contaminants in the First Creek surface water drainage.

The components of the offpost surface-water monitoring program will be contained in a report to be completed following completion of the ROD. The ROD contains the Army commitment to both surface-water and groundwater monitoring programs in the offpost area as a component of the selected remedy.

Appendix A-4
U.S. DEPARTMENT OF THE ARMY
RESPONSES TO REGION VIII U.S. ENVIRONMENTAL PROTECTION AGENCY
COMMENTS REGARDING THE ROCKY MOUNTAIN ARSENAL
OFFPOST PROPOSED PLAN
JUNE 17,1993

GENERAL COMMENTS

Comment No. 1 - Irondale Boundary Control System (IBCS)

Along with the north and northwest boundary control system, the IBCS must also be committed by the Offpost Record of Decision (ROD) to continue to operate as required in the Federal Facilities Agreement (FFA). We understand this omission from the Proposed Plan to be unintentional.

Response

Continued operation of the Irondale Boundary Containment System has been included as a component of the selected remedy in the Offpost Record of Decision (ROD).

Comment No. 2 - Continued Operation of Three Boundary Systems

The Offpost ROD will have to select the Federal Facilities Agreement requirement at Section 2.7 (regarding ground water quality flowing offpost). The three boundary systems must be required to continue operation, as necessary to accomplish that obligation.

Response

Continued operation of the three boundary containment systems is required as part of the selected remedy in the Offpost ROD.

Comment No. 3 - Acknowledging the State Ground Water Regulations as Legal Standards:

EPA considers the Colorado Basic Standards for Ground Water (CBSGs) to be Action Specific ARARs (and has adopted them on other Superfund sites, as well as for RMA IRAs). EPA's use of this regulation as an Action Specific ARAR is to require that cleanup activities do not degrade the quality of existing ground water during response activities. This is consistent with such ARARs as Section 7020 of RCRA, which are established to improve ground water quality without setting specific standards. EPA also believes that the CBSGs should be used to establish chemical specific remediation levels. The clear language of the regulation allows for the establishment, for CERCLA, RCRA, and UST sites, of cleanup levels which differ from the standards set forth in the Tables, therefore, those tables do not provide a chemical specific numerical standard for CERCLA actions. Nevertheless, chemical specific cleanup levels should be derived using the site specific exemption language and the procedure provided by the CBSGs to set protective levels for cleanup.

Response

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirement (ARAR) criteria under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). After extensive discussion with all the parties, the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health. In most cases, the treatment goals for the offpost and boundary containment systems are more protective than the drinking water standards.

CERCLA expressly provides that state standards can be ARARs at a site. However, only those standards that are more stringent than federal requirements may be considered. In addition, the state standards must be promulgated (i.e., the requirement must be of general applicability and legally enforceable). Finally, the requirements must be identified in a timely manner by the

particular state (40 Code of Federal Regulations [CFR] Section 300.400[g][4]).

Regulations promulgated pursuant to the Colorado Water Quality Control Act, Colorado Revised Statutes (CRS) Sections 25-8-101, et seq., establish standards for groundwater (5 Code of Colorado Regulations [CCR] 1002-8, Section 3.11.0). A key aspect of the regulation is that Tables 1 through 4 standards are not automatically applicable to groundwater (Section 3.11.7[A]), but apply only if the aquifer has been classified in accordance with Section 3.11.4.

Most aquifers in the state are unclassified. Consequently, the Water Quality Control Commission (Commission) promulgated the interim narrative standard (Section 3.12.5) for five specified aquifer systems to avoid degradation of water quality prior to aquifer classification. Each of the five identified aquifers must meet the standards in Tables 1 through 4 or the ambient quality as of October 30, l99l, if it was less restrictive, until the aquifers are classified and numerical standards are adopted.

The Commission promulgated a second group of groundwater standards that are applied differently than the standards in Tables 1 through 4. These statewide standards (Section 3.11.5[C]) include water quality standards for radioactive materials and interim standards for organic pollutants (Table A), including chloroform. Table A standards differ from the standards in Tables 1 through 4 in an important way: Table A standards are automatically applicable to all state groundwater (Section 3.11.7[A]). The Commission recognized that the automatic application of Table A standards can lead to unnecessarily overprotective and technically impracticable results at contaminated sites and added exceptions to the regulation for remediation activities at CERCLA sites, Resource Conservation and Recovery Act (RCRA) sites, and underground storage tank (UST) sites. The CERCLA exception, Section 3.l1.5(C)(5)(a), states the following:

> Nothing in this regulation shall be interpreted to preclude ... [a]n agency responsible for implementation of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, et seq., as amended, from selecting a remedial action and a point of compliance that are more or less stringent than would be achieved by compliance with the statewide numerical standards established in this subsection, or alternative site specific standards adopted by the Commission, when a determination is made that such a variation is authorized pursuant to the applicable provisions of CERCLA.

Sections 3.11.5(C)(5)(b) and (c) provide similar exceptions for corrective actions under RCRA Subtitle C (hazardous waste treatment, storage, and disposal facilities) and Subtitle I (UST sites), respectively.

Section 3.11.5(C)(5) is internally consistent only if the Commission intended not to impose the interim organic standards in Table A as cleanup standards. According to the regulations, the interim organic standards automatically apply on a statewide basis, except at CERCLA, RCRA, and UST sites where "certain federal regulatory determinations regarding groundwater quality would not be superseded by the Commission's standards" (Section 3.11.10[B]). In promulgating the Table A exceptions, the Commission recognized that implementing agencies are more familiar with site-specific conditions and are in a better position to determine the appropriate cleanup standards. By not imposing unnecessarily stringent application of the Table A standards, the Commission sought to show "explicit deference to certain federal regulatory programs, which may apply different standards" (Section 3.11.10[H]).

The Army concludes that the CBSG interim organic standards are not ARARs for several reasons. The CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA that are more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applica-

ble and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable, when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

Comment No. 4 - Institutional Controls

Use of Institutional Controls presently exists in the Offpost in the form of permitting and development laws, etc. This concept is not limited to deed restrictions or prohibitions on use of property. The Proposed Plan could have acknowledged that Institutional Controls will be considered; however, the ROD should select them, as necessary, to ensure protection of human health and the environment. They can be refined in the design and remedial activity phases, or anytime on data review, via an appropriate process (e.g., a ROD Amendment or Explanation of Significant Difference (ESD)).

Response

Institutional controls have been included as a component of the selected remedy in the Offpost ROD.

Comment No. 5 - Contamination in the Deeper Aquifer

The Abandoned Well Closure IRA was expanded to address offpost wells, and such activities must be required in the Offpost ROD. The parties need to discuss the criteria that will be used to trigger such activities.

However, the Army's draft response to the State's concern does not specifically address the issue. Given that some twenty wells are currently identified and information exists on them, a more detailed response should be given. The Army acknowledges its current well closure plan but does not describe it; therefore, there is no information on closure to apply to the specific conditions of the wells. Since such information exists, it should be provided in that response.

Response

Well closure activities have been included as a component of the selected remedy. Appendix C of the ROD provides the criteria for closure of abandoned wells.

Comment No. 6 - Flexible Implementation of the Remedy

EPA's final concern is to ensure expeditious implementation of the flexibility for change in the Army's preferred alternative, in light of recent information received indicating that DIMP exists above health based levels north of (i.e. beyond) the Offpost IRA Intercept and Treatment System for the ground water plumes. Discussions have begun on the first step, which is to obtain additional sampling data to better characterize the area beyond the current intercept location. EPA expects that, to the maximum extent possible, such information will be used to evaluate potential modification of the current system, prior to the Offpost ROD. EPA, at this time, concurs with the Army's preferred remedy (pending evaluation of State and public concerns), due to its inherent flexibility. If information cannot be timely developed before the ROD, the option will still be available to later select and implement change, via an appropriate process (e.g., ROD amendment or ESD). The parties need to discuss this matter further.

Response

In the area north of the Offpost Groundwater Intercept and Treatment System, the Army intends to replace three groundwater monitoring wells and install three new groundwater monitoring wells. The Army has provided this information to the Organizations and State in a letter report with accompanying map showing proposed monitoring well locations. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells will be used to further define the extent of contamination greater than the remediation goals in this area and to evaluate whether modifications to the Offpost Groundwater

Intercept and Treatment System are necessary.

Comment No. 7 - Exposure Pathway of Dermal Contact with Ground water

On page 5, Column 1, of the Proposed Plan, when discussing Exposure Pathways, the word "Ground water" was omitted from the first bullet of the "Dermal" section. The omission of the word ground water is not consistent with the Dispute Resolution Agreements of May 5, 1992, which exclude only Zones 3 & 4 from using ground water for domestic purposes.

Response

The omission of "groundwater" was inadvertent. Dermal contact with groundwater was evaluated in the Endangerment Assessment.

Appendix A-5
U.S. DEPARTMENT OF THE ARMY
RESPONSES TO TRI-COUNTY HEALTH DEPARTMENT COMMENTS
REGARDING THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

Comment 1 - Preferred Alternative

We concur that Alternative N-4, Offpost Intercept and Treatment Systems, presents an appropriate treatment system to reduce shallow alluvial unconfined aquifer contamination. Since much of the excess risk in the offpost area is from the groundwater, limiting this exposure pathway is of primary importance. Along with the operation of this system an aggressive tap and monitoring well surveillance program should be maintained to evaluate success of this treatment system and to identify any other areas of concern.

Enhancement of N-4, such as is proposed in N-5 to provide more aggressive treatment within the same cost parameters should be evaluated with implementation reconsidered, if determined to be feasible and effective. We are concerned, however that more aggressive treatment within the same cost parameters should be evaluated with implementation reconsidered, if determined to be feasible and effective. We are concerned, however that more aggressive treatment may after the groundwater flow such that it will be more difficult to predict the effectiveness of the remedy and the time required for completion. If such alternatives are reconsidered the Army should verify the reliability of the assumptions used in the model from which the cleanup time is calculated. Based on continued monitoring of domestic water supplies and assurance that exposure pathways for consumption of contaminated groundwater are not complete, the time required to implement the alternative becomes less critical particularly if it increases the complexity and uncertainty associated with implementation.

Tri-county also endorses the continued operation and expansion, as necessary, of the North Boundary, Northwest Boundary and the Irondale Groundwater intercept and treatment systems to prevent further offpost migration of the contaminated unconfined/alluvial groundwater.

Response 1

The Army agrees that an evaluation of the potential need to enhance Alternative N-4 is appropriate. Collection and evaluation of site-specific operational data during the initial phases of operation of the Offpost Groundwater Intercept and Treatment System will be the basis for assessing the need for design modifications. Continued operation of the three existing boundary containment systems is a part of the selected alternative. A tap water and groundwater monitoring program is included as a component of the preferred alternative.

Comment 2 - DIMP

We are concerned about the repeated detection of high concentrations of DIMP in the well identified as TCHD Well 1178B, downgradient of the proposed intercept system described in N-4. Although there is historical evidence of a high concentration of DIMP in this well, this anomaly has not been adequately explained. We are particularly interested in whether further characterization of the problem with that well will impact the anticipated effectiveness of Alternative N-4 and what additional action will be taken to remediate the shallow alluvial unconfined aquifer in that area.

The Offpost Groundwater Intercept and Treatment System is located in areas of highest contaminant concentrations. The Army is aware that concentrations of diisopropyl methylphosphonate (DIMP) greater than 600 parts per billion (ppb) have been reported north of the Offpost Intercept and Treatment System. In that regard, the offpost remedial action groundwater monitoring program will be coordinated with the three existing groundwater monitoring programs active in the Offpost Study Area. These three programs are (1) the Groundwater Monitoring Program, (2) the Interim Response Action A Monitoring Program, and (3) the private well monitoring program. Additionally, in the area north of the Offpost Groundwater Intercept and Treatment System where DIMP has been reported to exceed 600 ppb, three monitoring wells will be replaced and three new monitoring wells will be installed. Replacement wells are being installed for wells originally in the monitoring network that were found to be damaged or destroyed. Two new monitoring wells will be installed downgradient of the First Creek Pathway and one new

monitoring well will be installed downgradient of the Northern Pathway. The Army has provided information regarding the additional monitoring wells to the Organizations, State, and Tri-County Health Department in a letter report and accompanying map showing the locations of the proposed monitoring well locations. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells will be used to further define the extent of contamination greater than the remediation goals in this area and assist in determining whether modifications to the Offpost Groundwater Intercept and Treatment System are necessary.

Comment 3 - Risk Levels Used To Initiate Cleanup

We are aware of some discussion concerning the risk level that should initiate the need for cleanup action. If 1 x 10-4 were used to trigger cleanup what additional offpost areas would require attention? It is our opinion that the National Contingency Plan guidelines should be followed. We also understand that there may be different interpretations of NCP guidance. The overriding issue to Tri-County is what is the likelihood of guidance. The overriding issue to Tri-county is what is the likelihood of exposure to Arsenal contaminants and the risk associated with that exposure. Based on our analysis of the available information we see no need, at this time, to consider a change in the proposed plan based on the risk level trigger utilized. We would request further discussion concerning this issue which may result in additional comment.

Response 3

The Army has closely followed U.S. Environmental Protection Agency (EPA) guidance and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to in individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range. The Army's goal, through operation of the Offpost Groundwater Intercept and Treatment System, is to further reduce offpost risk toward the 10-6 level.

The Offpost Study Area risk assessment showed that, even without remedial action, the baseline cumulative risks from contamination in surface water, soil, sediment, air, and groundwater are within the acceptable risk range established by the EPA. However, several site-specific factors suggest that remedial alternatives for groundwater should be considered. These site-specific factors consider (1) that groundwater contributes approximately 73 percent of the total baseline risk, (2) maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) are exceeded for some groundwater contaminants, and (3) hazard indices (HIs) for children slightly exceed 1.0 in zones 2, 3, and 4. Through operation of the Offpost Groundwater Intercept and Treatment System and attainment of the cleanup standards specified in the Record of Decision (ROD), the Army intends to further reduce risks toward the 10-6 level.

Comment 4 - Inter-aquifer Migration

To prevent contamination of the Arapahoe aquifer from the migration of shallow groundwater containing Arsenal contaminants and to assure the long term quality and safety of the Arapahoe aquifer as a drinking water source we urge the Army to close/seal all wells that penetrate more than one aquifer and are poorly constructed or otherwise damaged or abandoned. This action should be taken in accordance with Rule 11 -Abandonment Standard of the State of Colorado, Office of the Engineer. A list of the known wells that present a threat, as described, is available as a result of our ongoing Offpost Private Well Inventory. The prevention of interaquifer migration should be identified as a high priority by the Army in order to avoid degradation of the Arapahoe aquifer.

Response 4

Well closure has been added as a component of the selected remedy. Appendix C of the ROD describes criteria for well closure. Table C.1 in Appendix C presents the wells identified by

the Colorado Department of Health (CDH) and the Tri-County Health Department (TCHD) as candidate wells for closure. The Army will review the information available for the candidate wells for closure and present recommendations for closure to CDH, TCHD, and EPA. Several of these wells have been identified as no longer in use. As noted in the comment, Rule 11.1.1 of the Abandonment Standards states that it is the responsibility of the well owner to plug and abandon unused wells properly.

Comment 5 - Control of New Well Construction

We recommend the use of institutional controls to prevent the construction of wells allowing use of the unconfined alluvial groundwater that may contain Arsenal contaminants. It is our understanding that the State Engineer's office is responsible for issuing well permits and has, to date, not established a policy preventing, or at least controlling, the construction of new wells in the offpost area. The Army, EPA, the Colorado Department of Health and Tri-County Health Department should meet with the State Engineer and insist that action be taken to assure that future exposure to Arsenal contaminants cannot take place through consumption of water from new wells that are constructed.

Further, those agencies should work with the State Engineer to assure adequate oversight of the construction of all new water wells in the offpost areas to control the potential for future aquifer contamination.

Response 5

Institutional controls have been added as a component of the selected remedy. Appendix B of the ROD provides an evaluation of the institutional controls available and their applicability. These controls include prohibitions on well construction in areas where groundwater contaminant concentrations exceed cleanup standards and potential well bans in larger areas.

Comment 6

The Army should commit to review of the Proposed Plan in view of future changes in zoning and land use that are proposed for offpost areas 3 and 4. The Army should work with Adams County and/or Commerce City to ensure that any proposed change in land use designation for the offpost areas 3 and 4 will require consideration, with opportunity for public input, of the potential for an increase or decrease in risk to health associated with exposure to Arsenal contaminants. Further clean-up may then be required based on the risk that is calculated and the land use designation proposed. Changes by County or City in land use designation should not result in increased risk to the public. Although all feasible land uses should be considered in the Endangerment Assessment it is Tri-county's opinion that the remedy should also be based on a realistic scenario with a clear commitment to re-evaluate, as necessary, not one that is unduly speculative.

Response 6

The Army is committed to working with Adams County and/or Commerce City to assure that human health is protected in the event that offpost zoning and/or land use changes in the future. The land use scenarios studied in the final Offpost Endangerment Assessment are extremely conservative and provide protectiveness for a range of future land uses. Given the probability of the realignment and widening of 96th Avenue, future development along 96th Avenue will likely be commercial/industrial or urban residential. Based on local agency planning documents the Army has selected an urban residential land use for the risk evaluation as this would result in more conservative (e.g., higher) estimated risks than the likely commercial/industrial land use. In addition, the institutional controls described in Appendix B of the ROD provide additional protection of the public in the event of future land use changes.

Comment 7 - Colorado Standards As ARAR's

We request that the Army provide an explanation of what Colorado standards were not designated as ARAR's and why. Based on this response we may have further questions or comments on the subject of ARAR's.

Response 7

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirement (ARAR) criteria under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP. After extensive discussion with the Organizations and State the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health. In most cases, the treatment goals for the offpost and boundary treatment systems exceed the drinking water standards.

CERCLA expressly provides that state standards can be ARARs at a site. However, only those standards that are more stringent than federal requirements may be considered. In addition, the state standards must be promulgated (i.e., the requirement must be of general applicability and legally enforceable). Finally, the requirements must be identified in a timely manner by the particular state (40 Code of Federal Regulations [CFR] Section 300.400[g][4)).

The Army concludes that the CBSG interim organic standards are not ARARs for two reasons. First, the CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA and allows the selection of a remedy that is more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

For additional discussion, see response to State comment No. 4 in Appendix A-3 of the ROD.

Comment 8 - Soil Contamination In Zones 3 and 4

There was a wide range of results from surficial soil sampling for pesticides in Zones 3 & 4. The risk for each area was calculated based on an average of all samples in that area. We are concerned that the risk for selected areas, in which the highest concentrations of dieldrin were found, may be understated through the averaging process. Has the Army evaluated what risk is associated with each "hot spot?" What is the potential for completing the pathway for exposure of current or future residents or others to that increased risk? We are concerned that there has not been adequate characterization of the risk in those Zones, both of the concentration and source of dieldrin contamination.

Response 8

The Army used a large amount of onpost and offpost surface soil data to interpret Rocky Mountain Arsenal (RMA)-related soil contamination. The combination of onpost and offpost data demonstrates that detected concentrations of contaminants offpost are attributable to windblown transport from RMA and to offpost activities, including agricultural application of pesticides. Localized areas of high dieldrin concentrations are unlikely to result from windblown contaminants. Windblown contamination would more likely result in a uniform deposition.

Because of the extensive agricultural activities that have occurred in areas north and east of the RMA boundaries and the application of registered pesticides that are a consequence of agricultural activities, it is not unusual to find dieldrin residues in soil. Examination of organochlorine pesticide data obtained from onpost surface soil samples does not support RMA as being the source for organochlorine pesticide transport east of RMA. In addition, five samples collected east of RMA have dieldrin concentrations ranging from nondetectable to approximately 25 ppb. On this basis, it is the Army's position that the dieldrin detected at 99 ppb east of

RMA is not related to onsite activities. This value is at the lower end of EPA's acceptable risk range as specified in the NCP. Therefore, the incorporation of this single value would not have affected the final results of the risk assessment.

Comment 9 - Public Water Supply

Arsenal contaminants, regardless of concentration, have impacted the quality of alluvial ground water, in the offpost area, which is used for domestic purposes. There are also other potential sources of such contamination within the same aquifer for which the Army is not responsible. Whereas there may not be a violation of existing drinking water standards or health advisories and, therefore, no imminent public health hazard, the Army should work with other agencies, residents and elected officials that are considering alternative strategies to secure a higher quality and possibly safer domestic water supply for residents in the area.

Response 9

The Army has committed, as part of the Preferred Alternative, that anyone who is drinking water with Arsenal related contaminants above applicable, relevant, and appropriate drinking water standards will be provided an alternative water supply. At this time, the Army is not planning to provide a public water supply to residents offpost and cannot unless drinking water standards are being exceeded over a large area.

Office of the Program Manager

Mr. Chris Wiant, M.A., M.P.H.
Director of Environmental Health Services
Tri-County Health Department
4301 East 72nd Avenue
Commerce City, Colorado 80022-1488

Dear Mr. Wiant:

Enclosed are responses to your comments on the Offpost Proposed Plan for the Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope these responses increase your understanding of the offpost cleanup.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop

Colonel, U.S. Army
Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 1ll, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO CITY OF COMMERCE CITY COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

The City of Commerce City (City) submitted comments dated June 21, 1993, on the Offpost Proposed Plan. Attached to the City's comments were two sets of comments from the State of Colorado: The first set of comments was a copy of the State of Colorado's draft formal comments dated May 4, 1993. The State's comments were later submitted, in a slightly reorganized format but essentially verbatim from the draft, as official comments on June 21, 1993. The Army's responses to the State's official comments are provided in Appendix A-3. The second set of State comments attached to the City's comments is identical to the State's comments on the Proposed Plan dated February 19, 1993. The Army's responses to the State's February 19, 1993, comments are provided in Appendix A-1.

The City expressed agreement with the State's comments and offered additional comments on particular issues. The Army's responses are provided below.

Comment 1 - Applicable, Relevant and Appropriate Requirements

(ARARS) CERCLA Section 121 (d)(2)(A) (ii) which specifically states, "Any promulgated standard, requirement criteria or limitation under a State environmental or facility siting law that is more stringent than Federal standard, requirement, criteria or limitation, including each such State standard, requirement, criteria or limitation contained in a program approved, authorized or delegated by the Administration under a statute cited in sub-paragraph (A), and that has been identified to the president by the State in a timely manner..." is an 'Applicable, Relevant and Appropriate Requirement,' i.e., (ARAR).

It's believed that this section clearly demonstrates that Congress intended for the states to be proactive participants in CERCLA actions and allows for stricter state environmental control standards. The city holds that the Army and the U.S. Environmental Protection Agency (EPA) have failed to demonstrate any formal evidences to waive the applicability of the Colorado Basic Standards for Ground Water or the Methodologies of Surface Waters, as is required under Section 121(d)(4) of CERCLA. Furthermore, one of the Army's arguments to dismiss these as ARARs centers on the State purportedly failing to consistently apply these standards. Now where can one discern any examples offered by the Army or the EPA to substantiate this conclusion. The City finds it paradoxical that the Army would recognize some of these stricter State requirements as ARARs for the remediation of uninhabited Arsenal land and deny their applicability for residential and commercially inhabited off-post areas. Ironically, if the State allows the presently planned remediation to proceed, it would establish the very precedent the Army is attempting to use in foregoing these State standards.

Response 1 - Applicable, Relevant and Appropriate Requirements

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirement (ARAR) criteria under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). After extensive discussion with all the parties, the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health.

In most cases, the treatment goals for the offpost and boundary treatment systems exceed the drinking water standards.

The Army concludes that the CBSG interim organic standards are not ARARs for two reasons. First, the CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA and allows for a remedy that is more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and Underground Storage Tank sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.
For additional discussion, see response to State comment No. 4 in Appendix A-3 of the ROD.

Comment 2 - Risk Assessment

It perceives the risk assessment as inadequate and not in compliance with the spirit and the intent of the National Contingency Plan (NCP). It is clear that the Army's Risk Assessment is lacking in the following required assessment parameters.

a. Thorough understanding of all possible hazardous constituents (especially DIMP & IMPA) their basic toxicology, routes of exposure, synergistic and antagonistic effects.

b. Thorough delineation of both the vertical and horizontal migration of the contaminants.

c. Failure to address the levels and effects the contaminants would have on receptors who are predisposed to health problems.

d. Failure to adequately address why the Army departed from the NCP's acceptable basic cancer risk level of one in a million.

Response 2a - Risk Assessment - DIMP and IMPA

The U.S. Environmental Protection Agency (EPA) developed the Health Advisory for diisopropyl methylphosphonate (DIMP) in 1989 on the basis of an extensive review of more than 30 existing toxicology studies involving a variety of animal species. EPA's Office of Drinking Water re-reviewed the Health Advisory, in light of the State's concern, and concluded on March 28, 1990, that "the existing Health Advisory values and the basis for the values represent the best scientific position for the protection of human health." On the basis of toxicity information summarized in EPA's isopropyl methylphosphonic acid (IMPA) Health Advisory and the Integrated Risk Information System database, there is no information to indicate that IMPA concentrations lower than 700 ppb may pose a threat to human health.

In accordance with EPA's Risk Assessment Guidance for Superfund (RAGS), the Army used EPA's Health Advisory and information contained in the IRIS database to evaluate risk to human health.

For additional discussion of DIMP and IMPA, see response to State comment Nos. 2d and 2h in Appendix A-3 of the ROD.

Response 2b - Risk Assessment - Vertical and Horizontal Extent of Contamination

The Army believes that it has adequately defined the vertical and horizontal extent of contamination in a manner sufficient to allow definition of those areas requiring remediation. However, additional monitoring wells are being installed to enhance the assessment of the locations and concentrations of contaminants in the Offpost Study Area. The performance of the Offpost Groundwater Intercept and Treatment System will be evaluated based on the results of the monitoring program and the system will be modified, if necessary.

Response 2c - Risk Assessment - Individuals Predisposed to Health Problems

The purpose of the baseline risk assessment is to provide estimated risks on the basis of exposures to a normal population. Many of the safety factors built into the assessment of noncarcinogenic and carcinogenic risks are intended to result in the protection of sensitive

individuals. While individuals may have specific sensitivities, an assessment of these individuals, as well as the particular type of sensitivity or predisposition, is beyond the scope of CERCLA and NCP requirements for a baseline risk assessment.

Response 2d - Risk Assessment - Departure from one in a million risk level

The Army has closely followed EPA guidance and the NCP regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states

> The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 Federal Register 8718).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risks toward the 10-6 level.

Comment 3 - Point of Compliance

The NCP is clear on the issue of ensuring that all points of exposure to a contaminant be addressed in the risk assessment and any resulting remediation. Essentially, this alternative creates a no-man's land that is unavailable for development and/or other uses.

Response 3 - Point of Compliance

The results of the risk assessment do not preclude development or other land uses. The Army intends to achieve the remediation goals at all points within the contaminated plume, consistent with the NCP. The groundwater modeling conducted by the Army in support of the remedial alternatives evaluation in the Offpost Endangerment Assessment/Feasibility Study (EA/FS) report used attainment of remediation goals as a primary criterion in assessing time to cleanup for the various remedial alternatives. This information is presented in summary form in the Proposed Plan and Volume VI, Section 3.2 of the EA/FS and in detail in Volume VII, Appendix E of the EA/FS. The area of concern to the State appears to be the portion of the plume that lies between the North Boundary Containment System (NBCS) and the Offpost Groundwater Intercept and Treatment System. The NBCS has been demonstrated to be effective in reducing the contaminant concentrations at the RMA boundary to meet remediation goals. The purpose of the Offpost Groundwater Intercept and Treatment System is to extract and treat that portion of the plume that had migrated past the RMA boundary (prior to installation of the North Boundary System) and contains contaminants exceeding the remediation goals. The groundwater monitoring program implemented as part of the selected remedy will provide the data necessary to evaluate attainment of treatment goals within the plume and provide data necessary for assessment of modifications to the treatment system, if necessary.

Comment 4 - Land Use

a. Classification of Land Use

The assessment process fails to use proper and correct demographics, zoning and land use data. The City is of the opinion that the Army failed to consider that the City has and is currently in the process of annexing properties to the north and west of the Arsenal. It appears that the current remediation plan was based solely upon land use information provided by Adams county, and thereby neglects the future land use plans of Commerce City.

b. Institutional Controls

The use of institutional controls are only useful temporary procedures and by themselves offer a loop hole to responsible parties to negate CERCLA's main purpose: the thorough restoration of contaminated environments. The Army should seek whatever institutional controls are necessary to prevent any possible adverse health effects to residents and businesses in the affected area. The City also believes that it is the responsibility of the Army to provide water taps as emergency institutional controls to negate any possible adverse health effects to the areas citizens during remediation of the ground water.

Response 4a - Classification of Land Use

The future land use scenarios used by the Army in the risk assessment are highly conservative. For example, the rural residential scenario used in zones 1, 2, and 6 includes all pathways contributing substantially to potential risk, even though most of the total population is not exposed to the agricultural exposure pathways described in the risk assessment. Shell Oil Company purchased the land in zones 3 and 4 for Army use in constructing the Offpost Groundwater Intercept and Treatment System. It is not presently occupied; therefore, the current zoning designation as rural residential is not applicable. Given the probability of the realignment and widening of 96th Avenue, future development along 96th Avenue will likely be commercial/ industrial or urban residential. Based on local agency planning documents, the Army selected an urban residential land use for the risk evaluation as this would result in more conservative (e.g., higher) estimated risks than the likely commercial/industrial land use.

The Army did not neglect land use plans of Commerce City. Section 2.2.2, Volume II, of the Endangerment Assessment (EA) discusses the master plans, zoning, and planning documents from Commerce City that were utilized. Figure 2.2.2.1.2-2 of the EA presents those areas immediately north and west of RMA that have been zoned by Commerce City.

For additional discussion, see response to State comment No. 3a in Appendix A-3 of the ROD.

Response 4b - Institutional Controls

Institutional controls have been added as a component of the selected remedy. Appendix B of the ROD provides an evaluation of the institutional controls available and their applicability.

Comment 1 and 2 - DIMP and IMPA Contamination in GroundWater.

This appears to be another instance where the Army and EPA are ignoring CERCLA's Section 121(d)2(A) mandating the use of State environmental standards and/or criteria as legal ARARs. Both the Army and the EPA have failed to produce any convincing scientific evidence to make use of the waiver from these under Section 121(d)(4). While the Army, EPA and the State Health Department disagree over what levels of these substances may be safe, the City is of the opinion that additional toxicological information is needed before proceeding with any remediation choice. Therefore, the City feels it is incumbent upon the Army to provide funding for an independent toxicological study to ascertain the actual hazards of these two substances.

Response 1 and 2 - DIMP and IMPA Contamination in Groundwater

See response to State comment Nos. 2d and 2h in Appendix A-3 of the ROD.

In accordance with EPA guidance on conducting risk assessments, the Army has used the EPA's Health Advisory levels for both DIMP and IMPA. The Army believes that the State has not provided sufficient or scientifically defensible evidence that the EPA's Health Advisory levels are not sufficiently protective of human health. The EPA and the Army believe that there is sufficient toxicological information available to support the Health Advisory levels. The Army is currently evaluating the applicability of the 8 parts per billion level for DIMP that the Water Quality Control Commission may promulgate in a few months.

The Offpost Groundwater Intercept and Treatment System is located in areas of highest contaminant concentrations. The Army is aware that concentrations of DIMP greater than 600 parts per billion (ppb) have been reported north of the Offpost Groundwater Intercept and Treatment System. In that regard, the offpost remedial action groundwater monitoring program will be coordinated with the three existing groundwater monitoring programs active in the Offpost Study Area. These three programs are (1) the Groundwater Monitoring Program, (2) the Offpost

Groundwater Intercept and Treatment System monitoring program, and (3) the private well monitoring program. Additionally, in the area north of the Intercept and Treatment System where DIMP has been reported to exceed 600 ppb, three monitoring wells will be replaced and three new monitoring wells will be installed. Replacement wells are being installed for three wells originally in the monitoring network that were found to be damaged or destroyed. Two new monitoring wells will be installed downgradient of the First Creek Pathway, and one new monitoring well will be installed downgradient of the northern Pathway. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells will be used to further define the extent of contamination greater than the remediation goals in this area and assist in determining whether modifications to the design of the Offpost Groundwater Intercept and Treatment System are necessary.

Comment 3 - More Aggressive Treatment of Groundwater

If the final remediation includes a "pump and Treat System." At the present, the City holds that the selection of the current preferred remediation plan was based upon inconclusive scientific studies and unfounded assumptions. In view of these inadequacies, and the lack of local public support, it is hoped that the Army and EPA will re-examine its reasons for selecting this alternative, with a focus on a more realistic remediation time frame.

Although the City has no problem with the pump and treat technology for some remediation objectives, it is now of the opinion that the Army and EPA appear determined to foist what was once originally intended to be an interim remedial measure as a permanent solution. Although the City supported the interim use of the proposed alternative action, it did so with the understanding that it was an auxiliary plan to prevent future migration of the contaminants. Now that it appears that the Army is relying upon this supposed interim action as a permanent solution, the City must now question the wisdom of commenting favorably upon this as well as other interim Arsenal actions.

Response 3 - More Agaressive Treatment of Groundwater

The Army selected Alternative N-4 instead of Alternative N-5 primarily because Alternative N-4 includes potential future modifications, only if such modifications are found to be necessary based on actual operating data, to the Offpost Groundwater Intercept and Treatment System. Selection of Alternative N-5 instead of Alternative N-4 will not necessarily provide a more cost effective alternative because of a slightly shorter estimated remediation timeframe. The Army based its assessment of the relative differences between the groundwater alternatives and estimates of remediation timeframes on groundwater models that are very general in nature; thus, the estimated remediation timeframes should not be construed as precise predictions. Use of actual full-scale operating data is preferable to selecting additional components for the Offpost
Groundwater Intercept and Treatment System using the more speculative modeling data (i.e., Alternative N-5). The Offpost Proposed Plan culminates approximately 10 years of study. The Army believes that the alternative chosen combines exceptional protection of human health and the environment with the common sense approach of improving the groundwater systems if post-ROD monitoring results determine it necessary.

For additional discussion, see response to State comment No. 2a in Appendix A-3 of the ROD.

Comment 8 - Human Health Risk characterization 9 - Ecological Risk Characterization, 10 - Hot Spots in Soils, and 11 - Contamination of Barr Lake

Because of the lack of toxicological and assessment sampling data, it appears that the Army (with the approval of the EPA) has selected a premature remedial action plan that fails to sufficiently address all contaminated environs. Further, there is still the unresolved question of what particular ARARs apply. It's hoped that the Army and EPA broaden the scope of the remediation study to cover all the off-post contamination areas and contaminates.

Response 8 - Human Health Risk Characterization

The Army considered all of the exposure pathways listed by the State and, on the basis of EPA guidance presented in Risk Assessment Guidance for Superfund (RAGS), the pathways were

eliminated from further evaluation in the risk assessment. The Army presented the human health risk assessment pathways to EPA, the U.S. Fish and Wildlife Service (USFWS), Shefl Oil Company, and the State for discussion. After identifying all potential complete exposure pathways, the Army followed EPA guidance in RAGS (page 6-16) to select those pathways to be evaluated further in the exposure assessment. Guidance allows for the elimination of some complete pathways if there is sound justification, such as:

1. The exposure resulting from the pathway is much less than that from another pathway involving the same medium at the same exposure point.

2. The potential magnitude of the exposure from the pathway is low.

3. The probability of the exposure occurring is very low, and the risks associated with the occurrence are not high.

For additional discussion, see response to State comment No. 8 in Appendix A-1 of the ROD.

Response 9 - Ecological Risk Assessment

The State has not presented any evidence to support its contention that assumptions made for the ecological risk assessment (RA) will result in levels of contamination remaining in the Offpost Study Area that may not be protective of biota. The Army presented the ecological RA assumptions and approaches to the USFWS, EPA, Shell Oil Company, and the State at meetings throughout the ecological RA study period. The Army considered these meetings and subsequent feedback critical because of the lack of formalized EPA guidance on conducting a dose-based ecological assessment. The Army believes that the findings of the ecological RA are protective of wildlife because many aspects of the approaches used to estimate potential effects are more conservative than other hazard assessment methodologies currently followed by EPA and other agencies. Because the approaches to conducting an ecological RA are continually being developed, the assumptions and parameters used by the Army for the final ecological RA were thoroughly discussed with the parties and modified throughout the ecological RA process, and the best available methodology and professional judgement were used. The USFWS participated in the ecological RA process and supported the final methodologies used to evaluate the potential ecological hazards.

Response 10 - Hot Spots in Soil

Background sampling indicated that pesticides are present throughout the Offpost Study Area. Agricultural application of pesticides is a contributing source. Agricultural application of a registered pesticide is exempt from CERCLA. However, the risk associated with the dieldrin concentrations in these hot spots do not exceed a lifetime caner risk of 5 x 10-6, which is at the lower end of the acceptable risk range defined by the U.S. Environmental Protection Agency (EPA). Therefore, specific cleanup of these soil areas is not required. Cleanup of offpost groundwater will provide the greatest benefit of risk reduction.

Response 11 - Contamination of Barr Lake

Remediation of offpost groundwater well reduce contaminant concentrations on First Creek. Surface-water monitoring will continue as part of the offpost monitoring program. A surface-water monitoring program has been included as a component of the selected remedy. An offpost implementation document will be prepared following the approval of the Record of Decision, which will include a monitoring program for surface water and groundwater.

Comment 12 - Closing Poorly Constructed Domestic Wells

The City strongly agrees with the State on this issue. It is incumbent upon the Army to stop the migration of the contaminants to the deeper Arapahoe Formation aquifer, and at the same time provide fresh water to affected area residents and businesses. CERCLA and the NCP both emphasize the importance of preventing the spread of contamination during emergency and long-term removal and remediation actions. Given the lack of thorough understanding of al possible contamination, routes of exposure, toxicological effects, and ARA applicability, the Army should take the prudent move to close these wells regardless of what particular remediation plan is instituted.

Response 12 - Closing of Poorly Constructed Domestic Wells

The Army has incorporated well closure as a component of the selected remedy. The criteria for well closure are presented in Appendix C of the Record of Decision.

Office of the Program Manager

Mr. Steven S. Crowell, Sr.
City Manager of Commerce City
5291 East 60th Avenue
P.O. Box 40
Commerce City, Colorado 80037

Dear Mr. Crowell:

Enclosed are responses to your comments on the Offpost Proposed Plan for the Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope these responses increase your understanding of the offpost cleanup.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop

Colonel, U.S. Army

Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

Appendix A-6

US. DEPARTMENT OF THE ARMY
RESPONSES TO THE FARMERS RESERVOIR AND IRRIGATION COMPANY
COMMENTS REGARDING THE ROCKY MOUNTAIN ARSENAL OFFPOST
PROPOSED PLAN
APRIL 20, 1993

GENERAL COMMENT

Comment No. 1

The companies divert water from First Creek on their decrees into either the Burlington-O'brian canal which continues to Barr Lake or to the "Little Burlington" canal which delivers water directly to the shareholder's lands without entering Barr Lake.

The offpost study area delineated in the Citizen's Summary refers only to consideration of the surface waters of Barr Lake and the Burlington-O'Brian canal. It does not appear as if the area served directly by the Little Burlington canal as been specifically identified as a study area.

During the irrigation season, First Creek is diverted into the Little Burlington Canal. In relation to the amount of water diverted through the main Burlington Canal, flows in the Little Burlington canal are very small. The amount of dilution of First Creek flows in the Little Burlington Canal is quite small. At times, the only flow in the canal will be First Creek water--undiluted by any other flows. The Little Burlington canal provides irrigation water for a significant amount (approximately 10,000 total acres) of vegetables and other crops in the Burlington area.

It does not appear whether this direct and undiluted use of First Creek water for vegetable irrigation has been adequately considered. From the exposure zone mapping and exposure pathway analysis presented, in the plan synopsis, it does not appear that interception and transport by the Little Burlington canal system has been adequately assessed.

Response

Although Little Burlington Canal was not specifically evaluated for the Endangerment Assessment/Feasibility Study (EA/FS), the U.S. Department of the Army (Army) believes that all potential impacts that may result from the direct and undiluted use of First Creek water in Little Burlington Canal, especially for irrigation purposes, are addressed by the EA. Generally, the concentrations of constituents detected in First Creek surface water are lower than the concentrations detected in groundwater. (Arsenic is an exception; however, the arsenic levels may be attributed to naturally occurring sources.) Also, samples taken from the Little Burlington Canal indicate that RMA contaminants, when detected, are at lower concentrations than those found in First Creek. Therefore, the potential risks resulting from use of surface water are less than the potential risks resulting from use of groundwater. The EA quantitatively evaluated the uptake of constituents by vegetables irrigated with groundwater and/or surface water. For study zones 1A, 1C, and 6, the EA assumed irrigation water was primarily surface water (more than 92 percent). For zones 1B, 2, 3, 4, and 5, the EA assumed shallow groundwater provided more than 90 percent of the irrigation water. On the basis of the irrigation/plant uptake modeling effort, the lowest estimated concentrations of constituents in vegetables occurred in the zones irrigated primarily with surface water. The plant uptake model and exposure equations used very conservative or cautious assumptions; therefore, it is highly unlikely that the potential plant concentrations and associated risks were underestimated. The Army believes, on the basis of the findings of the EA, that any Rocky Mountain Arsenal (RMA)-related constituents that may be transported to Little Burlington Canal via First Creek do not pose a health threat to humans and the environment.

Comment No. 2

Water from Barr Lake presently forms a portion of the physical municipal supply for the City of Brighton. Use of Barr Lake for potable municipal water purposes is anticipated to significantly increase in response to the new airport and related urbanization. The Barr Lake "plan" to integrate Barr Lake into a metropolitan water use system has gained recognition from the State

of Colorado as one of the primary municipal water supply plans which can provide for increasing demands into the next century.

Any discharge into First Creek or any groundwater which is otherwise intercepted by the Burlington ditch system must take into account the existing and proposed future domestic water uses.

It is not apparent whether the domestic water quality requirements have been adequately considered in the remediation plan.

Response

Based on existing monitoring data, the concentrations of constituents (RMA or from other sources) in Barr Lake are not statistically elevated above background. The low concentration of constituents indicates that any potential health risk from the surface water pathway would be very small compared to other possible pathways of exposure (e.g., domestic use of groundwater). EPA risk assessment guidance allows for the elimination of pathways of exposure for quantitative risk evaluation if the potential risks associated with the pathway are likely to be very small. Additionally, it is anticipated that any contribution of contaminants to First Creek and ultimately to Barr Lake from RMA-related sources will be decreased because of the operation of the groundwater intercept and treatment systems.

Comment No. 3

Reference is made to identification of various constituents in soils and groundwater. The offpost
study area identification referred only to surface waters in Barr Lake (in which some RMA substances were found). Sediment accumulation in the Burlington Canal and Barr Lake does not appear to have been sufficiently considered.

No quantification of the metals (arsenic and manganese) appears in the Citizen's Summary. The experience of the company in one of its other lakes (Standley lake) with regard to these metals may be applicable to Barr.

In Standley lake, seasonal variations in the dissolved oxygen levels of the lake has resulted in resolution of metals from the bottom sediments by a factor of more than 10 to 1. The impact of metals transported to the lake sediment may thus vary with time, season and eutrophic conditions.
no consideration of these conditions appears in the plan.

Response

Because of the historic input of constituents from other sources (e.g., Denver sewage effluent and agricultural runoff) into Barr Lake and ultimately into the lake sediment, it is nearly impossible to differentiate the percent contribution from RMA. Inorganic constituents, such as arsenic and manganese, complicate the issue further because these constituents also occur naturally; the levels found in Barr Lake may be unrelated to RMA activities.

The Army agrees that physical, chemical, and biological conditions present at any given moment may influence the distribution of metals in sediments and in surface water. However, the EA evaluated constituent concentrations on the basis of available sediment and surface-water analytical data and showed that the concentrations of constituents in Barr Lake were not signifi-
cantly elevated above background concentrations.

Comment No. 4

Various of the substances identified appear to be persistent or are bio-accumulated. There does not appear to have been any consideration of these issues as applied to the Barr Lake sediments in the offpost study plan.

Response

The concentrations of the persistent and bioaccumulative constituents found in the sediment of Barr Lake are below background concentrations. The EA evaluated the potential impact of constituents found in First Creek sediment (elevated above background) on human health and the environment. The findings of the EA indicated that even under this "worst case scenario" in First
Creek (as compared to the potential risk posed by lower level constituents in Barr Lake), the contribution from the sediment to overall risk was very small, even for ecological receptors.

Conclusion

These comments have been submitted to insure that the present and future uses of Barr Lake, the Burlington Canal and waters transported through the system have been adequately considered. Various of these uses do not appear to have been considered in the existing plan.

The companies do not have the technical or financial resources to adequately assess the past and future impact of contamination into and through the companies' systems.

The companies' irrigation system is the recipient of all First Creek flows, as well as groundwater migration to the creeks and the canals themselves. As such the companies believe that at a minimum an ongoing water and sediment monitoring program is required to adequately assess past contamination and the efficacy of the proposed remediation.

Until continued assessment of present conditions, taking into account all existing and proposed uses of the waters in the companies' system, has been undertaken delineation of the companies specific concerns cannot be made.

Response

The Army is committed to an ongoing surface-water and groundwater monitoring program to ensure that the preferred alternative continues to meet the remedial action goals and to ensure the protection of human health and the environment. The Army would be glad to discuss the monitoring program with the Farmers Reservoir and irrigation Company (FRICO) in the future.

Office of the Program Manager

Mr. Albert F. Sack
President
Farmers Reservoir and Irrigation Company
80 South 27th Avenue
Brighton, Colorado 80229-1220

Dear Mr. Sack:

Enclosed are responses to your comments on the Offpost Proposed Plan for the Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope these responses increase your understanding of the Offpost cleanup.

Also enclosed is information your group requested at a meeting held with the Army on May 18, 1993.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at 289-0201.

Sincerely,

Eugene H. Bishop

Colonel, U.S. Army

Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO SIERRA CLUB COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
RECEIVED JUNE 21, 1993

Comment A - Air quality:

1. Why wasn't air quality addressed more specifically? We are particularly concerned about: the reference to the widening of 96th Ave. which would increase traffic, air current flow from the location of the SQ1 on the Arsenal, and increased airport activity following the opening of the new airport. The only reference we have seen in the study to air is the inhalation of particulates from soil and dust.

2. Ref. Vol. 1, ES- 3: How can it be stated that air exposure to chemicals of concern does not contribute to human exposure to these chemicals? Even if the concentrations are very low, it is not accurate to say that exposure does not contribute even slightly to increasing the total doses of chemicals to which residents of the offpost area are exposed.

3. When considering total solid Particulates (TSP) in air, the Plan states that concentrations at the RMA boundaries are lower that those found in metro Denver's air, and that metals are proportional to the same. Again, we are concerned that the activation of the SQI and the possibility of the widening of the road along the northern border of RMA will increase the TSP above the levels in metro Denver.

Response A 1:

Air emissions from the submerged quench incinerator (SQI) have been addressed as part of the SQI risk assessment and were determined to be within federal and state health guidelines. Potential air emissions resulting from widening 96th Avenue will be addressed by the appropriate regulatory agencies when that construction activity occurs.

Response A2:

The Rocky Mountain Arsenal (RMA) Comprehensive Air Quality Data Assessment Report by R.L. Stollar and others, 1990, presented data that indicated air quality within the Offpost Operable Unit (OU) was not impacted by contaminants related to RMA. Additional information is presented in the "Nature and Extent" subsection of Volume I of the Final Offpost Endangerment Assessment/Feasibility Study report. The evaluation of exposure to dusts presented in Appendix B of the Endangerment Assessment (EA) indicates that the potential exposures through inhalation of chemicals in dust are much less than exposures that could be received through other routes. The Risk Assessment Guidance for Superfund allows for the elimination of a route of exposure if the contribution to exposure from that route is small compared to other routes.

Response A3:

See Response Al above.

Comment B - Chemicals of Concern:

1. We question the validity of 4 of the twelve background sites used in the study as being agricultural areas. Although these sites would have increased levels of pesticides present from crop applications, how does this site relate to what a residential area concentration of Dieldrin should be, for example? We feel that these sites may be biasing the background reference data to appear higher in chemical concentrations. than would normally be present without agricultural practices.

2. When analyzing the degradation charts for Dieldrin and Aldrin in zones 3 and 4, it is evident that these COC's will not be down to "background" levels within their

boundaries for 25 and 15 years respectively. We would like to see a moratorium on development in these zones for the amount of time it would take to achieve the background levels for these COC's.

3. Ref. Vol. 2053: It was stated here that the COC's are diluted 130:1 after O'Brian Canal. this would seem to indicate that the authors feel the "solution to pollution is dilution." We are supposed to be cleaning things up here, not dilution the problem. The COC's are still present in relative quantities, particularly in the sediments.

Response B1

Generally, the concentration of dieldrin would be lower in residential areas compared to agricul-
tural areas; however, it is impossible to make a definitive statement without knowing anything about the residential area and whether historical domestic applications of dieldrin occurred. The
soil samples collected from the background sites in the predominately agricultural area did not bias the pesticide reference data. Table 1.3.3-1 (Volume II, Section 1.0 of the EA) shows that soil samples collected within the designated locations where the highest concentrations of RMA-related chemicals occur, or are expected to occur, had pesticide detections that were significantly elevated above the background soil samples, except for isodrin. All of the pesticides were evaluated in the risk assessment, including isodrin. Additionally, the risk assessment estimated risk on the basis of total risk rather than incremental risk (i.e., the Army did not subtract background residue contributions from the computation of exposure concentrations).

Response B2

The estimated potential risks associated with the soil in zones 3 and 4 are presented in the Final Offpost EA report and are within the acceptable risk range as defined by U.S. Environmental
Protection Agency (EPA). Based on this evaluation, potential risks due to contamination should not limit rural residents or commercial/industrial development in these areas, although the Army is not aware of any plans for such development at this time.

Response B3

The reference to dilution of contaminants in surface water flowing from First Creek into O'Brian Canal is not made in the context of remediation. It is simply a statement of fact. The Army evaluated the potential risks associated with the contaminant concentrations in First Creek without regard to potential dilution for both human and animal receptors and showed the overall risks to be very small.

Comment C - Water.

1. Since the proposed clean-up for the Off-Post area is currently planned for groundwater only at the plume peripheries, but since readings for certain COC's have been found beyond where the original plume borders had been determined, we cannot support option N-4 of the Plan. We would prefer to see option N-5 enacted.

2. Ref. Vol 2-1-6: It states in reference to groundwater contamination that "inorganic chemical background concentrations are substantially different (and generally higher) in the Arapaho Formation when compared to the alluvium and upper Denver." We are concerned that this matter is not being addressed.

   In addition we have been made aware that some wells on the other side of the Platte have yielded traces of certain COC's, and that the South Platte may not be acting as the hydrological barrier that it once was thought to be. Has this been considered in the clean-up effort and how will it be addressed?

3. Ref. Vol. 2, Table 1.3.2-7" In analyzing the sediment samples from Barr Lake,

only 5 samples were used. We do not consider this to be a representative sample for the lake. Perhaps more sampling is necessary to adequately evaluate lake contamination.

4. Ref. Vol. 2, 1-19: Sediments form First Creek were poorly studied. Only 2 samples were listed for the reference data, while 11 samples were collected for RMA-tainted samples. According to proper risk assessment protocol, an n=3 is the minimum number acceptable for samples. An n=2 is not valid for accurate statistical analysis.

   Because one of the two reference samples had high levels of several COC's, the background level is high, therefore leading RMA samples to appear statistically insignificant from controls. There was reference to "other data" which was used in evaluating the samples, but no mention was made as to what it was. Consequently, we believe more sediment samples are required from First Creek to obtain an adequate reference database.

   Also, an assumption has been made that metals are not COC's in First Creek based on the background data. We think that this assumption was inappropriate since the reference sampling was not complete.

5. Ref. Vol. 2-2-53: In reference to groundwater contamination by chemicals, the study states that "hydrophobic chemicals are absorbed by aquifer materials". Please clarify which materials COC's are absorbed by and where they deposit to?

   Can you also clarify the following statements:

   - "aliphatic COC's undergo dechlorination under anaerobic conditions"
     What anaerobic conditions?
     What is the relevance of this statement?

   - "aromatic COC's (i.e. benzene, etc.) are readily biodegraded under aerobic conditions". However, for aliphatic chemicals an anaerobic degradation was stated.
     Which condition prevails?
     What are the degradative products which are referred to...phenols, quinones, etc.?
     Which may be potentially more toxic?

6. We would like to see a surface water monitoring program established in the Off - Post area including:

   - South Platte River
   - O'Brian Canal
   - Burlington Canal
   - Barr Lake
   - First Creek
   - Second Creek
   - Fulton Ditch.

Response C1

The Commenter has incorrectly stated the Army's rationale for elimination of Alternatives N-5 and N-6. As presented in the Final Offpost EA/FS report Volume VI, Section 4.2.1, Screening of Alternatives - North Plume Group, effectiveness, implementability, and cost criteria were explicitly evaluated consistent with the requirements of the National Oil and Hazardous Substances Pollution Contingency (NCP). In this section of the EA/FS, it was concluded that Alternatives N-4, N-5, and N-6 afford the best reduction in toxicity, mobility, and volume, the best long-term protection, and the best compliance with remediation goals. Alternative N-6 was screened out at this point on the basis of similar performance in comparison with Alternative N-5
with respect to reduction in toxicity, mobility, and volume, yet it afforded no benefit in terms of remediation timeframe (10 to 20 years) and at higher cost.

The Army selected Alternative N-4 instead of Alternative N-5 primarily because Alternative N-4 uses actual operating data as a basis for system modifications, if necessary. This is considered to be more effective than expanding the system based on more speculative modeling data.

The Army is committed to efficient operation of the Offpost Groundwater Intercept and Treatment System and will evaluate operating data to assess the need for system modification. Similar to the onpost boundary treatment systems, it is difficult to assess whether the installation of additional wells will provide more efficient operation without collecting full-scale operating data for the Offpost Groundwater Intercept and Treatment System. The Army has included an intensive monitoring component as part of the preferred alternative, Alternative N-4, in the Proposed Plan. This intensive monitoring program will allow the collection and subsequent interpretation of performance data for the full-scale operation of both the Offpost Groundwater Intercept and Treatment System and the onpost boundary systems. The data will be used to assess the need for any improvement to the systems and will provide increased accuracy in assessing contaminant cleanup. Acquisition of this operational data is preferable to adding extraction wells and recharge trenches without the benefit of operational data, because additional data are required to assess the necessity and placement of any additional extraction wells or trenches. If operational data supports the conclusion that the cleanup timeframe can be shortened without 2 significant increase in long-term costs, modifications to Alternative N-4 will be implemented. By taking this approach, improvements to the system will be more effective than improvements made based on computer modeling data.

The selected remedy does not address groundwater only at the periphery of the plume. The Offpost Groundwater Intercept and Treatment System is located in the middle of the North Plume Group in the area of highest concentration.

For additional discussion, see response to State comment No. 2a in Appendix A-3 of the ROD.

Response C2

The background concentrations of certain inorganic compounds in the Arapahoe Formation are naturally occurring and are not addressed by the offpost clean up.

As defined by the Federal Facility Agreement (FFA), the areas requiring remediation are those areas where concentrations of contaminants exceed the remediation goals. These remediation goals were developed to be protective to both human and ecological receptors and are within the acceptable risk range defined by EPA. The diisopropyl methylphosphonate (DIMP) detections west of the South Platte River are approximately 100 times less than the concentration recommended by EPA to be protective of human health. Continued groundwater monitoring will ensure that all areas will not exceed the remediation goals established to be protective of human health.

Response C3

Chemicals of concern in the canals were not present above background concentrations in the sediments of Barr Lake. Additionally, the absence of elevated concentrations in Barr Lake surface
water indicate that sediments are unlikely to be contaminated. Sampling locations for Barr Lake sediments included locations near the inlet to Barr Lake, expected to have the highest sediment concentrations.

The Army acknowledged that intensive statistical analysis of the sediment at Barr Lake was hampered by the small sample size; however, on the basis on the sampling locations, the Army contends that the samples are representative of sediment at Barr Lake. Additional sampling is not
warranted.

Response C4

The Army indicated that the reference data set was not sufficient to adequately address whether First Creek sediment was elevated for chlorinated hydrocarbon pesticides; therefore, as indicated, other criteria were used. These "other criteria" are specified in the EA and included the detection frequency of the constituent in First Creek sediment, status of the constituent as a surface-water chemical of concern (COC), and the organic partition coefficient for the

constituent. The assumption was made that if a constituent concentration was elevated in the surface water, it would lso be elevated in the sediment. Although a statistical comparison of the chlorinated hydrocarbon pesticides in First Creek sediment compared to background was not possible, all detected pesticides in the sediment were evaluated in the risk assessment (see Table 2.4.2.6-9 in the Final Offpost EA).

Although the background (reference) data set is small, the concentrations of metals present in the First Creek sediment samples (n=l 1) are low by any standard and are unlikely to pose an adverse effect to human and ecological receptors.

Response C5

The hydrophobic COCs, such as the chlorinated hydrocarbon pesticides, may be adsorbed to clay particles and organic matter present in the aquifer. These particles are not likely to be mobile;
thus significant desorption is unlikely to occur.

Anaerobic conditions indicate a lack of oxygen. Such conditions may be present in portions of the
saturated areas of an aquifer and may be ideal conditions for the biological transformation (i.e., biodegradation) of some chlorinated hydrocarbon pesticides by anaerobic microorganisms. Aerobic conditions may be present in the unsaturated zones of an aquifer. Either aerobic or anaerobic conditions may be present at any given time. The type of biotransformation (aerobic or anaerobic) depends on the type of microbial population present in the aquifer as well as the nature of the chemical substrate (aliphatic or aromatic) and the presence of any microbial nutrients. Although some degradation products may be more toxic than the parent compound, the usual condition is to produce less toxic and more soluble products. Most of the products (toxic and nontoxic), if present above detection levels are measured using standard analytical methods and would have been included in the risk assessment.

Response C6

A surface-water monitoring program is a component of the selected remedy in the Record of Decision (ROD). The specifics of the program will be developed after the ROD is finalized.

Comment D - Soil:

1. Ref. Vol. 2-1-21: Regarding surficial soil, comparison was made between RMA-tainted samples and regional reference data instead of reference data obtained at the Off-Post sites. We cannot understand how rules can be changed in the middle of the game. As such, we believe that comparisons should be made between all RMA-tainted samples and reference data from the Off-Post sites. A comparison of RMA-tainted data for copper, lead and zinc would have been statistically elevated compared to the reference data. This is not acceptable, and we would like the surficial soil data re-evaluated.

2. Ref. Vol. 2-2-49 and 2-2-74: Why haven't the vegetables been analyzed for COC's? Because the produce is grown in soil on the Off-Post area and irrigated with groundwater contaminated with COC's, it would seem logical to sample the vegetables grown there. They are a relevant source of exposure for humans inhabiting the Off-Post area as well as for local residents purchasing the goods.

3. We are concerned about localized soil contamination hot spots in the Off -Post area which we don't see being addressed by any of the clean-up proposals. We would like these areas identified to the local residents and the contamination addressed.

Response D1

The extension of the background data set to include regional data is appropriate and allows for a
more realistic analysis of the significance of site-related metal concentrations. There can be tremendous variability in metal concentration as a result of natural geologic phenomena at a site, particularly a site the size of the Offpost Study Area. Thus, it is important to evaluate

site data with all available appropriate information. The "rules" did not change. Reference to Shacklette and Boerngen's soil data, as well as other soil databases, is common accepted practice in risk assessment.

Response D2

The Army recognizes the value of actual site-specific data when performing a risk assessment. Vegetables were not analyzed because no clear guidance exists on which kinds of plants are the most appropriate and because of seasonal availability during the scheduled soil sampling events. The Army's modeling approach uses conservative input parameters to predict potential plant tissue
concentrations; thus, it is highly likely that potential risks associated with vegetable ingestion by local residents have been overestimated.

Response D3

The estimated risks associated with the areas of elevated pesticide concentrations in soil are within the acceptable risk range as established by the EPA. However, particularly with regard to the distribution of pesticides, it is apparent that localized areas of higher concentrations may not be attributable to simple windblown erosion from onpost soil. Because of the widespread use of pesticides in agricultural practices, pesticide residues are widespread and are found in nearly all soil samples in the offpost area. The general nature of windblown soil indicates that localized offpost areas of high soil pesticide concentrations are unlikely. Intentional pesticide application is believed to be at least partly responsible for the high concentrations of pesticides in certain soil areas.

However, the estimated risks (approximately 5 x 10-6) associated with these higher concentrations
of pesticides found offpost are well within the EPA health guidelines.

Comment E - Land Usage:

1. Have the Army and Shell been communicating with Commerce City and the Adams County Board of Commissioners with regards to master plans and future zoning requirements for the Off-Post area? We are particularly concerned about zones 2, 3, and 4.

Response E1

As discussed in Volume II, Section 2.2.2 of the EA, master plans, future use forecasts, and zoning information from both Commerce City and Adams County were utilized in establishing the reasonable future land use for the Offpost Study Area.

Comment F - Testing Procedures:

1. Ref. Vol. 2-2-74: Why are samples form agricultural products considered insufficient for exposure determinations of eggs, meat and milk? When evaluation sediment samples in /first Creek, an n=2 for control samples was considered adequate.

2. Ref. Vol. 2-2-76: Why was modeling conducted for vegetable exposure? Wouldn't it have been much more relevant to sample actual produce? We don't understand why so much time and money was wasted modeling egg, meat and vegetable contamination when samples were readily available and would have been more reliable. Vol. 2-2-85 indicated the limited monitoring data showed higher Dieldrin levels than the model's predicted value for meat and eggs.

3. Ref. Vol. 2-2-90: Why is age 0-30 considered a lifetime risk? We realize that 30 years is considered average for the U.S. due to population movement statistics. However, much of the Adams County area in question has a very stable population which often resides on a site for a lifetime. Many residents have already lived with high exposure rates for over 40 years and may live in this area for another 30 years. We feet that the risk values would change if residency were considered for a longer time.

4. Ref. Vol. 2-2-90: Please justify how and increased length of lifetime exposure would result in a reduced estimate of COC intake. How is it presumed that soil exposure and dairy product consumption would be lower for an adolescent than an adult? Anyone who has observed, or been, a teenager can attest to the fact that they play a variety of sports in the dirt, and will drink quantities of milk.

5. Relating to the risk management decision by the Army to use 1 in 2000 as the acceptable cancer risk, the Sierra Club feels that this is unacceptable. We feel that the clean-up should be to 1 in 1,000,000 as set by the EPA.

Response F1

There is a greater potential for sample variability to occur when evaluating biological samples from a population rather than abiotic samples, such as sediment, from a limited area; therefore, a larger sample size is critical for meaningful interpretation of results. Each animal may have unique individual biological characteristics that are not readily apparent but that can influence
chemical residue and toxicity evaluations. It is difficult to address the influence of individual
variability when an evaluation is limited to a very small data set.

Response F2

See Response D2 above.

Response F3

A time span of thirty years is used as the estimated reasonable maximum lifetime exposure in accordance with risk assessment guidance documents from EPA. The basis of this value is that 90 out of 100 people will live 30 years or less at one residence. Hence, 30 years is the expected duration of potential exposure to contaminants. Although some people will exceed 30 years at one residence, the intent of this value is not to represent the absolute maximum number of years that
would be represented by a very limited number of people, but rather a value that encompasses the majority of people. EPA does not advocate utilizing absolute "worst-case" values in risk assessments. Use of the standard EPA default factors provides for more consistent risk assessments. A statistical evaluation of the Army's risk assessment exposure parameters actually indicated that the reasonable maximum exposure intake used by the Army approaches the 99th percentile, meeting and exceeding the definition for a reasonable maximum exposure (RME) estimate.

Response F4

The basis of the comment, the reference to page II-2-90 of Volume II, is unclear. The risk assessment estimated potential risk on the basis of a reasonable maximum exposure as defined in the response to comment F3 for all populations evaluated.

As shown in Tables 2.4.3.2-1 and 2.4.3.2-la of the Final Offpost EA report, the intake rates for soil and water used in the risk assessment are greater for an adolescent/child than for an adult.

Response F5

The Army has closely followed EPA guidance and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range. The risk was calculated without operations of the Offpost Groundwater Intercept and Treatment System being considered.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states

> The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 Federal Register 8717).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risk toward the 10-6 level.

Also, refer to the NCP and EPA risk assessment guidance documents, including Office of Solid Waste and Emergency Response Directive 9355.0-30 (Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, April 22, 1991), for clarification of this issue.

Comment G - Legal Requirements:

1. Ref. Vol. 7-A-6: This ARAR analysis section states that the Federal Endangered Species Act, Migratory Bird Treaty Act, and Bald Eagle Protection Act apply to RMA. This section further states that remediation goals have been established for Off-Post contamination in conformity with the requirements of these three statutes. It further states that these remediation goals will be included as enforceable remediation levels in the proposed plan and record of decision. However, on page A-7, it is specifically stated that these three statutes are not ARAR's, but that they will be complied with for purposes of implementing an alternative remedy.

   The Sierra Club is concerned that as the requirements of these three statutes regarding wildlife protection are not ARAR's, there may be some conflict between complying with these statutes and meeting the remediation goals for the Off-post OU. Specifically, how will conflicts between the requirements of these three statutes and established ARAR's be resolved in the Off-Post remediation?

   Additionally, how can it be anticipated that remediation goals for the Off-Post OU can be achieved along with the requirements of those statutes for protection of wildlife?

   The Sierra Club has concerns that there will be conflicts due to the presence of bald eagles in and around the Arsenal. To the greatest extent possible, the proposed plan and record of decision for the Off-Post OU should set forth how any potential conflicts are to be resolved to assure that remediation goals will be met, while at the same time protecting the wildlife included under the three statutes.

2. Ref. Vol. 7-A-20: Section 4.9 raises the question of protection of the wetlands in the remediation process. This section specifically states the requirements of Executive Order 11990 for protection of wetlands. This executive order directs federal agencies to take action to minimize the destruction, loss, or degradation of wetlands. The EA/FS states that because wetlands have been identified at the Arsenal, the requirements of this executive order may be potential location specific ARAR's

   We are also concerned that there may be conflicts between wetlands protection and meeting required remediation levels. To the greatest extent possible, existing wetlands at the Arsenal should be protected in the Off-Post remediation process. Moreover, any contamination of wetlands areas should be remedied to a lx10 -6 localized risk of cancer.

3. Ref. Vol. 7-A-22: Section 4.12 deals with the Colorado Non-Game Endangered or Threatened Species Conservation Act. This section states that because remedial alternatives anticipated for the Off -Post OU are primarily sub-surface, and do not detail harassing, taking or possession of non-game species, these regulations are not applicable or relevant to the Off-Post OU.

   While remedial alternatives may be primarily sub-surface in nature, they may

never-the-less involve some harassment or destruction of non-game, endangered or threatened species. For this reason, the Colorado Non-Game Endangered or Threatened Species Conservation Act should apply in evaluating alternatives for the Off -Post OU.

Response G1

The EA/FS (vol. 7, pg. A-6) does state that these three statutes apply to RMA and are applicable to the offpost remedy. In itself, the FFA requirement is not an ARAR because it is not a promulgated standard. However, the FFA requirement is legally binding on RMA activities. Language has been added to the ROD indicating that all appropriate actions will be taken during the operation of the preferred alternative to ensure compliance with these statutes.

Response G2

Protection of wetlands will be an integral part of the operation of the preferred alternative. Presently, the Army does not anticipate any conflict between operation of the Offpost Ground-water Intercept and Treatment System and protection of wetlands. If modifications to the Offpost Groundwater Intercept and Treatment System are necessary, protection of wetlands will be one of the issues evaluated.

Response G3

Colorado non-game endangered or threatened species will be protected during the operation and modification (if necessary) of the Offpost Groundwater Intercept and Treatment System.

Comment H

Our last question does not fall under a particular heading, but we would like you to answer it

> Why can't the Army and Shell take the lead in developing new techniques for chemical clean-up using both the Off-Post area and RMA to do this? This would be an excellent money-making opportunity for Shell. It would also give both the Army and Shell Oil Company a more positive image in the eyes of the community and ultimately the nation.

Response H

The Army and Shell Oil Company have evaluated a number of new and emerging technologies for use at RMA. Both bench- and pilot-scale tests of several technologies have been or will be conducted. The biggest problem, when evaluating new technologies, is their application to large scale clean up activities. If data becomes available indicating potential applications of new technology at RMA, the Army and Shell will evaluate and apply these technologies to the cleanup program at RMA.

Office of the Program Manager

Ms. Sandra A. Horrocks
Subcommittee Chairperson
Rocky Mountain Chapter, Sierra Club
1452 East Northcrest Drive
Highlands Ranch, Colorado 80126

Dear Ms. Horrocks:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope the enclosed responses increase your understanding of the offpost cleanup. Also included are the comments you submitted on the Offpost Proposed Plan for easier reference to the response.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128>

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO CITIZENS AGAINST CONTAMINATION COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
MAY 13, 1993

GENERAL COMMENTS

First bullet

The Army has closely followed U.S. Environmental Protection Agency (EPA) guidance and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) regarding the use of the 10-4 risk threshold to assess whether remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4 , but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states

> The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 Federal Register 8718).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risk toward the 10-6 level.

Second bullet

The Army used a large amount of onpost and offpost surface soil data to interpret Rocky Mountain Arsenal (RMA)-related soil contamination. The combination of onpost and offpost data demonstrates that detected concentrations of contaminants offpost are attributable to windblown transport from RMA and to offpost activities, including agricultural application of pesticides. Further, risks corresponding to offpost soil concentrations are within EPA's acceptable risk range. Therefore, remediation of offpost soil is not required.

For additional discussion. see response to State comment No. 4 in Appendix A-1 of this ROD.

Third bullet

The Army will continue to work with EPA, the Colorado Department of Health, and the Tri-County health Department in assessing the effectiveness of one Offpost Groundwater Intercept and Treatment System in evaluating the need for alternative water supplies where remediation goals are exceeded.

Fourth bullet

The Army has recognized all state laws and regulations that meet the applicable or relevant and appropriate requirement (ARAR) criteria under CERCLA and the NCP. After extensive discussion with all the parties, the Army has concluded that the Colorado Basic Standards for Groundwater (CBSGs) do not meet the ARARs criteria because of inconsistent application and ambiguous language. ARARs for the Offpost Operable Unit are based on federal drinking water standards and are protective of human health. In most cases, the treatment goals for the offpost and boundary treatment systems exceed the drinking water standards.

CERCLA expressly provides that state standards can be ARARs at a site. However, only those standards that are more stringent than federal requirements may be considered. In addition, the state standards must be promulgated (i.e., the requirement must be of general applicability and legally enforceable). Finally, the requirements must be identified in a timely manner by the particular state (40 Code of Federal Regulations [CFR] Section 300.400[g)[4]).

The Army concludes that the CBSG interim organic standards are not ARARs for two reasons. First, the CERCLA exception in Section 3.11.5(C)(5)(a) applies to remedial actions authorized under CERCLA that are more or less stringent than would be achieved by compliance with the statewide standards. As a result, the overall effect of the statewide standard and accompanying exceptions is a state regulation that is only sometimes more stringent than a federal requirement. CERCLA only considers state standards that are stricter at all times as potential ARARs. Therefore, by definition, the interim organic standards are not ARARs at Superfund sites.

Second, the CBSG interim organic standards cannot be ARARs because they are not generally applicable or legally enforceable. A requirement in CERCLA for state requirements to be ARARs is that they must be promulgated standards, which means they must be generally applicable and legally enforceable. Clearly, the interim organic standards do not meet this test when applied at CERCLA sites. By definition, the interim organic standards are applicable throughout the state, except at CERCLA, RCRA, and UST sites. In those instances, the relevance of the standards is determined by the remedial sites. It is hard to understand how the standard could be legally enforceable when the Commission added language specifically ensuring that the standards may or may not be met at CERCLA sites.

For additional discussion, see response to State comment No. 4 in Appendix A-3 of this ROD.

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO ARSENAL ACTION ALLIANCE COMMENTS
REGARDING THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

GENERAL COMMENTS

Comment 1

The proposed plan for groundwater clean-up is completely inadequate.

> The Army fails to propose a plan for the clean-up and/or replacement of domestic water supplies that are currently contaminated with by-products of chemical warfare agents, solvents and other Arsenal-related compounds which have been identified in over a hundred wells spanning miles at varying levels.
>
> The boundary system plan in its current form will do nothing to suck up or treat the contaminant plume that has already spread for miles past the interceptor points.

Response 1

The proposed plan includes a requirement for providing alternate domestic water supplies at locations where domestic water currently contains contaminants above applicable relevant and appropriate drinking water standards. These standards have been established to be protective of human health. The Army will continue to monitor groundwater contaminant concentrations during cleanup activities and will provide an alternate domestic water supply for any locations identified in the future where RMA contaminants exceed groundwater cleanup standards.

As indicated in the proposed plan, the North Boundary Contaminant System is not designed to capture contamination that has migrated past the RMA north boundary. Capture and treatment of groundwater downgradient of the North Boundary Contaminant System is the basis for the construction and operation of the Offpost Groundwater Intercept and Treatment System. Additional monitoring wells have been installed in this area to help define the extent of contamination and to aid in monitoring the effectiveness of the treatment system. The Offpost Groundwater Intercept and Treatment System is designed to extract and treat groundwater in order to attain groundwater cleanup standards.

Comment 2

The proposed plan fails altogether to address soil contamination in the offpost area, with no plan to remove toxins in yards where children and pets play, and track contaminants to indoor living areas.

Response 2

Remediation of soil is not necessary because the estimated risk from exposure pathways relating to soil is within EPA health guidelines. Extraction and treatment of offpost groundwater will reduce the total potential risk through all pathways toward the l x 10-6 level.

Comment 3

The plan fails to base its assessment of human health risks on actual conditions and the history of prior Arsenal-related exposures.

> While the Army is aware that elevated rates of at least one cancer type were demonstrated in the population for a period of time studied, the Army and EPA have based the "risk assessment" on projections that falsely assume a previously healthy population.
>
> The Army ignores the fact that a significant number of offpost residents, especially in the Irondale area, were literally "gassed" by seven months of virtually uncontrolled toxic fumes including high levels of deadly Shell pesticides and other toxic Arsenal compounds during the Basin F excavation in 1988 and '89, causing

significantly high levels of risk for cancers and other diseases, according to some independent medical experts.

The Army ignores the fact that human beings in some sectors of the offpost area already have elevated risk from Arsenal poisons, having consumed levels of TCE and other toxins exceeding federal health guidelines in their drinking water through South Adams County's Water system for years prior to charcoal filtration, and even at times since.

Response 3

The Army followed EPA guidance in the conduct of the risk assessment for the Offpost Study Area. These guidelines do not account for existing health conditions, which may or may not be present in a population. However, the EPA risk assessment procedures include sufficient safety factors to be protective for sensitive populations.

The risk assessment conducted for the Offpost Study Area does not, by definition, assess whether adverse health effects have occurred or will occur and cannot identify particular individuals likely to suffer health problems because of contamination at a site. The Agency for Toxic Substances and Disease Registry (ATSDR), in cooperation with the Colorado Department of Health, have ongoing epidemiological studies near RMA to address the occurrence of health effects and assess whether these effects may be attributable to exposure to contaminants from a hazardous waste site. To date, the health study completed by the Colorado Department of Health and ATSDR has given no proof of a cause-effect relationship between Arsenal contamination and health problems in the offpost area.

Questions regarding violation of federal drinking water standards by the South Adams County Water and Sanitation District (SACWSD) should be addressed directly to SACWSD. The Army is not involved in the operation or maintenance of that facility.

CITIZEN RECOMMENDATIONS FOR THE U.S. ARMY AND SHELL

Recommendation 1

All domestic wells currently contaminated by DIMP, IMPA and/or any other Arsenal-related toxins, found at any level should immediately be replaced with an alternative source of water, to eliminate all current routes of toxics exposure, including dermal exposure and steam inhalation while bathing and showering.

Response to Recommendation 1

The Army will continue to work with the U.S. Environmental Protection Agency (EPA), the Colorado Department of Health, and the Tri-County Health Department in assessing the effectiveness of the Offpost Groundwater Intercept and Treatment System and in evaluating the need for alternative water supplies where cleanup standards are exceeded.

Recommendation 2

Cap all shallow groundwater wells, to prevent continuing migration of Arsenal poisons to the deeper aquifer, as was recommended by the U.S. Public Health Service in 1959, over 30 years ago.

Response to Recommendation 2

Well closure of offpost wells has been included as a component of the selected remedy. See Appendix C of the Record of Decision (ROD). Specifics, relating to the criteria for individual well closures, are being discussed with the EPA, Colorado Department of Health and Tri-county Health Department.

Recommendation 3

Install groundwater interceptor systems along the leading edge of the plume, to the west of the South Platte River, to the north near or above Brighton, and east where the plume has

not been adequately characterized, to date.

Response to Recommendation 3

The Offpost Groundwater Intercept and Treatment System is located such that the groundwater will be treated to meet or exceed the remediation goals established to be protective of human health. Diisopropyl methylphosphonate (DIMP) concentrations at the leading edge are approximately 100 times less than the concentration established by the EPA to be protective of human health. The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) does not require cleanup to a concentration of zero.

Recommendation 4

Develop a comprehensive contaminated soil removal and clean-up plan for any and all offpost areas (including areas to the east and elsewhere, not currently included in the "offpost study area") where RMA chemicals -- including Shell's dieldren, aldrin, endrin and other poisons -- have been identified.

Response to Recommendation 4

Background sampling indicated that pesticides are present throughout the Offpost Study Area. Agricultural application of pesticides is a contributing source. Agricultural application of a registered pesticide is exempt from CERCLA. However, the risk associated with the dieldrin concentration in these hot spots do not exceed a lifetime cancer risk of 5 x 10-6, which is at the lower end of the acceptable risk range defined by the U.S. Environmental Protection Agency (EPA). Therefore, specific cleanup of these soil areas is not required. Cleanup of offpost groundwater will provide the greatest benefit of risk reduction.

Recommendation 5

Develop a plan that includes analysis for compounds in offpost soil and surface waters associated with the RMA's onsite hazardous waste incineration and mechanisms for clean-up of heavy metals, dioxins and other toxins released to offpost area yards, farms and/or businesses in conjunction with the Army's two-year incineration activities.

Response to Recommendation 5

Monitoring plans will be developed following completion of the ROD. See Response to Comment 4, regarding the Submerged Quench Incinerator, following the Offpost Proposed Plan Responses.

Recommendation 6

Postpone the "Record of Decision" on the offpost clean-up until the State of Colorado enacts groundwater standards for currently unregulated, Arsenal-related toxic -compounds, based on independent medical opinion without conflicts of interest with the Army or its agents. Once those standards are adopted, set clean-up levels that meet -- or preferably exceed -- the standard.

Response to Recommendation 6

The Army is not required to postpone the ROD in Order to wait until a standard is promulgated. Flexibility is inherent in the Army's selected alternative, and if a standard changes and subsequently applies to the offpost program, the selected alternative will be modified.

Health advisories developed for DIMP and isopropyl methylphosphonic acid (IMPA) by the EPA and its Office of Drinking Water represent an evaluation by independent organizations that have no conflict of interest with the Army.

Recommendation 7

Abandon risk assessment for the offpost based on "zones," and clean up all contaminated soil and water areas to the maximum extent considered safe for residential use, since there are no mechanisms in place whereby land uses are to be restricted on private property, and

cannot be projected in perpetuity.

Response to Recommendation 7

The NCP does not assume that unrestricted residential use will be the overriding consideration in cleanup efforts. In fact, the NCP states that the assumption of residential use is not a requirement, only that future land use be evaluated. Section 104(i) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) states that health risk assessments should evaluate the potential risk to human health posed by "individual sites," based on such site-specific factors as the "nature and extent of contamination" and the "existence of potential pathways of human exposure." Clearly, this language indicates that the EPA recognizes that all areas of a site are not equal in terms of potential risk. Because the guidelines for determining which areas require remediation are risk-based, it is important and essential to establish exposure areas (e.g., zones) with differing chemical concentrations and potential exposure patterns. This allows identification of those areas that pose the greatest concern (by virtue of higher risk) and that will require remediation. In addition, Institutional Controls have been added to the ROD to further protect the public from potentially contaminated areas.

Recommendation 8

> Amend the plan to reflect clean up standards that meet -- or preferably exceed -- the EPA's National Contingency Plan level of "acceptable" risks, which clearly states no more that 1 excess cancer per million is considered safe. The Army's plan to allow a level of 1 excess cancer per 10,000 is outrageous, inconsistent with Superfund clean-up levels at other sites around the country, and which we believe to be overt environmental discrimination, whereby the U.S. Army would intentionally subject citizens in predominantly low-income communities to dramatically higher risks of death from its cleanup actions alone, on top of already elevated risks due to previous water, air and soil contamination from the Arsenal.

Response to Recommendation 8

The Army has closely followed EPA guidance and the NCP regarding the use of the 10-4 risk threshold to assess whether Remediation is necessary. Guidance states that if the cumulative cancer risk to an individual is less than 10-4, remedial action may not be warranted unless certain site-specific conditions exist. If remedial action is warranted, the 10-4 to 10-6 risk range must be achieved, with an initial preference for the 10-6 end. EPA guidance further states that the upper boundary of the risk range is not an absolute at 1 x 10-4, but rather, the acceptable risk range can extend to 5 x 10-4. The cumulative offpost cancer risk is a maximum of 3 x 10-4, which is within the acceptable risk range. This risk was calculated without considering operations of the Offpost Groundwater Intercept and Treatment System.

In explaining the use of the point of departure, the EPA, in the preamble to the NCP, states

> The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range, but does not reflect a presumption that the final remedial action should attain such a risk level (55 Federal Register 8718).

The operation of the Offpost Groundwater Intercept and Treatment System reflects the Army's goal of further reducing the potential risk toward the 10-6 level.

Additionally, the Army is following EPA regulations and does not practice environmental discrimination, as implied in the comment.

Recommendation 9

> Abandon so-called "clean-up" plans that allow people to be exposed to known dangerous toxic compounds, in addition to an array of unknown hazards from the negligent actions at the Rocky Mountain Arsenal over the last half century, which continue to sacrifice public health, homeowners' investments, the environment, and the viability of whole

communities.

Response to Recommendation 9

The Army will not abandon the cleanup plan identified in the Proposed Plan. The selected alternative for offpost cleanup will not be determined until the Final ROD is accepted by the U.S. EPA and issued (now scheduled for early 1994). The Army believes its preferred alternative will protect human health and the environment and benefit property values offpost.

Office of the Program Manager

Ms. Adrienne Anderson
P.O. Box 512
1200 Madison Street
Denver, CO 80206

Mrs. Bennie Muniz
P.O. Box 261
Henderson, CO 80640

Mrs. Mary Daigle
8810 E. 88th Ave. #40
Henderson, CO 80640

Dear Madams:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. Also included are responses to comments you submitted on the Submerged Quench Incinerator (SQI). I hope these responses increase your understanding of the SQI and offpost cleanup.

Please Contact Mr. Bill Thomas, Public Affairs Office, at (303) 289-0136 if you have any questions regarding the SQI and Mr. Tim Kilgannon at (303) 289-0201, if you have any questions regarding the Offpost Proposed Plan.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Enclosure
Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

RESPONSES TO COLORADO PESTICIDE NETWORK COMMENTS
COMMENTS ON THE PAST PROPOSAL

We support the N-5 cleanup alternative because it will give a more speedy initiative to the cleanup of this area. Expected pressures for developing the area because of the new Denver International Airport necessitate giving attention to the cleanup.

We would Like the dieldrin hot spots and other contaminated areas to be remediated. CERCLA established a strict joint and several liability scheme. If other parties also contributed to the contamination, the cleanup remedy is a contribution suit. We have not seen any evidence which would prove that the arsenal did not at least contribute to the excess dieldrin contamination.

DIMP should be cleaned from ground and surface water to at least 8 ppb. The EPA suggested cleanup level of 600 ppb is much too high because different criteria are used to determine nutrient needs in human and to animals; the average American diet (USDA 1977) does not even supply the recommended daily doses for nutrients; test animals were given extra supplements to meet their nutrient needs off post dwellers may not take any supplements.

The 1990 mink study only solicits further questions about the impacts DIMP and sudden deaths of mink related to DIMP. The former mink study show sudden death should be given top consideration in considering DIMP toxicity.

<IMG SRC 0896128C>

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO COLORADO PESTICIDE NETWORK COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

Response to Comment No. 1 - Preference for Alternative N-5.

The Army selected Alternative N-4 rather than N-5 on the basis of the evaluation criteria specified by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as described in the Record of Decision (ROD). The slightly shorter time frame for cleanup estimated for Alternative N-5 was not the overriding issue in the selection process. The Army believes that the immediate operation of the existing Offpost Groundwater Intercept and Treatment System with later evaluation (Alternative N-5) is preferable to incurring increased construction costs for Alternative N-5 based on results of computer modeling. After review of actual operational data (which includes an evaluation of the change in chemical concentrations in groundwater), if improvements or modifications to the existing system are necessary, they can be implemented more effectively. These improvements would be based on actual data and would therefore be more effective than Alternative N-5 based on computer modeling results.

For additional discussion, see response to State comment No. 2a in Appendix A-3 of the ROD.

Response to Comment No. 2 - Dieldrin Hot Spots.

Based on our evaluation, isolated areas of increased dieldrin concentration (i.e., hot spots) in offpost soil are not a result of transport from Rocky Mountain Arsenal. Windblown soil would be deposited in a more uniform pattern and would not result in a deposition of high concentrations of dieldrin in one area. Additionally, background sampling indicated that pesticides are present throughout the Offpost Study Area. Agricultural application of pesticides is a contributing source. Agricultural application of a registered pesticide is exempt from CERCLA. However, the risks associated with the dieldrin concentrations in these hot spots do not exceed a lifetime cancer risk of 5 x 10-6, which is at the lower end of the acceptable risk range defined by the U.S. Environmental Protection Agency (EPA). Therefore, specific cleanup of these soil areas is not required. Cleanup of offpost groundwater will provide the greatest benefit of risk reduction.

Response to Comment No. 3 - DIMP Cleanup Standard and Studies

The Army is using the EPA's Health Advisory value for diisopropyl methylphosphonate (DIMP) of 600 parts per billion (ppb) to determine which areas of DIMP-contaminated groundwater require remediation. This value represents a determination concurred by many EPA scientists and toxicologists. As stated in the Operation and Maintenance Manual for the Offpost Groundwater Intercept and Treatment System, the treatment system is designed such that the treated water contains no more than 10 ppb of DIMP. Because the treatment system is located in the area of highest groundwater contamination, treatment of the groundwater to a level of 10 ppb DIMP should have a significant impact on the regional DIMP concentrations.

Because humans and animals are different, their nutrient needs are also different. All EPA animal testing guidelines indicate that animals should be properly fed with a diet that includes the appropriate nutrients. Although the average human diet may be lacking in some nutrients, there are no procedures currently being used by EPA or state agencies to specifically account for this. There are, however, a number of safety factors built into the determination of the health advisory that the EPA believes are sufficient to account for potential variation among human sensitivities.

The EPA has recommended that the mink DIMP study not be used for human health effect studies because of the high natural annual mortality in mink, the general lack of information on the mink, and uncertainties concerning the relevance of mink to human health assessment.

For additional discussion of the DIMP standard, see response to State comment No. 2d in Appendix A-3 of the ROD.

Office of the Program Manager

Ms. Angela Medbery
Colorado Pesticide Network
2205 Meade Street
Denver, Colorado 80211

Dear Ms. Medbery:

Thank you for your comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope the enclosed responses increase your understanding of the Offpost cleanup. Also included are the comments you submitted for easier reference to the Army's response.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army

Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO ENVIRONMENTAL INFORMATION NETWORK COMMENT'S
REGARDING THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN

Comment 1:

The preferred option cites Barr Lake and Burlington Ditch as offpost study areas, yet it appears that a comprehensive characterization has not occurred as yet. Are there current plans for extensive sediments and sediment core samples to be done throughout these areas?

Response 1:

The Army believes that the sampling activities conducted at Barr Lake and Burlington Ditch have been sufficient to adequately characterize these areas and to evaluate the need for remediation. In addition, a surface-water monitoring program will be implemented as a component of the preferred alternative.

Comment 2:

Have sufficient 3-dimensional plume maps been generated to answer the following questions: have the plume heads been defined in such a manner that the locations are identified? Have the plume heads reached and dispersed in the local tributaries, canals, and lakes?

Response 2:

Through the combination of data collected from an extensive system of offpost and onpost monitoring wells and use of groundwater modeling techniques, the areal extent of Rocky Mountain Arsenal (RMA)-related contaminants is well-defined. As discussed in the Final Remedial Investigation report, contaminant detections in local tributaries, canals, and lakes are generally not above background levels.

Comment 3:

The Groundwater monitoring alternative cited states the samples will be collected periodically. Will these be grab or composite samples? What exactly will be monitored? What are the target analytes? How long will it take to get results from this testing? How frequently will the samples be taken, and at what locations?

Response 3:

Specifics of the groundwater monitoring program to be implemented as part of the offpost selected remedy have not yet been developed. The Record of Decision (ROD) states that the monitoring plan will be developed following finalization of the ROD.

Comment 4:

A site review will be conducted at least every five years according to the U.S. Army brochures. A site of this complexity and severe nature of contamination dictates a much more aggressive review time line. Every 5 years therefore is not acceptable. This should be brought forward for further public discussion. Please explain why the Army feels that a 5 year parameter is sufficient.

Response 4:

As stated in the Proposed Plan and the ROD, Section 121(c) of the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA) mandates that a formal site review be conducted at least every five years to assure that human health and the environment are protected during and after remediation. However, informal reviews of the efficiency, effectiveness, and environmental impacts of the treatment systems will be a continuous process. A large part of these informal reviews will be an assessment of the groundwater and surface-water monitoring data collected as part of the long-term monitoring program. These informal reviews will be performed as often as long-term monitoring is performed. Based on the information obtained during operation of the treatment systems, a formal review may be conducted

sooner than five years following implementation of the remedy, but no later.

Comment 5:

Alternate Water Supply is cited as being provided if domestic wells are identified as containing concentrations that exceed remediation goals. Please specify exactly what those concentrations consist of, and whether they are protective of chronic exposures and synergistic accumulative uptake in small children, and pregnant women.

Response 5:

Remediation goals (i.e., cleanup standards) are listed in Table 7.1 of the ROD. Based on U.S. Environmental Protection Agency (EPA) guidance on risk assessment methodology, these concentrations are expected to be protective of adverse health effects for sensitive individuals and for chronic exposures.

Comment 6:

The RMA boundary containment systems may not be adequate systems for ground water recharge pump-and-treat containment if they are relying solely on carbon adsorption units for removal of organics only. Other contaminants at the RMA include metals, which are not affected by carbon adsorption units. Other processes such as precipitation may be required to address this.

Response 6:

Concentrations of metals and other inorganics approaching the RMA boundaries were determined to meet all applicable groundwater standards. If ongoing groundwater monitoring results show that other chemicals are approaching the RMA boundaries above standards, the Army will revise the treatment systems as necessary.

Office of the Program Manager

Ms. Paula Elofson-Gardine
Executive Director
Environmental Information Network (EIN), Inc.
P.O. Box 280087
Lakewood, CO 80228

Dear Ms. Elofson-Gardine:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. Also included are responses to comments you submitted on the Submerged Quench Incinerator (SQI). I hope these responses increase your understanding of the SQI and offpost cleanup.

Please contact Mr. Bill Thomas, Public Affairs Office, at (303) 289-0136 if you have any questions regarding the SQI and Mr. Tim Kilgannon at (303) 289-0201, if you have any questions regarding the Offpost Proposed Plan.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army

Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

RESPONSES TO DENVER AUDUBON SOCIETY COMMENTS

<IMG SRC 0896128C1>

In justifying the selection of N-4 as the favored option, the Army observes (5.4.1.4) that "the potential for exposure in the timeframe is reduced by the Army committment to provide alternative water to any future identified ground water users." While this seems prudent, we are concerned that the uncertainties in ecological risk might be ignored.

The Army has emphasized that the 2-year intensive monitoring proposed under option N-4 is needed for decision-making regarding potential improvements to the treatment Installations. They have not made clear the compelling need. on the other hand there seems to be clear justification for expecting more rapid cleanup for the treatment plans under N-5. The real tradeoff seems to be more accurate modeling for risk assessment as opposed to more aggressive removal of groundwater contaminants, which might not be optimal, but is sure to work.

<IMG SRC 0896128C2>

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO DENVER AUDUBON SOCIETY COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

GENERAL COMMENTS

Comment 1: Selection of N-4 instead of N-5

As presented in the Final Offpost EA/FS report Volume VI, Section 4.2.1, Screening of Alternatives - North Plume Group, effectiveness, implementability, and cost criteria were explicitly evaluated consistent with the requirements of the NCP. In this section of the EA/FS, it was concluded that Alternatives N-4, N-5, and N-6 afford the best reduction in toxicity, mobility, and volume, the best long-term protection, and the best compliance with remediation goals. Alternative N-6 was screened out at this point on the basis of similar performance in comparison with Alternative N-5 with respect to reduction in toxicity, mobility, and volume, yet it afforded no benefit in terms of remediation timeframe (10 to 20 years) and at higher cost.

The Army selected Alternative N-4 instead of Alternative N-5 primarily because Alternative N-4 includes potential future modifications, if such modifications are found to be necessary based on actual operating data, to the Offpost Groundwater Intercept and Treatment System and because use of actual full-scale operating data is preferable to selecting additional components for the Offpost Intercept and Treatment System using the more speculative modeling data (i.e., Alternative N-5).

The Army is committed to efficient operation of the Offpost Groundwater Intercept and Treatment System and will evaluate operating dam to assess the need for system modification. Similar to the onpost boundary treatment systems, it is difficult to assess whether the installation of additional wells will provide more efficient operation without collecting full-scale operating data for the Offpost Groundwater Intercept and Treatment System. The Army has included an intensive monitoring component as part of the preferred alternative, Alternative N-4, in the Proposed Plan. This intensive monitoring program will allow the collection and subsequent interpretation of performance data for the full-scale operation of both the Offpost Groundwater Intercept and Treatment System and the onpost boundary systems. The data will be used to assess the need for any improvement to the systems and will provide increased accuracy in assessing contaminant cleanup. Acquisition of this operational data is preferable to adding extraction wells and recharge trenches without the benefit of operational data, because additional data are required to assess the necessity and placement of any additional extraction wells or trenches. If operational data supports the conclusion that the cleanup timeframe can be shortened without a significant increase in long-term costs, modifications to Alternative N-4 will be implemented. By taking this approach, improvements to the system will be more effective than improvements made based on computer modeling data.

For additional discussion, see response to State comment No. 2a in Appendix A-3 of this ROD.

Comment 2: Cleanup of Surface Water

Given that the following three factors point to continuing beneficial impacts to offpost water quality, the Army is committing to an ongoing surface water monitoring program to track the cleanup of offpost surface water (1) remediation of groundwater should have a beneficial effect on offpost surface water quality, (2) contaminant concentrations are lower during storm event runoff periods (Surface Water Comprehensive Monitoring Program Annual Report for 1989 [R.L. Stollar & Associates, and others, 1990]), and (3) the Army has committed to closing the onpost sewage treatment plant, thus eliminating a possible source of contaminants in the First Creek surface water drainage.

The components of the offpost surface water monitoring program will be contained in a report to be completed following completion of the ROD. The ROD contains the Army commitment to both surface water and groundwater monitoring programs in the offpost area as a component of the selected remedy.

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO WE THE PEOPLE COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN

GENERAL COMMENTS

Comment 1:

The plan and its alternatives are based on suspect or manipulated data. This was evidenced at the April 28, 1993 public meeting by comments regarding DIMP levels in wells showing levels exceeding what is often broadly and publicly reported.

Response 1:

The Army has not based the selection of the preferred alternative on suspect DIMP data, nor has the Army engaged in manipulating DIMP data. If the commentor is referring to the State of Colorado's statement regarding levels of DIMP exceeding 600 ppb north (downgradient) of the Offpost Groundwater Intercept and Treatment System, the Army is aware of these data. A component of the preferred alterative involves installation of three new monitoring wells. Two new monitoring wells will be installed downgradient of the First Creek Pathway and one new monitoring well will be installed downgradient of the Northern Pathway. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these wells and existing wells will be used to further define the extent of contamination greater than the cleanup goals in this area and assist in determining whether modifications to the Offpost Groundwater Intercept and Treatment System are necessary.

Comment 3:

The offpost plan and its alternatives are so inadequate in their remediation and ongoing monitoring of, water, soils, the air basin, existing and ongoing harm to the public health, offpost wild and domestic animal life; plus the very limited scope of the offpost area itself, that the only possibility is to start over.

Response 3:

The selection of the preferred alternative in the Record of Decision was based on the evaluation criteria established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The results of the EA/FS indicated that groundwater is the major contributor to potential risks. Treatment of groundwater with the Offpost Groundwater Intercept and Treatment System will reduce the estimated risk toward the level of one excess cancer per one million people (1 x 10-6).

Part of the preferred alternative involves extensive monitoring of offpost groundwater conditions throughout the operation of the Offpost Groundwater Intercept and Treatment System. Results of the Comprehensive Air Monitoring Program for RMA indicated that the air quality is not a health concern in the offpost area. The results of the risk assessment conducted for the Offpost Study Area indicated that potential harm to wildlife is minimal, and that potential harm to domestic animals is nonexistent. However, the Army will continue to monitor offpost groundwater surface water, and soil as needed as part of the preferred alternative. The Agency for Toxic Substances and Disease Registry (ATSDR) and the Colorado Department of Health (CDH) have ongoing epidemiological studies near RMA to evaluate the occurrence of health effects. The Army believes that the Offpost Study Area and the investigations conducted to date are not of "limited scope." The studies conducted for the offpost area have been done with the approval of the U.S. Environmental Protection Agency (EPA) and with review and comment by CDH. The Army does not intend to start over; rather, the Army intends to proceed with implementation of the preferred alternative so that potential offpost risks will be reduced.

SPECIFIC COMMENT'S

Comment 1:

The offpost study area is too limited in scope to be meaningful. The following scope areas and

the way they are addressed are inadequate in the proposed plan and its alternatives:

Comment 1b: Soil monitoring and remediation is inadequate. The idea that other sources are responsible for the contamination of soils in the surrounding area is an unacceptable premise to make from any organizations that have openly, blatantly, willfully, and; who without any regard whatsoever for environmental, health, and social harms, freely polluted surrounding communities for 40 years. A soils remediation plan needs to be developed, and in such a way as to not create additional risk exposure to the environment and the public.

Response 1b:

The Army has adequately characterized the extent of contamination in the offpost soil. The Army has not stated that other sources are entirely responsible for the offpost soil contamination. However, particularly with regard to the distribution of pesticides, it is apparent that localized areas of higher concentrations may not be attributable to simple windblown erosion from onpost soil. Because of the widespread use of pesticides in agricultural practices, pesticide residues are widespread and are found in nearly all soil samples in the offpost area. The general nature of windblown soil indicates that localized offpost areas of high soil pesticide concentrations are unlikely. Intentional pesticide application is believed to be at least partly responsible for the high concentrations of pesticides in certain soil areas.

However, the estimated risks (approximately 5 x 10-6)associated with these higher concentrations of pesticides found offpost are well within the EPA health guidelines.

Comment 1c: The lack of establishing a thorough baseline health study of the affected areas and the deviation or lack of deviation from the health of unaffected areas. This must include the evaluation of human, wildlife, and domestic animal populations.

Response 1c:

The baseline risk assessment performed for the Offpost study area is not based on knowledge or information regarding the current health status of potentially exposed individuals. The risk assessment is based on estimating the current and potential future exposures. A comprehensive epidemiological study is not required by either CERCLA or the NCP. While this information may be useful, the EPA does not require it as part of the risk assessment process or as a factor in the selection of the remedy. Rather, the EPA has consistently used the results of the site-specific risk assessment as a basis for determination of the need for cleanup.

A risk assessment, like the one performed for the Offpost Operable Unit, is a scientific evaluation of the probability that adverse effects will occur if people, wildlife, or domestic animals are exposed to contaminants present at the site. The risk assessment considers the ways humans and animals may be exposed (pathways of exposure), the likelihood of adverse health effects, the expected types of health effects, and the toxicity of individual chemicals. A risk assessment does not, by definition, determine whether adverse health effects have occurred or will occur and cannot identify particular individuals likely to suffer health problems because of contamination at a site.

However, separate from the risk assessment process, the ATSDR in cooperation with CDH may conduct a health assessment and, on the basis of their findings, institute a full-scale epidemiological study to address the actual occurrence of health effects and determine if these effects may be attributable to exposure to contaminants from a hazardous waste site. The ATSDR and CDH have ongoing epidemiological studies near RMA.

Comment 1d: The lack of ongoing monitoring of health harms; and provisions for harm(s) done or yet to be done to the health of human, wildlife and domestic (including pets, farm, and ranch) populations.

Response 1d:

See response to comment 1d above.

Comment 1f: In an information meeting at the Montbello library it was revealed that water

coming back to the RMA from the Montbello area was contaminated. The assumption stated was, that this contamination was generated by industrial sources within the Montbello community. Once again, the idea that other sources are responsible for the contamination of water or soils in the surrounding area is an unacceptable premise to make from any organizations that have openly, blatantly, willfully, and; who without any regard whatsoever for environmental, health, and social harms, freely polluted surrounding communities for 40 years. An in-depth determination must be made to determine that this contamination is not from prior exposure to pollutants from RMA ground and air pathways to Montbello soils and water, and further if other Pollution generators are discovered that they and the appropriate community authorities and governmental regulators be notified. Further, if the contaminants were possible products from RMA activities, with no present day generators then remediation and ongoing monitoring plans should be established.

Response 1f:

The commentor has misinterpreted the statement made at the informational meeting. Water does not "come back" to RMA from the Montbello area. Groundwater flow direction is from the south to the north. Groundwater contaminants present beneath RMA would therefore be transported to the north. If contaminated groundwater is identified at the southern boundary of RMA, the source of this contamination is most likely located south of RMA, perhaps within the Montbello, area. The Army has not stated that other sources are responsible for the contamination. The Army is stating that in some areas, it is apparent that some contamination appears to have originated from sources other than RMA activities. The Army is in full agreement with the statement that if the contaminants are possible products from RMA activities, remediation and ongoing monitoring plans should be established. This is the purpose of the Remedial Investigation, Endangerment Assessment/Feasibility Study (EA/FS), the Proposed Plan, and selection of the preferred alternative in the Record of Decision.

Comment 2:

The offpost study area is too limited in size to be meaningful. The following areas need to be added to the study area along with the pertinent scope that including them would necessitate:

Comment 2a: The entire western boundary of the RMA needs to be part of the plan even if there is another superfund site along part of it. Pollution was done to the whole, the plan needs to address in detail the whole.

Response 2a:

The entire western boundary of RMA was included initially in the evaluation of the offpost area. Soil and groundwater samples were collected and analyzed from the area included in the EPA Study Area. Concentrations of contaminants in this area do not exceed offpost cleanup goals. As defined in the Federal Facility Agreement, the offpost areas requiring cleanup are those areas where RMA-related chemical concentrations exceed EPA standards or cleanup goals. Consequently, this area was not included in further offpost studies. Additionally, the groundwater migration direction indicates that sources other than RMA are responsible for the contamination in this area. Because it is part of another study area, other parties are responsible for the cleanup.

Comment 2c: Include the communities of Montbello and Green Valley Ranch. They are downwind of RMA and therefore were exposed to definite pollution via air pathways. They may have also been exposed via heavy rains and blowing snow.

Response 2c:

The claim of "definite pollution via air pathways" cannot be substantiated. Results of the Comprehensive Air Monitoring Program (CAMP) for RMA indicate that potential exposures at the boundaries of RMA through the air pathway are negligible, if not unmeasurable. However, the CAMP will monitor air quality at the RMA boundaries as long as cleanup continues onpost.

Response 2d: Expand the northern boundaries to include leaching areas on both sides of the

shown waterways and the area to and including the perimeter of Barr lake. Additionally, add the Brighton area water supply area for ongoing monitoring and a remediation contingency plan if plumes of pollution continue their creep towards their water supply.

Response 2d:

The boundaries of the Offpost Study Area were defined to include those areas of groundwater known to contain RMA-related chemicals and surface water bodies that may be affected. The land adjacent to the streams was not shown to contain elevated concentrations of contaminants. Similarly, the land surrounding Barr Lake would not be expected to contain chemicals in concentrations exceeding other land areas included in the Offpost Study Area. Therefore, the land adjacent to the waterways and Barr Lake were not included as part of the Offpost Study Area.

The Army has many groundwater monitoring wells downgradient of the Offpost Groundwater Intercept and Treatment System, including wells upgradient of the Brighton area water supply wells. The monitoring program implemented as part of the preferred alternative will adequately identify potential plume migration before reaching the Brighton water supply wells. If such migration is identified and is a threat to the safety of the drinking water, the Army will modify the offpost cleanup plan to protect the Brighton water supply wells.

Comment 2g: A minimum of 5 kilometers in all directions from each stack of the north plant and south plant.

Response 2g:

Neither the North Plants or the South Plants are currently operating or involved in any manufacturing processes. There are no emissions from the stacks at either location. RMA-related contamination has not been detected at locations other than north of the RMA boundary (the Offpost Study Area). Therefore, it is not appropriate to include a 5 kilometer 360-degree radius around the RMA onpost area as the Offpost Study area.

Comment 3:

We would request that the Army respect the Colorado Department of Health's recommended Standard for DIMP in ground water at 8 ppb. Further the Army, Shell, its agents Holme Roberts and Owen, and the EPA should not further interfere with or lobby the Colorado Water Quality Commission (WQCC) to set a higher standard in order to benefit the RMA parties at the risk of Public Health and the ENVIRONMENT. We feel these activities undermine Public confidence in the WQCC and will dilute the sovereignty of the State of Colorado.

Response 3:

The Army did not interfere with or lobby the Colorado Water Quality Commission to set a higher standard for DIMP in groundwater. The Army has presented its position to the Commission as part of the public hearing process. The Army stated that in was in agreement with the EPA's position which has the support of many top-level scientists, both from within the EPA and other national organizations. The Army believes it is inappropriate to set a standard based on the opinions of one scientist when that opinion is not shared by the scientific peer group.

The Colorado Water Quality Control Commission recently set an 8 parts per billion standard for DIMP in groundwater. The Army is currently evaluating the applicability of this standard to the preferred alternative.

Comment 4:

In reviewing the various DIMP data and after talking with personnel from EPA and the State of Colorado we find it incomprehensible for the EPA to have not considered the Mink study with a great deal more importance than they did. Their assumptions on the controls seem to be greatly flawed and suspect. We feel there exists a significant difference of opinion between the State and the EPA. Therefore:

Comment 4a: DIMP only affected the area around the RMA. It does not exist anywhere else in the country, nor does it affect any other ongoing production activity. Since it is only a product of SERAN production which is not now or will be manufactured, no ongoing industry will be affected.

Response 4a:

No specific comment or recommendation made.

Comment 4b: Humans using DIMP contaminated water wells are being exposed daily via direct and indirect Pathways and are therefore exposed to significant health risk.

Response 4b:

Based on the EPA health advisory for DIMP, which has been peer-reviewed by many nongovernmental scientists, the results of the endangerment assessment indicate that the concentrations of DIMP in groundwater do not correspond to a significant health risk. However, treatment efficiency data for the Offpost Groundwater Intercept and Treatment System indicate that concentrations of DIMP in the treated groundwater are reduced to less than 10 to 15 parts per billion on average, thereby reducing the potential risks from DIMP to an insignificant level.
Comment 4c-Further study and manipulation of the regulatory process should be no longer considered. Reasonable responsibility for providing a alternatives for water in the DIMP affected area should be undertaken by the Army as soon as possible.

Comment 4c: Further study and manipulation of the regulatory process should be no longer considered. Reasonable responsibility for providing a alternatives for water in the DIMP affected area should be undertaken by the Army as soon as possible.

Response 4c:

The Army has not manipulated the regulatory process. All investigative and interpretive efforts have been conducted in accordance with the NCP and with the cooperation and approval of the EPA. The Army has provided an alternative water supply to all residents where private well water exceeds the cleanup goals established in the Record of Decision. See response to Comment 3.

Comment 4d: Further the parties should step up to their responsibility to monitor and provide for health contingencies of affected people who have had Prolonged exposure to DIMP.

Response 4d:

The Army is not in the position to monitor the health of all people in the Offpost Study Area. The Army is committed to operation of the Offpost Groundwater Intercept and Treatment System to reduce the concentrations of groundwater contaminants to meet or exceed the cleanup goals. As indicated in the response to comment 1c above, the ATSDR is currently conducting an epidemiological study of the health status of offpost residents.

Response 4e: No offpost plan or alternative is acceptable without providing for alternative water
for DIMP affected wells.

Response 4e:

The Army continues to support and provide alternative water supplies to individuals where private drinking water wells contain concentrations of RMA-related contaminants above the EPA health guidelines. See response to Comment 3.

Comment 5:

Rationalizing which ARARs the Federal Government agencies and Shell are willing to live with is unacceptable. Standards set by the State of Colorado should unconditionally be followed (i.e. Chloroform). Also in that same spirit, the parties should conform to Colorado's Sunshine act and

open up all proceedings without exception.

Response 5:

The Army has followed all applicable federal regulatory guidance for Superfund in determining which standards apply to the offpost cleanup effort. Neither CERCLA nor the NPL require that meetings between the Army, Shell, CDH, EPA, and contractors be open to the public. CERCLA, however, does provide for specific public involvement opportunities as part of the overall Superfund process. The Army has provided these opportunities to the public. Additionally, all documents relating to the offpost program are available for your review at the Joint Administrative Records Facility at the Security building at the west gate of RMA. Also, RMA's Technical Review Committee meeting monthly and is open to the public. You are welcome to call the RMA Public Affairs Office at 289-0136 for more information.

Comment 6:

Further planning and alternatives should be based on human health and animal health studies in place of risk assessments. Moreover the actual baseline health of the area should be established prior to determining possible risk exposure. Conventional risk assessments are not respected or believed by the public and, as we have found, most non-governmental professionals. These health studies must account for all health and reproductive risks, not just carcinogenic. We recognize that hazard quotient and hazard index were used, but this we view as risk art and definitely no risk science. Based on information that we believe, risk assessments have a very high degree of fallibility and are not in the least reassuring. We have often heard and seen it written that risk assessments can be made to say almost anything.

Response 6:

See response to comment Ic regarding the establishment of baseline health. Many of the risk assessment procedures and methodologies recommended by the EPA were originally developed by nongovernmental professionals. The Army is legally bound to use EPA-approved procedures and to follow the requirements listed in the NCP. The risk assessment procedures used by the EPA have been developed to be conservative, and final risk estimates are interpreted to be a worst case estimate of risk, meaning that the true risk is likely to be much less.

Comment 7:

Various financial trusts should be established for the care of harms due to exposure of health risks caused by activities connected to past, present and future activities at the RMA. In connection to these trusts, ongoing human and animal health monitoring must be established. This may need to last several generations due to the hormonal nature of some toxics and the saturation levels in the environment.

Response 7:

The EPA, CERCLA, and NCP do not require the establishment of financial trusts specific for potential health effects caused by exposure, nor is the establishment of such a trust appropriate

for RMA. No offpost health effects have ever been documented from RMA activities. The Army is committed to providing adequate funding for both the present and future operation of the Offpost Groundwater Intercept and Treatment Facility until the cleanup goals established in the ROD are achieved. With regard to ongoing human and animal health monitoring, see response to comment Ic above.

Comment 8:

By its very nature clean-up says something is wrong. Even in terms of the proposed plan offpost cleanup could take 15 to 30 years. This and of course prior activities has a very depressing effect on the value of all property in the surrounding area. Therefore a plan needs to be established as part of the offpost proposal for the immediate and ongoing rehabilitation of property values and the real value of the affected communities. None of the alternatives address this.

Response 8:

Implementation of the preferred alternative will further reduce contamination in the offpost area. Contamination has already been reduced offpost through the operation of the boundary treatment systems. By implementing the preferred alternative, the offpost area will experience quicker reduction of contamination, which should protect property values offpost.

Comment 9:

We have heard many anecdotal stories of the stress and strain experienced on a day to day basis by residents of these communities who worry about their health, the affect on their communities, the affect on their property values, and the RMA unknowns. As part of the proposed plan, psychotherapy alternatives should be established and funded to clean-up this most insidious kind of offense against the people.

Response 9:

The Army does not intend to establish a regional outpatient psychotherapy center. The Army has based its offpost cleanup program on the most current and peer-reviewed information regarding chemical toxicity. The Army believes that the procedures followed by the Army, and instituted at other Superfund cleanup sites, are protective of human and ecological health.

Comment 10:

All areas need to be remediated to the highest standards. It is unacceptable for the artificial manipulation of standards by predetermining use, particularly zones 3 and 4 whose designation as urban residential appears to be completely arbitrary since it is zoned rural. Moreover, the established designations don't reflect the value that the community applies to these areas. This is procedurally and bureaucratically tyrannical.

Response 10:

The Army has not predetermined use for zones 3 and 4. The selection of an urban residential land use was made in accordance with local governmental planning documents from Commerce City and Adams County. Based on these planning documents, the likely future use along 96th Avenue is either commeTCial/industrial or urban residential. Selection of an urban residential scenario is more conservative (e.g., results in higher estimated risks) than selection of a commercial/industrial scenario.

Comment 11:

The EPA, USFWS and Shell invoked dispute resolution concerning the MATC values used in the ecological risk assessment. Initially, the value of the MATC for both aldrin and dieldrin in birds of prey was set at 1.6 ppm. The EPA pointed out that 1.6 ppm was the average concentration in the carcasses of 101 bald eagles found dead between 1971 and 1974 (p. VIII-13), and thus could hardly be considered a "protective" level. Furthermore, the EPA wrote that a carcass concentration as low as 0.66 has been associated with deaths from dieldrin poisoning. How is the MATC of 1.1 established by the dispute resolution process protective of the birds' health? The MATC for Endrin; for the Great Horned Owl and for the American Kestrel = 4 (p. II-5-27); can we expect some birds to die as a result of endrin poisoning? How were the synergistic effects of contaminants taken into account? How do you understand the fact that "only a fraction of the eagles who visited the RMA roosting sites during the 1988-1989 season (possibly 100) only 7 returned form the previous year?" (p. III-5-33).

Response 11:

As discussed in Volume VIII of the EA/FS, the Army does not agree with the conclusions drawn by the EPA regarding the literature studies reviewed for dieldrin toxicity. The Army believes that the literature cited by the EPA does not support their contention that dieldrin concentrations of 0.66 ppm were associated with death. These concentrations were present in dead animals but, according to the research authors, were not responsible for the animals' death. As part of the dispute resolution process, several articles published on dieldrin toxicity were reviewed by the dispute resolution parties. Following review and discussion, including input

from the scientist whose study was cited by EPA, a dieldrin concentration of 1.1 ppm was agreed to by the Army, EPA, U.S. Fish and Wildlife Service, and Shell.

The Army does not expect birds to die from endrin poisoning. While the ratio value of 4 does exceed I for the great horned owl and the american kestrel, this is only an indication of potential concern and not an absolute indication of the severity of a potential effect. The maximum allowable tissue concentration (MATC) does not represent a lethal concentration. The interpretation of the MATC is that this concentration is expected to be protective against health effects much less severe than death. Similar to the application of a reference dose in humans, exceedance of the MATC does not indicate unacceptability, only that an increased potential for adverse health effects (not including death) may occur. Additionally, measured tissue concentrations in wildlife were less than those predicted by the food web model, indicating that the modeled tissue concentrations may be overly conservative.

Synergistic effects in wildlife were not evaluated because adequate scientific literature is not available for reference, and EPA has not developed specific guidance on appropriate methods to use in evaluating these effects in wildlife and ecosystems.

With respect to the comment on the number of eagles returning from the previous year, the commentor has apparently misinterpreted the information presented in the EA/FS, which is itself slightly misleading. The EA/FS (vol III, page 5-33) states "The (U.S. Fish and Wildlife) report states that possibly 100 or more eagles visited the RMA roost during the 1988-1989 wintering season and that casual observation of the eagles in early November suggests that up to seven of the eagles may have returned from the previous year." Eagle populations at RMA do not peak until early January. In early November, it is likely that there were only seven eagles at the roosting area at that time. The population continues to increase until January. Over the years, the number of eagles using the RMA roosting sites has increased. It is important to understand that although as many as 100 eagles may use the roosting site during any given season, the number of eagles present on any given day may only be 30 to 40. Eagles do not use the same roost continuously but instead migrate to different areas (sometimes on a daily basis) depending on where the food supply is located. Banding, capture, and observation efforts by the USFWS in recent years have demonstrated that the number of eagles using and returning to the RMA roost sites is at least stable and possibly increasing.

Comment 12:

What is the "hot spot of surficial soil contamination" (p. II-2-56) located within 1/2 mile of the intersection of 96th and Peoria street? Is it located on the property Shell recently purchased? To what extent does it contribute to the high cancer and liver toxicity risks associated with zone 3 and 4? To what extent does it contribute to the contamination of First Creek? What assurances do we have that no homes will be built on top of this "Hot Spot?" Are there any plans to remediate the soil contamination here? If not, please explain.

Response 12:

The NCP requires an evaluation of future land use that is both reasonable, from land use development patterns, and may be associated with the highest (most significant) risk. The Army believes that designation of these zones as rum] residential is inappropriate for 1) current use, because these zones are not currently used as such, or 2) future use, because of the probability of development along 96th Avenue.

The hot spot of surfitial contamination near 96th and Peoria Street is an area of localized higher pesticide concentrations. Concentrations of these pesticides contribute approximately 50 percent of the carcinogenic risks and 25 percent of the noncarcinogenic hazard indices in zones 2 and 3. This area of surficial contamination is not expected to have a significant effect on the pesticide concentrations identified in First Creek. At the present time, there are no cleanup plans for the soil in this area. Estimated risks associated with this soil are within EPA's health guidelines. If it becomes apparent that future land use in this area will be different from the land use evaluated in the EA, the Army will reevaluate the risks in this area and coordinate discussions with the EPA and CDH regarding land use.

Office of the Program Manager

Mr. Dan Mulqueen
Project Leader RMA
We The People
661 Pennsylvania Street
Denver, CO 80203

Dear Mr. Mulqueen:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. Also included are responses to comments you submitted on the Submerged Quench Incinerator (SQI). I hope these responses increase your understanding of both the SQ1 and the offpost cleanup.

Please contact Mr. Bill Thomas, Public Affairs Office, at (303) 289-0136 if you have any questions regarding the SQ1, and Mr. Tim Kilgannon at (303) 289-0201, if you have any questions regarding the Offpost Proposed Plan.

Sincerely,

Eugene H. Bishop
Colonel, US. Army
Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building III, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXCRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

RESPONSES TO LEAGUE OF WOMEN VOTERS COMMENTS

<IMG SRC 0896128C3>

The League of Women Voters of Colorado continues to request that an ADVISORY COMMITTEE, with attendance open to the public be created, at least for the Final Record of Decision. The stakes are high and the Army's continual refusal to have an Advisory Committee is seen as an effort to hold back information. We are not advocating replacing the Technical Review Committee. That body can continue to serve by reviewing information being prepared for public distribution and be a first line conduit for dissemination of information between their various constituencies and the decision-makers.

We would suggest that a process be put in place which would include workshops, public meetings and public hearings leading up to the Final Record of Decision (ROD). The work already done on the Proposed Offpost Plan In the kind of work we would support for each of the components of the Final Plan, and we commend you for making studies available as they are produced, but we would recommend that NO FURTHER DECISIONS be made until the Final Record of Decision.

There are those who feel that the Interim Response Action process has been abused in order to bypass public involvement and the creation of an adequate database. Many studies which have been suggested in the past have not been completed. It is time to stop, look at the total project, bring in an advisory committee and proceed with the caution needed to guarantee that the Cleanup of Rocky Mountain Arsenal will, indeed, be a model to be emulated at other Federal Facilities.

<IMG SRC 0896128C4>

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO LEAGUE OF WOMEN VOTERS COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

Response to General Comment Regarding Citizen

The Army has provided for appropriate citizen involvement in the selection of the remedy as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA). The design and conduct of offpost investigative activities have been carried out with input and cooperation of the Colorado Department of Health, the U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service. All documents relating to the offpost program are available for your review at the Joint Administrative Records Facility (JARDF) at the Security building at the west gate of RMA and local libraries. You are welcome to call the RMA Public Affairs Office at 289-0136 for more information.

A public hearing was not held. However, all comments made at the public meeting are part of the official record and a transcript is part of the Administrative Record. In addition, all public comments sent to the Army were responded to personally and are included as an appendix to the Record of Decision.

The Army has implemented an Interim Response Action (operation of the Offpost Groundwater Intercept and Treatment System) to begin cleanup of groundwater offpost. The Army will conduct groundwater and surface-water monitoring during operation of the treatment system to ensure compliance with the groundwater cleanup standards. If monitoring data suggest that the system is not performing as expected, the Army will modify the treatment system to achieve the cleanup standards.

The Department of Defense is currently evaluating its role in the Site Specific Advisory Board (SSAB) concept at cleanup sites. The RMA has not created an overall plan for participating in a SSAB, should one be established, and cannot until the Department of Defense and the Department of the Army complete their evaluations. The Army is, as you know, expanding the role of the Technical Review Committee to implement some of the SSAB philosophies. As always we encourage any ideas or comments you may have on the Technical Review Committee.

ISSUES RAISED IN LETTER

1) The Dieldrin, DIMP, and Chloroform concentrations in groundwater are well defined. An extensive monitoring effort continues in the offpost area to track these and other compounds. The locations of highest concentrations can be found in the Remedial Investigation Addendum for the Offpost Study Area. This document can be found at the JARDF as mentioned in the above comment.

2) All Lab results taken in November, 1992 were sent to the owners offpost. The Army has taken steps to correct the poor turnaround time, the time from when the wells are sampled to when results are available, it had experienced in the past.

3) Future land use is summarized in the Final Endangerment Assessment/Feasibility Study based on planning information from Adams County and Commerce City. Institutional Controls have been added to the Record of Decision (ROD) to further preclude the possibility of shallow drinking water wells being drilled in areas of higher contaminant concentrations.

4) The Army completed a 90 day mink study with DIMP that concluded that the 600 parts per billion Health Advisory set by the EPA is protective of Human Health and the Environment. The Army is currently evaluating the applicability of the 8 parts per billion level that the Water Quality Control Commission is expected to promulgate in a few months.

5) The Final Decision for cleanup of the Offpost Operable Unit will not be made until the Final ROD is released in early 1994. No final cleanup decisions have been made Offpost, to date.

Office of the Program Manager

Ms. Betsy McBride
President, League of Women Voters
1410 Grant, B-204
Denver, CO 80203

Dear Ms. McBride:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope the enclosed responses increase your understanding of the offpost cleanup. Also included are the comments you submitted on the Offpost Proposed Plan for easier reference to the response.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army

Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denvei, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

U.S. DEPARTMENT OF THE ARMY
RESPONSES TO DENVER REGION GREENS COMMENTS REGARDING
THE ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN
JUNE 21, 1993

Comment 1:

The OSA is not large enough. The limiting of the offpost plan to just the area north of 80th Ave. between the South Platte River and Second Creek, with Barr Lake included, does not make sense, since the Colorado Department of Health (CDH) has found diisopropyl methyl phosphonate (DIMP) west of the South Platte, and has stated it has not conducted adequate testing northeast of Second Creek. We question the criteria used to determine what constitutes "acceptable" and "unacceptable" risk (see comment #5 below) used to rule out inclusion of the other offpost areas east, south, and west of the RMA in the OSA.

Response 1:

The Offpost Study Area was defined as those areas where RMA-related contaminants could be identified in soil, surface water, groundwater, or sediments. The general areas east, west, and south of RMA were not found to contain contaminants that could be directly attributable to RMA activities. The major factor in this finding is the direction of groundwater flow, which is toward the northwest. The Army is cooperating with the Colorado Department of Health with regard to additional sampling in certain areas. If the results from these sampling activities indicate that conclusions of the Endangerment Assessment/Feasibility Study are no longer correct, the Army will evaluate the need to expand the area encompassed by the selected remedy.

Comment 2:

The OSA plan does not address remediation of ground water contamination that has already occurred beyond the current and proposed contaminated ground water intercept and treatment systems. At a minimum, residents who might be exposed to contamination from non-intercepted contamination plumes should be provided with a safe, non-contaminated alternative water supply, not just bottled drinking water.

Response 2:

The Army is aware that contamination exists downgradient of the Offpost Groundwater Intercept and Treatment System. Two new monitoring wells will be installed downgradient of the First Creek Pathway and one new monitoring well will be installed downgradient of the Northern Pathway. The purpose of the three new monitoring wells is to aid in assessing the extent of contamination downgradient of the Offpost Groundwater Intercept and Treatment System. Data collected from these and existing wells will be used to further define the extent of contamination greater than the remediation goals in this area and assist in determining whether modifications to the design of the Offpost Groundwater Intercept and Treatment System are necessary.

The Army is committed to providing alternative water supplies to residents whose drinking water exceeds groundwater cleanup standards as defined in the Record of Decision.

Comment 3:

The OSA plan does not deal with other forms of offpost contamination such as air, surface water, and soil contamination by RMA sources. Assessment of air contamination to offpost areas was made before the Submerged Quench Incinerator (SQI) went into operation; the same for surface water and soil contamination. Again, we also question the criteria used to determine what constitutes "acceptable" health and environmental risk (see #5 below).

Response 3:

The three media mentioned (air, surface water, and soil) were addressed in the Endangerment Assessment/Feasibility Study. The air pathway was determined to be a negligible contributor to potential risks in the Offpost area. Potential health hazards associated with soil contamination are within the acceptable range as defined by the U.S. Environmental Protection Agency.

Following implementation of the selected remedy, the water quality of First Creek will improve. The Army will implement a long-term surface water monitoring program to ensure the effectiveness of the remedy on surface water quality. The Army has also committed to closing the onpost sewage treatment plant, thus eliminating a possible source of contaminants in the First Creek surface water drainage.

Comment 4:

The OSA plan does not deal with compensation of residents living near the RMA for:

a) negative health effects due to current and past exposures to RMA offpost contaminants;

b) continuing expenses to near-by residents for past, present and future health care and health monitoring costs due to exposure to RMA offpost contamination;

c) losses in property values to near-by residents due to contamination of air, soil, and water by the RMA.

Any plan to deal with RMA offpost contamination needs to address these very critical compensation and continuing health care issues.

Response 4:

The risk assessment conducted for the Offpost Study Area does not, by definition, determine whether adverse health effects have occurred or will occur and cannot identify particular individuals likely to suffer health problems because of contamination at a site. The Agency for Toxic Substances and Disease Control, in cooperation with the Colorado Department of Health, have ongoing epidemiological studies near RMA to address the occurrence of health effects and determine if these effects may be attributable to exposure to contaminants from a hazardous waste site. To date, no adverse health effects have been attributed to RMA.

The Army continues to conduct comprehensive monitoring programs in the Offpost area. If data is obtained indicating that chemical concentrations exceed (1) the cleanup standards established for the Offpost OU, or (2) other EPA health standards, the Army will institute appropriate action to reduce the health threat.

Comment 5:

The levels of "acceptable" health risks in offpost areas, as high as five (5) excess cancers per ten thousand (10,000) people, using an Environmental Protection Agency (EPA) suggested level, is obscenely high, and should be raised to at least only one excess cancer per one million (1,000,000) people, and we strongly urge a human health risk factor of no more than one excess cancer per ten million (10,000,000) people. We hold that no one should involuntarily be subjected to health risks on the order of 5 excess cancers per 2,000 people. People living in such conditions are living in environmentally toxic circumstances which should be viewed as repugnant by the EPA or any other regulatory or responsible agency or entity (business, federal facility, etc.). We also point out that there exist different opinions between the CDH and the EPA on what levels of exposure to certain chemicals are "acceptable" or not, e.g., DIMP standards. We support the most protective standards.

Response 5:

Operation of the Offpost Groundwater Intercept and Treatment System will reduce the estimated risks toward 1 x 10-6, the lower end of the acceptable risk range defined by the EPA. It is important to realize that the estimated risks presented in the EA/FS are most likely overestimated, in that several exposure pathways considered do not now occur and may not occur in the future. The army is aware of the recent Water Quality Control Commission standard of 8 ppb DIMP in groundwater. The Army is evaluating the applicability of this standard to the offpost remedial actions.

Comment 6:

There has been no epidemiological study of the residents living near-by the RMA for a range of possible health problems that could reasonably be expected from exposure to RMA contaminants. A limited study by the CDH found elevated levels of certain cancers in some near-by RMA residents. A comprehensive epidemiological study, including former residents who have since moved, should be conducted as part of the OSA plan to assess the possible extent of negative health effects due to RMA contamination, and as a basis for compensation issues.

Response 6:

The Cancer Incidence Study completed by CDH found no conclusive evidence that cancer rates in nearby residences were increased due to RMA contamination. For additional information see

Response No. 4.

Comment 7:

The Record of Decision (ROD) regarding the OSA plan should be delayed until the State of Colorado has determined the State standards for RMA water and air contaminants, e.g., a DIMP groundwater standard.

Comment 8:

The ROD should be delayed until the legal status of the recent 10th Circuit Court of Appeals ruling given the State of Colorado increased standards setting and other authority over RMA clean up activities has been clarified.

Comment 9:

The ROD should be delayed until any legal and implementation questions regarding the applicability of the 1992 Federal Facilities Compliance Act to the RMA have been clarified. Provisions of this ACT bear directly on actions the State of Colorado can take regarding RMA clean up.

Response 7, 8, and 9:

The Army is not required to delay the issuance of the ROD pending State promulgation of standards or court interpretations on various issues. The Army intends to proceed with implementation of the selected remedy to begin Offpost cleanup as soon as possible.

Comment 10:

The ROD regarding the OSA should be delayed until the other outstanding issues mentioned in comments #1 through #6 above have been resolved through a process of negotiation which includes all interested and affected parties, a process which has not been developed at this time. Such a process would include representatives of citizens' groups, environmental and public interest groups, neighborhood associations, city and county and state governments, special district boards, unions, and any other organizations that have an interest in such a decision, e.g., public health associations, etc.

Response 10:

The Army has provided for public involvement opportunities for the public as required by the National Contingency Plan and the Comprehensive Environmental Responsibility, Compensation, and Liability Act. All documents relating to the offpost program are available for your review at the Joint Administrative Record and Document Facility at the Security building at the west gate of RMA. You are welcome to call the RMA Public Affairs Office at 289-0136 for more information.

Office of the Program Manager

Mr. T. Philip Hufford
Denver Region Greens
1071 Madison Street
Denver, CO 80206

Dear Mr. Hufford:

Thank you for providing comments on the Offpost Proposed Plan for Rocky Mountain Arsenal. The Army appreciates the large number of comments submitted on the Offpost Proposed Plan. I hope the enclosed responses increase your understanding of the offpost cleanup. Also included are the comments you submitted on the Offpost Proposed Plan for easier reference to the response.

If you have any further questions please contact Mr. Tim Kilgannon of my staff at (303) 289-0201.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Enclosure

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128C6>

I am a resident of the "Offpost Study Area" and am directly affected by contamination from the Rocky Mountain Arsenal. I join with others in my community in opposing the Army's proposed plan. We urge that it be amended to address broad community concerns with a comprehensive solution to widespread contamination problems that the Army and Shell Chemical Company have failed to address, to date, and which currently poison domestic water supplies and private property for miles to the north and northwest of the Rocky Mountain Arsenal. Contaminants include deadly pesticides that were banned by the EPA years ago, by-products of chemical warfare agents, and other toxic substances.

I demand that the U.S. Army and Shell Chemical Company develop and implement a plan to: 1) eliminate all current sources of toxic exposure to citizens affected by off-site poisons from the Rocky Mountain Arsenal; 2) provide a permanent, alternative, uncontaminated source of water to residents with any level of RMA toxins in their water; 3) conduct comprehensive offpost soil and water clean-up that meets all applicable federal and state guidelines, including RCRA; 4) that no final "Record of Decision" be issued until the Colorado Water Quality Control Commission adopts standards for unique, unregulated, Arsenal-related poisons, such as "DIMP"; and 5) that the Army will meet or exceed those standard(s) in all groundwater clean-up actions on and offpost.

My additional comments about the Army's inadequate clean-up plan are these:

(see reverse side for continued comments)

<IMG SRC 0896128C6>
<IMG SRC 0896128C7>

Mr. and Mrs. Owen Bakes
11460 Peoria Street
Henderson, Colorado 80640

Dear Mr. and Mrs. Bakes:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The preferred alternative for the Offpost Operable Unit will clean up contamination that came from RMA. The Army has spent nine years studying the best possible way to eliminate potential health threats offpost. We believe the Offpost Preferred Alternative goes beyond what is required by the U.S. Environmental Protection Agency (EPA). In addition, the Army cannot legally provide offpost residents with a new water supply because legal chemical health guidelines are not being exceeded. The Army will, as it has in the past, provide offpost residents an alternative water supply if applicable EPA health guidelines are not being met in their private well water. Finally, the Army believes that all applicable federal and state guidelines are being met for soil and water offpost.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the EPA DMIP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability
of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

<IMG SRC 0896128C8>

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128C9>
Office of the Program Manager

Mr. Jack E. Clancy
12220 Peoria
Henderson, Colorado 80601

Dear Mr. Clancy:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for the Rocky Mountain Arsenal (RMA). Public feedback is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I have ensured that the Army would further study the DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMIP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is safe for consumption and for the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System treats the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

Based on our current data, all residents in the offpost study area are drinking water that meets all applicable or relevant and appropriate federal and state regulations. Army continues to extensively monitor drinking water wells in the offpost area. If levels of Arsenal-Related chemicals were to rise above health guidelines in the drinking water for any resident, the Army will provide an alternate water supply to that resident.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022
<IMG SRC 0896128D>

I am a resident of the "Offpost Study Area" and am directly affected by contamination from the Rocky Mountain Arsenal. I join with others in my community in opposing the Army's proposed plan. We urge that it be amended to address broad community concerns with a comprehensive solution to widespread contamination problem that the Army and Shell Chemical Company have failed to address, to date, and which currently poison domestic water supplies and private property for miles to the north and northwest of the Rocky Mountain Arsenal. Contaminants include deadly pesticides that were banned by the EPA years ago, by-products of chemical warfare agents, and other toxic substances.

I demand that the U.S. Army and Shell Chemical Company develop and implement a plan to: 1) eliminate all current sources of toxic exposure to citizens affected by off-site poisons from the Rocky Mountain Arsenal; 2) provide a permanent, alternative, uncontaminated source of water to residents with any level of RMA toxins in their water; 3) conduct a comprehensive offpost soil and water clean-up that meets all applicable federal and state guidelines, including RCRA; 4) that no final "Record of Decision" be issued until the Colorado water Quality Control Commission adopts standards for unique, unrelated, Arsenal-related poisons, such as "DIMP"; and 5) that the Army will meet or exceed those standard(s) in all groundwater clean-up actions on and offpost.

My additional comments about the Army's inadequate clean-up plan are these:

(see reverse side for continued comments)

<IMG SRC 0896128D1>

Office of the Program Manager

Mr. and Mrs. Steve Evanoff
11890 Peoria Street
Henderson, Colorado 80640

Dear Mr. and Mrs. Evanoff:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The preferred alternative for the Offpost Operable Unit will clean up contamination that came from RMA. The Army has spent nine years studying the best possible way to eliminate potential health threats offpost. We believe the Offpost Preferred Alternative goes beyond what is required by the U.S. Environmental Protection Agency (EPA). In addition, the Army cannot legally provide offpost residents with a new water supply because legal chemical health guidelines are not being exceeded. The Army will, as it has in the past, provide offpost residents an alternative water supply if applicable EPA health guidelines are not being met in their private well water. Finally, the Army believes that all applicable federal and state guidelines are being met for soil and water offpost.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the EPA DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022
<IMG SRC 0896128D2>

I feel there are still some unresolved issues related to the Offpost Proposed Plan. First, however, is the issue of the appropriateness of the Plan at this time. I submit that the intent of the FINAL RECORD OF DECISION is to include all long-term decisions under one process. I would, therefore, request that no further action be taken an the Offpost Plan. Continue operation of the offpost water treatment facility and use the next year or so to gather data as to what contaminants are still getting past it, where else contaminants are showing up, and how best to handle the land use issues.

Here is a list of the issues I feel should be addressed before a final decision is made:

1. CITIZEN INVOLVEMENT: There is a significant difference between a Technical Review Committee and an Advisory Committee or Board, both in function and in makeup. I would like to see both! The information I have seen so far about Site Specific Advisory Boards leads me to suggest you explore that type of approach for the final ROD.

2. CUMULATIVE EFFECTS: By looking at each action as a separate unit, there is a good chance that the cumulative effect of all actions will be much more detrimental to human health and the environment than is being suggested by the current approach. I'll be more comfortable with the Final Decision after I've seen some more data on long-term, cumulative effects of such things as DIMP, dieldrin and chloroform. How much of each is added to the life-time exposure for people by the combination of all actions at Rocky Mountain Arsenal and what are the risks?

3. DATABASE: Until all of the data is in about the health effects of some of the chemicals of note, it is premature to decide on the final level of cleanup. My reading of the preferred alternative for the Off Post Plan is that further monitoring and upgrades would be expected, just as they have been for the NW Boundary System. Since mink studies did not work out, there must be some way to test for harm. Without proof that there is no harm, I would recommend total cleanup. My guess is that it would be less expensive to conduct further studies than to remove all contaminants. Even one person able to win a suit that he or she has been harmed by the DIMP (for instance) would hurt the Army's credibility at all of its cleanup sites! Better safe than sorry.

<IMG SRC 0896128D3>

Before a final decision is made, I would recommend retesting all of the wells in and near the study area to verify that the current system is working as designed. Public availability of the data would add to the credibility of the Army and Shell. Also, the levels and types of contaminants on the soil could be verified on a smaller scale, perhaps even lot by lot, before final land use restrictions and decisions are agreed to by Adams County, Commerce City and any other land use decisionmakers.

4. ARARs: Given the historical propensity to sue, someone is bound to push for State standards and/or guidelines, especially when they are more stringent than those of EPA. It seems to me to be a better use of taxpayer money to try to meet the most stringent levels as a part of the Final Plan, rather than to spend years defending the decision in court.

5. LAND USE: There seen to be legitimate concerns for the future land use of the area. By postponing the final decision on the Offpost area, you will have more time to work with the appropriate land use decisionmaking bodies in order to guarantee safe use of the land and/or adequate cleanup for the allowed land use.

You have done a good job so far and the cleanup is at a critical point. People are not

nearly as easy to predict as chemical compounds, but it is a safe bet that support is more likely when stakeholders have "bought into the decisions."

None of these comments should come as a great surprise to you, but I want them in the official record, in part because my experiences with both public participation and the planning process lead me to hope that you will do everything possible to prevent embarrassing problems later. I have been a member of the Technical Review Committee since 1988 and, honestly, want to be proud of what is accomplished at Rocky Mountain Arsenal.

<IMG SRC 0896128D4>
Office of the Program Manager

Ms. Clara Lou Humphrey
9390 W. 1st Avenue
Lakewood, Colorado 80226

Dear Ms. Humphrey:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is an integral part of the cleanup process at Rocky Mountain Arsenal. I will respond to your comments in the order we received them.

I appreciate your request to delay the Offpost Final Record of Decision until monitoring of the Offpost Treatment System has been completed for one year. The Army will be constantly reevaluating the Offpost Treatment System through our ongoing monitoring program to examine whether modifications are necessary. The Final Record of Decision does not include the details of the monitoring programs and modifications to the Offpost Groundwater Treatment System. The Final Record of Decision states the selected alternative for cleanup of the Offpost Operable Unit. This selected alternative is based on nine years of study. Subsequent documents, including an implementation plan, will be completed detailing the offpost monitoring to be conducted and any changes to the selected alternative that are based on monitoring data. Listed below are responses to your numbered comments:

1. The Department of Defense is currently evaluating its role in the Site Specific Advisory Board (SSAB) concept at cleanup sites. The RMA has not created an overall plan for participating in a SSAB, should one be established, and cannot until the Department of Defense and the Department of the Army complete their evaluations. The Army is, as you know, expanding the role of the Technical Review Committee to implement some of the SSAB philosophies. As always we encourage any ideas or comments you may have on the Technical Review Committee.

2. The Arm evaluated the long-term and cumulative health effects of the chemicals offpost. These effects were analyzed in the Offpost Risk Assessment. In fact, the Offpost Risk Assessment evaluated the cumulative risks of contamination offpost over a 70- year period, which is stipulated by U.S. Environmental Protection Agency (EPA) guidance. The risks presented in the Offpost Proposed Plan are the long-term risks of the contamination offpost without considering the benefit of Offpost Treatment System operations.

3. One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I have ensured that the Army complete additional DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

The land use projections were used for the Offpost Risk Assessment. The Offpost Risk Assessment analyzes potential risks from chemicals to the human body. These land use projections in no way mean that the offpost area has been or will be zoned in a particular fashion. The land use projections we established for the Offpost Risk Assessment are the most conservative for the zone studied in the Proposed Plan. Conservative land use projections are the human health problems that could possibly develop and pose the highest potential risk. Say, for instance, that in zones 3 and 4 the Army projected urban residential land use. According to Adams County and Commerce City projections, the land in these two zones will most likely be industrial/commercial in the future, but the actual land use won't be decided until the land is developed. The Army decided that by using urban residential land use for the Offpost Risk

Assessment, we were examining the worst-case risk assessment and thus providing the best cleanup alternative.

Soil contamination was evaluated in the Remedial Investigation and subsequently in the Offpost Risk Assessment. After evaluating wind patterns at the Arsenal and concentrations of contaminants as they travel from onpost to offpost, the Army concluded that offpost soils are well within EPA's health guidelines. Over 70 percent of the risk calculated offpost (prior to construction of the Offpost Treatment System) was due to groundwater contamination; thus surface water, soil, and sediment are minor contributors to the overall risk. Institutional controls have been incorporated into the Offpost Preferred Alternative based on State, EPA, and public comments. These institutional controls will prevent offpost residents from drilling new drinking water wells in groundwater that does not meet applicable federal and state standards.

4. First, human health and the environment are not impacted by the fact that the Army has not adopted state standards as Army standards. Second, the Army does not believe that the state standards are drinking water standards. Even though the Army does not believe the state standards are drinking water standards, the differences between federal and state standards are described below.

For the chemicals of concern for the Offpost Study Area, only two chemical standards within the state standards are more stringent than the federal standards. Dieldrin, a pesticide, has both federal and state standards that are below the chemical detection limit, which means, with current technology, the Army cannot measure to the federal or state standard. When a chemical standard is below the detection limit treatment must be made to that detection limit.

The other chemical where the state regulations differ is chloroform. The Colorado standard for chloroform is 6 parts per billion. The Army treats chloroform in the Groundwater Treatment Systems to approximately 12 parts per billion. Municipal water supplies for drinking water in the Denver Metro Area typically have chloroform concentrations of 10-50 parts per billion as a result of the chlorination process, which kills bacteria living in the water supplies.

Again, the Army believes that the federal drinking water standards are protective of human health.

5. See response to comment number 3.

I hope this information helps to alleviate your concerns. I appreciate your continued support of the RMA program and the input you give the Army with the Technical Review Committee. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128D5>
Office of the Program Manager

Mr. and Mrs. John Humphreys
11690 Peoria Street
Henderson, Colorado 80640

Dear Mr. and Mrs. Humphreys:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for the Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The Army, as stated in the Proposed Plan, will spend more than 70 million dollars cleaning up the groundwater (water beneath the ground surface) at the north and northwest boundaries of RMA and offpost during the next 15 to 30 years. The Army has already spent over 15 million dollars to treat the groundwater offpost. Groundwater offpost, even though within the U.S. Environmental Protection Agency health guidelines, contributes approximately 70 percent of the health risk offpost. For this reason, the Army decided to clean up the groundwater to further reduce the possible risk.

The Army, in cooperation with Tri-County Health Department, samples private wells offpost on a quarterly basis. The Army will notify Tri-County Health Department about your well so that it can be sampled as soon as possible.

If you have any questions regarding the sampling procedures of your private well(s), please contact Tri-County Health Department at (303) 288-6816. Questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at (303) 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128D6>

I am a resident of the "Offpost Study Area" and am directly affected by contamination from the Rocky Mountain Arsenal. I join with others in my community in opposing the Army's proposed plan. We urge that it be amended to address broad community concerns with a comprehensive solution to widespread contamination problems that the Army and Shell Chemical Company have failed to address, to date, and which currently poison domestic water supplies and private property for miles to the north and northwest of the Rocky mountain Arsenal. Contaminants include deadly pesticides that were banned by the EPA years ago, by-products of chemical warfare agents, and other toxic substances.

I demand that the U.S. Army and Shell Chemical Company develop and implement a plan to: 1) eliminate al1 current sources of toxic exposure to citizens affected by off-site poisons from the Rocky Mountain Arsenal; 2) provide a permanent, alternative, uncontaminated source of water to residents with any level of RMA toxins in their water; 3) conduct a comprehensive offpost soil and water clean-up that meets all applicable federal and state guidelines, including RCRA; 4) that no final "Record of Decision" be issued until the Colorado Water Quality Control Commission adopts standards for unique, unregulated, Arsenal-related poisons, such as "DIMP"; and 5) that the Army will meet or exceed those standard(s) in all groundwater clean-up actions on and offpost.

My additional comments about the Army's inadequate clean-up plan are these:

(see reverse side for continued comments)

<IMG SRC 0896128D7>
Office of the Program Manager

Mr. J.H. Irthum
11230 Peoria Street
Henderson, Colorado 80640

Dear Mr. Irthum:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The preferred alternative for the Offpost Operable Unit will clean up contamination that came from RMA. The Army has spent nine years studying the best possible way to eliminate potential health threats offpost. We believe the Offpost Preferred Alternative goes beyond what is required by the U.S. Environmental Protection Agency (EPA). In addition, the Army cannot legally provide offpost residents with a new water supply because legal chemical health guidelines are not being exceeded. The Army will, as it has in the past, provide offpost residents an alternative water supply if applicable EPA health guidelines are not being met in their private well water. Finally, the Army believes that all applicable federal and state guidelines are being met for soil and water offpost.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the EPA DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U. S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022
<IMG SRC 0896128D8>

Off-Post Proposed Comments
Program Manager for Rocky
Mountain Arsenal

AWN - Colonel Eugene H. Bishop

June 18, 1993

We would request that this additional investigation be maintained for the 30 year life expectancy of the plan. It is our understanding that the Dept. of the Army has cooperated with other entities on similar matters in the past. My client believes the additional cost of this requested monitoring will be minimal as compared to the increase in safety of the people utilizing my client's water storage facilities and irrigation water rights.

Of course, if you have any questions in this matter, or wish to discuss this further, do not hesitate to contact me.

Very Truly Yours,

<IMG SRC 0896128D9>

Office of the Program Manager

Mr. Steven L. Janssen, P.C.
745 Walnut Street
Boulder, Colorado 80302

Dear Mr. Janssen:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

The Offpost Proposed Plan outlines a preferred alternative that is based on nine years of study. Following selection of a final alternative, the Army will produce an Implementation Plan that will address the monitoring of offpost groundwater and surface water. This document will be available for review in the joint Administrative Record and Document Facility.

Over the years the Army has documented a decrease of contaminants offpost, primarily due to the Boundary Groundwater Treatment Systems. With the addition of the Offpost Treatment System, which was fully operational in June 1993, contaminant concentrations will be reduced even further. The Treatment Systems are also important in improving the quality of water in First Creek as groundwater discharges into First Creek in some areas, including just north of the RMA
boundary.

The DIMP contamination you are referring to in Barr Lake was detected only once, approximately 100 times below the U.S. Environmental Protection Agency's (EPA's) Health Advisory level. No detections of DIMP were found in the many other water and sediment samples taken in Barr Lake. In addition, samples taken in the canals and creeks that eventually discharge to Barr Lake have shown only sporadic detections of DIMP at very low concentrations (more than 100 times below EPA's Health Advisory level).

Because chemical standards are being met in the canals and Barr Lake, the Army cannot provide funds to your client. As mentioned above, the Army will produce monitoring plans and will make these available for public review. The Army looks forward to working with you in the future.

I hope this information helps to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128E>
Office of the Program Manager

Mr. Jeffery D. Kanost
12505 Elmendorf Place
Denver, Colorado 80239

Dear Mr. Kanost:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The Army will continue to keep you informed about RMA activities and meetings. If you wish to discuss your concerns in more detail, please contact Mr. Tim Kilgannon at the number listed below.

The Offpost Proposed Plan identified only two areas to the north and northwest of the Arsenal boundary that require cleanup. In these north and northwest areas, only groundwater, which is water beneath the ground surface, requires cleanup. Montbello is not affected by RMA groundwater because groundwater travels to the north and northwest from the Arsenal and -not south toward Montbello.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene R Bishop
Colonel, US. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

May 19, 1997

Col. Eugene H. Bishop
Program Manager for the
Rocky Mountain "Arsenal
Building 111-RMA
Commerce City. Colo 800222-22180

Dear Col. Bishop

Concerning the offpost Proposal plan for groundwater clean-up of the north boundary containment system. NBCS.

I have reviewed the proposed plan and understand that the army plans to treat the groundwater thru extraction wells. Using plan N-4; 0ffpost Intercept and treatment Systems. I believe that there is four major problems with this plan.

First the length of time to perform the clean-up. In N-4 the time frame is 15 to 30 years. Yet in your proposal N-5: Expansion of offpost Intercept and Treatment System plans only 10 to 20 years. After reading both proposals they basically are the same, with N-5 has an increase of groundwater being cleaned-up at a rate of 90 gpm more. Thank to the increase of extraction wells and additional recharge trenches. It is my belief that the groundwater may be cleaned up by use of N-5 with additional potential future modification as needed to insure a complete-clean-up. There is no reason that the Army can't clean-up the groundwater off the Rocky Mountain Arsenal.

Second is the Army's position that 600 ppb of DIMP is the only guidelines needed. I have a personnel believe that 600 ppb of DIMP is not adequate number. This number is inadequate do to the increase on cancer and kidney problems of residents within the boundaries of the offpost study areas's. Being a firefighter within the area known as the offpost study area. I have witnessed an increase of cancer, kidney or liver problems within this area. Personally my family has been subjected to the Army's contamination, either by air contaminants, or by our water supply for over 37 years. I watched my Father having to have a kidney removed and obtain leukemia cancer and die. My belief is that the standards for DIMP and the other chemicals listed in your information sheet (Table 1) is set to high. If DIMP was the only problem I would still be opposed to the 600 ppb rating. However by the Army's own determination there are 34 chemicals that have contaminated the land/air/water leaving the Rocky Mountain Arsenal. EPA's figures are inadequate!

<IMG SRC 6128E0>

Third is the Army's commitment to continued monitoring program for private wells. I asked both Tri-County and the Army why analytical reports from November 92 we not released. Mr. Charlie Scharmann stated that it takes months to obtain analytical reports. I find this unacceptable. I know that Analytical become unstable if not properly cared for and most have a period of time when the material being analyzed become unusable. Most analytical laboratories are able to complete results within in a period of ten days to two (2) month. Why does it takes the Army over eight (8) months to obtain a report, this is beyond me.

Forth is my belief that the Army and Shell Oil should provide adequate water supply to all of the residents who have had their water contaminated. This does not mean just bottled water, but water service from a South Adams Water District. The Army has created a monster for families, there property values have become on nonexistence. Their lives have been changed for the worst. And the Army and Shell Oil has not offered to assist the residents who they have effected.

As a final statement and questions to the Army / Shell Oil Co. I would like to know why the Army chose N-4, a system that cost more (by their own determination), takes more time to complete and jeopardizes the residents of Adams County My second question is why does the Army believe that it is above legal regulation. If the company I work for contaminated groundwater, it would be sued for the clean-up and any hardship that the residents may have endured and pay fines and penalties. The last question is what does the Army / Shell Oil Co. plan to due for the residents who's ground water they have effected. I believe that the Army must start the clean-up

, But using only N-4 plan is only half a plan. Since N-5 follows the same guidelines as N-4 The Army should add additional systems listed in N-5 to remediate the problem of groundwater.

If there is any addition communication, feel free to call me at the phone number list below or write to the address listed below.

<IMG SRC 0896128E1>

Office of the Program Manager

Mr. Carl P. Kern
10020 Havana
Henderson, Colorado 80640-8439

Dear Mr. Kern:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

Alternative N-4 was chosen as the Army's preferred alternative over Alternative N-5, an expansion to the Offpost Treatment System, for two major reasons. The Offpost Treatment System, a major component of Alternative N-4,is already in operation has been for five months. Secondly, the most important component of the preferred alternative, N-4, is the flexibility of improving the Offpost Treatment System as the Army evaluates its performance. For these reasons, the Army selected the use of operational data as a basis for any future expansion of the Offpost Treatment System (Alternate N-4) instead of using a computer model as a basis for any expansion as called for in alternative N-5. With the flexibility of N-4, water monitoring results will show the Army how best to shorten and improve the cleanup time frame in the offpost area, which may include the addition of more extraction and recharge wells or trenches. Finally, the Offpost Treatment System
was designed with extra capacity so that additional wells can be connected if determined necessary.

One of the major concerns to offpost residents is the DIMP contamination in offpost groundwater. Since my tenure began at RMA, I have made sure that the Army conducted further assessment of the DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMP Health Advisory of 600 parts per billion is safe. Overall, Army has conducted more than 30 separate animal studies with DRvIP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion.

The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

The EPA conducts extensive analyses before setting safe chemical standards. The Army, like other Superfund cleanup sites, must follow the guidance and regulations the EPA has selected. If you have further questions regarding EPA's standard-setting criteria, I suggest calling the Denver Office (EPA, Region VM at (303) 294-7559 for information.

I apologize for the poor turnaround time on the private well results. Since the beginning of this year, the Army has refined the sampling and analysis process so that well results can be given to each homeowner more quickly. The turnaround time from well sampling to well results will still take approximately three months to complete because of the laboratory quality control and quality assurance that is done for each chemical sample. The laboratory quality control and quality assurance ensures that the chemical results are correct. The turnaround time, from well sampling to chemical results, will be much improved than it has in the past.

The Army has committed to treating groundwater offpost with Alternative N-4, with improvements as necessary. This alternative will achieve clean up levels that are more strict than EPA's own health guidelines, based on the Offpost Risk Assessment The Army believes that this will benefit offpost residents for many years to come. As the groundwater aquifer becomes cleaner, everyone offpost will benefit. The Offpost Risk Assessment evaluated all ways of exposure through water, soil, sediment, and air, and showed that residents offpost are living well within EPA's safe health guidelines.

Finally, the Army is required to follow all applicable federal and State of Colorado regulations, as any other Superfund site must do. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,
Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128E2>
<IMG SRC 0896128E3>
Office of the Program Manager

Mr. Jess Masunaga
10730 Brighton Road
Henderson, Colorado 80640

Dear Mr. Masunaga:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

One of the major concerns to offpost residents is the DIMP contaminant in groundwater. Since my tenure began at RMA, I have ensured that the Army would further study the DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is safe for consumption and for the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

Based on our current data, all residents in the offpost study area are drinking water that meets all applicable or relevant and appropriate federal and state regulations. The Army continues to extensively monitor drinking water wells in the offpost area. If levels of Arsenal-related chemicals were to rise above health guidelines in the drinking water for any resident, the Army will provide an alternative water supply to that resident.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128E4>
<0896128E5>
<IMG SRC 0896128E6>
<IMG SRC 0896128E7>
Office of the Program Manager

Mr. Glen Murray
11010 Havana Street
Brighton, Colorado 80601

Dear Mr. Murray:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The preferred alternative for the Offpost Operable Unit will clean up contamination that came from RMA. The Army has spent nine years studying the best possible way to eliminate potential health threats offpost. We believe the Offpost Preferred Alternative goes beyond what is required by the U.S. Environmental Protection Agency (EPA). In addition, the Army cannot legally provide offpost residents with a new water supply because legal chemical health guidelines are not being exceeded. The Army will, as it has in the past, provide offpost residents an alternative water supply if applicable EPA health guidelines are not being met in their private well water. Finally, the Army believes that all applicable federal and state guidelines are being met for soil and water offpost.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the EPA DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201 Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128E8>
Office of the Program Manager

Mr. James E. Nelson
11810 East 124th Avenue
Henderson, Colorado 80640

Dear Mr. Nelson:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The preferred alternative for the Offpost Operable Unit will clean up contamination that came from on-post contaminants, including the pesticides you reference in your letter. The Army has spent nine years studying the best possible way to eliminate potential health threats offpost. We believe the Offpost Preferred Alternative goes beyond what is required by the U.S. Environmental Protection Agency (EPA). In addition, the Army cannot legally provide residents offpost with a new water supply because health guidelines are not being exceeded. The Army will, as it has in the past, provide offpost residents an alternative water supply if applicable health guidelines are not being met in their private well water. Finally, the Army believes that all applicable or relevant and appropriate requirements federal and state are being met for soil and water offpost.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the EPA DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DROP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128E9>

Col. Eugene H. Bishop
Program Manager
Rocky Mountain Arsenal
Building 111-RMA
Commerce City, Colo
80022-218

Attention: Col. Eugene H. Bishop
AMXRM-PM

Reference: Proposed Plan For The Rocky Mountain Arsenal
OffPost Study Area
Citizen Comment

The Army has presented a proposed plan on the Offpost in great detail with studies to support their position.

The following are areas of comment, question, and concern.

The Army has proposed land uses.

The Army has proposed land use for development in the future, defining future as now and development as residential and or industrial.

"The "Shell" Property on the north side of 96th along Peoria Street and properties at approximately 100th Avenue."
Rezoned to I-2. May 1992

This land was rezoned without public notice as required by zoning practices.
Why is this land already rezoned when this proposal is still in the proposed stage? Please explain.

The defined zones along E. 96th Avenue to Peoria are already zoned industrial as above thus making the evaluations of land use within these zones incorrect.

Industrial zoned land on the north side of the Arsenal places people working in an environment between two treatment plant systems and in some instances less than one mile from the Submerged Quench Incinerator.

We are unable to find documentation of industrial development of Army Bases. Please explain why the Army has chosen to develop land on this particular base.

<IMG SRC 0896128F>

We are unable to find any information explaining how contaminated land is rendered ready for development. In the offpost study area the only visible changes we have been able to observe is the demolition of homes/buildings and in some areas the planting of anti-contaminate grass.
Please explain and clarify.

Housing foundations and sidewalks were left in place on properties north of the Arsenal along E. 96th Avenue between Highway 2 and Peoria Street.
Please explain and clarify.

The Army has proposed health risks and assessment.

The Army has identified chemicals of concern in this offpost area. We think based on our own knowledge and exposure that these chemicals are only the tip of the iceberg or in this case 'the tip of the plume. As advanced as the testing methods are we think that more research and accurate technology is needed in this area.

We now know that we have been exposed to numerous known and unknown chemicals, metals, pesticides, and by products of over a twenty year period.
We do not wish at this time to speculate as to which statistic we may be classified as.

The Army has proposed remedial alternatives.

We feel that measures should be taken to clean up contaminants identified in the ground water.

Summary

We feel that the Army has devoted a great deal of time, manpower, and money in preparing this proposal and in creating an illusion of well-being.

<IMG SRC 0896128F0>

Office of the Program Manager

Albert H. and Barbara Ohle
P.O. Box 129
Dupont, Colorado 80024-0129

Dear Mr. and Mrs. Ohle:

Thank you for your comments. The Army appreciates the many number of comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal. Public input is an integral part of the cleanup process at Rocky Mountain Arsenal. I will respond to your comments in the order we received them.

I hope my responses to your comments will relieve some of the concerns you both have regarding the Army's Proposed Plan for the Offpost Study Area and treatment of groundwater offpost

Your first comments are in regard to the land use the Army projected for the future in the offpost area. The Army did not rezone areas offpost The land use projections were used in the Human Health Risk Assessment only. The Human Health Risk Assessment analyzes potential risks from chemicals to the human body. These land use projections in no way mean that the offpost area has been or will be zoned in a particular fashion. The land use projections we established for the Human Health Risk Assessment are the most conservative for every zone we studied in the Proposed Plan. Conservative land use projections are the human health scenarios that could conceivably develop in a certain zone and that could pose the highest risk. Say, for instance, that in zones 3 and 4, where you use to live, the Army projected urban residential land use. According to Adams County and Commerce City projections, the land in these two zones will most likely be industrial/commercial in the future, but the actual land use won't be decided until the land is developed. The Army decided that by using urban residential land use for the Human Health Risk Assessment, we were examining the worst-case risk assessment and thus providing the best cleanup alternative.

The Army and the U.S. Fish and Wildlife Service are working cooperatively to cleanup the Arsenal so that it can become a wildlife refuge. No industrial development of the Arsenal will occur. Also, only Commerce City and/or Adam County can outline a timeframe for development of land offpost.

The Army, through its Preferred Alternative, is cleaning up the offpost area. During the cleanup timeframe, development of land by Commerce City or Adams County may occur as long as complete safety of human health and the environment is ensured. The Army studies supported by the Environmental Protection Agency, show that people residing offpost will be safe.

Demolition of homes was completed to install the Offpost Treatment System. The Army is not aware of an anti-contaminate grass. The Army did plant native grass seed offpost, once the demolition of buildings and the offpost groundwater treatment system were completed. This planting was done in order to restore the areas damaged by construction activities.

Once residents vacated the premises, the above-ground structures were demolished to avoid potential safety hazards with the abandoned buildings. Since the sidewalks and foundations pose no safety hazard, they were left in place.

The health risks presented in the Offpost Proposed Plan are present-day risks. in the offpost area without accounting for cleanup that is being accomplished by the Offpost Treatment System. The Army has committed to the Offpost Groundwater Treatment System, any necessary modifications to the system, and continued monitoring offpost as part of the Preferred Alternative. As the groundwater treatment systems continue to operate, risks to human health and the environment will further decrease. The Army believes that evaluation of the contaminants and associated human and environmental risks was very detailed.

I hope this information has helped to alleviate your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0239. Thank you again for your comments.

Sincerely,
Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, US. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128F1>
Office of the Program Manager

Ms. Annie R. Redmond
5331 Troy Street
Denver, Colorado 80239

Dear Ms. Redmond:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The Offpost Proposed Plan identified only two areas to the north and northwest of the Arsenal boundary that require cleanup. In these areas, only groundwater, which is water beneath the surface, requires cleanup. Monthello is not affected by RMA groundwater because groundwater from RMA travels north and northwest and not south toward Montbello.

In addition, the Offpost Proposed Plan summarizes the Off'post Health Risk Assessment that was completed. The Offpost Health Risk Assessment showed that Montbello residents are not affected by offpost contamination. Also, an Onpost Health Risk Assessment will be completed before cleanup begins on RMA. The Onpost Health Risk Assessment will evaluate the health risks to the onpost and offpost plants, animals, and humans before cleanup begins. The Army will not begin cleanup unless it determines that the public's health is protected.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:
Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street, Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky Mountain Arsenal, Commerce City, Colorado 80022

May 8, 1993

Offpost Proposed Comments
Program Manager for Rocky Mountain Arsenal
Attention: Colonel Eugene H. Bishoo
Building 111
Rocky Mountain Arsenal
Commerce City, Colorado 80022-2180

Dear Colonel Bishop,

You have asked me to write a letter expressing my concern about your water cleanup policies. I greatly admire your desire and efforts to clean up the Arsenal problem, however in the process, you have practically destroyed an excellent, small, minority owned business.

I represent The Fountain of Health. I have been selling natural artesian water now for 13 years. I well it for 25 cents per gallon. I have followed all of the rules of the Colorado Department of Health. Because of the purity, the State Department has issued a special waiver saying I DO NOT HAVE TO CHLORINATE, FILTER OR TREAT THE WATER.

I was never contacted when you started the program to deliver free water to my customers. The requirement that this water be delivered to people's homes, should not nave been considered one of the requirements of the program. The only consideration to deliver it to people's home would be, if they are elderly, disabled and cannot drive. The rest of the people should be issued food stamps or some kind of coupon redeemable anywhere. This would save the tax payers, literally millions and millions of wasted dollars.

Why should the customers drive here and Pay $0.25 when they can have it delivered to their door for nothing. This policy has had a devastating affect on my business. In the winter time I have driven around and taken pictures of piles and piles of frozen and busted deeprock bottles. I have seen many bottles in pig pens and horse corrals. This does not seem like a sensible way to handle the problem.

<IMG SRC 0896128F2>
Office of the Program Manager

Ms. Grace Russell
13185 Brighton Road
Brighton, Colorado 80601

Dear Ms. Russell:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA.

The Army was not responsible for providing residents with bottled water offpost. The State of Colorado provided bottled water to offpost residents, even though all drinking water from private wells meets existing drinking water regulations.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128F3>
<IMG SRC 0896128F4>
<IMG SRC 0896128F5>

Mr. and Mrs. Roger Sable
12270 Brighton Rd. P.O. Box 161
Henderson, Colorado 80640

Dear Ms. Sable:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

One of the major concerns to offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMP Health Advisory of 600 parts per billion is safe. Overall, Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

Based on current data, all residents in the offpost study area are drinking water that meets all applicable or relevant and appropriate federal and state requirements. The Army continues to extensively monitor drinking water wells in the offpost area. If levels of Arsenal-related chemicals were to rise above health guidelines in the drinking water for any resident, the Army will provide an alternate water supply to that resident.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Mr. Kilgannon and Mr. Charles Scharmann both spoke at the Public Meeting. They can both be reached at the number listed above. Thank you again for your comments.

<IMG SRC 0896128F6>

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

June 21,1993

Leif R. Southwell
11355 N Racine CT
Henderson Co, 80640

Offpost Proposed Plan Comments
Program Manager For Rocky mountain Arsenal
Attn: AMXRM/ Col. Eugene Bishop
Building 111-RHA
Commerce City, Co 80022-2180

Dear Sir, Re: Comments

BACKGROUND

The Army is authorized by Congress and therefore the American people to develop weapons for the defense of our nation. None of the above authorizes the Army to pollute our nation.

The Army has pursued a cocaine like addiction for weapons which has resulted in a blatant disregard for the environment. In the case of RMA the Army casually and haphazardly dumped the by-products of chemical warfare into evaporation pond(s) where the contents were allowed to leak directly into the water table.

Since the Arsenal was in full operation from the 1940's to the-mid 1980' the Army's only act of remediation was to pump 110 million gallons of the weapons by-product 5 miles deep into the earth's crust causing the first and only known man-made earthquake.

The Army has never had a viable plan either to protect the environment or the surrounding residents until it was discovered by an outside entity that drinking water was contaminated.

FINDINGS

The Army and the EPA refer to scientific levels of parts per billion when testing for some 34 chemicals which have contaminated residents drinking water but these standards are guesses only, as:

A. There are no long term health studies on the effects of chemicals such as DIMP.

B. There have been no studies done on the effect on humans of the combination of these chemical.

Scientific data is constantly changing as an example during the testing of Atomic the bomb the military told residents "down wind" in Utah that the bomb would not harm them. This was totally false as the military admitted this was inaccurate some 40 years later. Advertisements on TV during the 1950's advocated school children to hide under their desks in the event of an Atomic Bomb attack. Another totally false assumption.

<IMG SRC 0896128F7>

Once again many of these chemicals are unique to the RHA and projections from recent labratory tests on rats are not acceptable.

CONCLUSION

The Army's and EPA have somehow decided that current unsubstantiated

levels of pollution are acceptable for offsite remediation efforts. This is not comprehensible considering the Army has not been subject to any rules or laws during the last 51 years at the RMA. Why are guidelines suddenly being invoked now?

Short term health studies on chemicals leaked from the RMA which only exist at this site cannot possibly be accurately determined.

The Army has an obligation to the citizens of the impacted area to make the drinking water as it was before the pollutants were allowed to leak from the RMA and to infiltrate the ground water and aquifers. Since the goal of safe drinking water cannot be safely achieved even for deep wells the only alternative remaining would be a municipal type water supply. This alternative is never considered in the proposed plan since the Army and the EPA have seriously erred in their methodology by accepting "guesses" as scientific fact.

<IMG SRC 0896128F8>

<IMG SRC 0896128F9>

Mr. Leif R. Southwell
11355 North Racine Court
Henderson, Colorado 80640

Dear Mr. Southwell:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

The Army evaluated the long-term and cumulative health effects of the chemicals offpost. These effects were analyzed in the Offpost Risk Assessment. In fact, the Offpost Risk Assessment evaluated the cumulative risks of contamination offpost to humans over a 70-year period. The risks presented in the Offpost Proposed Plan are the long-term risks of the chemicals offpost without considering the benefits of operating the Offpost Treatment System.

One of the major concerns expressed by offpost residents is the DIMP contamination in groundwater offpost. Since my tenure began at RMA, I wanted to make sure the Army would further study the DIMP tests to evaluate whether the U.S. Environmental Protection Agency (EPA) DIMP Health Advisory of 600 parts per billion is safe. Overall, the Army has conducted more than 30 separate animal studies with DIMP, including one study with humans. The EPA and the National Academy of Sciences evaluated all health studies and concluded that the EPA's 600 parts per billion Health Advisory is protective of human health and the environment. In addition, the Army evaluated all possible ways DIMP and other chemicals could enter the human body. These tests again showed that the water offpost is protective of human health and the environment. As an additional protective measure, the Offpost Treatment System and the North Boundary System will treat the groundwater to less than 10 parts per billion. The Army is currently evaluating the applicability of the 8 parts per billion level that the Colorado Water Quality Control Commission is expected to promulgate in the next several months.

I hope this information alleviates your concerns. Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at (303) 289-0201. Thank you again for your comments.

Sincerely,

<IMG SRC 0896128G>

Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

<IMG SRC 0896128G1>

May 14, 1993

Offpost Proposed Plan Comments
Program Manager for Rocky Mountain Arsenal
Attn: AMXRM-PM/Col. Eugene H. Bishop
Building 111-RMA
Commerce City, Colorado 80022-2180

Dear Sirs:

I am submitting these comments on behalf of my mother, Irma L. Temmer, who resides at and owns the property at 16250 E. 104th Avenue, Commerce City, Colorado 80022.

I have enclosed a copy of a document entitled "State Concerns" prepared by the Colorado-Department of Health, dated April 1993. We agree with the concerns stated in this document and adopt it as part of our comments.

<IMG SRC 0896128G2>
<IMG SRC 0896128G3>

on existing state and federal environmental s, if they exist. In addition, risk assessments estimate cancer and non-cancer risks are used determine clean-up levels when environmental laws either do not exist or are not considered to be protec- tive at a particular site. A risk assessment compares the levels of contamination to EPA-established num- bers to determine hazard indices for non-cancer risk. Cancer risk is established through excess cancer risk predictions. An "excess" cancer means a cancer in addition to the predicted cancer risk. According to the American Cancer Society, one in three of us will develop a cancer sometime in our lives. The state has concerns with what the Army considers acceptable risk. These concerns are explained below:

Cancer Risk

Zones 2, 3 and 4, as depicted on the illustra- tion, are the most highly contaminated areas of the offpost study area. Contamination has been found in ground water, soil, and surface water. At current concentrations such contamination, according to the Army's studies, could pose excess cancer risks of approximately 3 in 10,000. The Army states that potential risks as high as 1 in 2,000 are acceptable. However, the state believes that federal law requires Superfund cleanups to aim for an excess cancer risk of not more than 1 in 1,000,000, unless that number cannot be achieved.

Non-Cancer Risk

Federal law states that hazard indices reflecting non-cancer risk should not exceed one. The Proposed Plan indicates that the hazard index exceeds one in Zones 2, 3 and 4 and a portion of Zone 1. This means that people exposed to existing contamination in those areas could suffer adverse health effects other than cancer, ranging from short-term effects such as eye and skin irritation to long-term effects such as asthma,

liver or kidney damage. The state believes that the risk should be reduced at least to the hazard index of one.

Access and Use

Zones 3 and 4 are owned by Shell Oil Company; Zone 2 is mostly privately owned. The Proposed Plan does not include active cleanup of soil in these three zones. In addition, ground water contamination will likely remain there for decades while it is gradually flushed by water treated at the North Boundary System. The Proposed Plan does not provide any mechanism for preventing people from Drinking ground water while it is being cleaned up. Nor is there a commitment to provide access and use controls (like deed and well restrictions) to prevent exposure to water or soils. Therefore, the state would like the Army to evaluate active remediation of the soil and at the very least initiate measures which would prevent exposures to ground water until it is cleaned up.

DIMP in Ground Water

In 1990 the state requested that the Water Quality Control Commission set a ground water standard for DIMP (diisopropylmethylphosphonate), a byproduct of nerve gas production at Rocky Mountain Arsenal. A current EPA Health Advisory Level of 600 ppb has been used by the Army to determine what areas of ground water should be cleaned up. The Army will consider cleanup only in those areas where DIMP levels are greater than the EPA Advisory Level. The state believes that a more conservative figure should be used.

The Army has asserted that the part of the ground water plume with DIMP concentrations above 600 ppb has not moved past their Offpost Intercept and Treatment System. The most recent testing done by CDH has found 800 ppb DIMP in a private well at least 1/2 mile past the proposed intercept system, indicating that DIMP well above EPA's Health Advisory Level is already in private drinking water supplies. The-well owner was already receiving bottled water from the state. The state believes the Army should address the significantly elevated level of DIMP contamination which has moved beyond the offpost intercept and treatment system.

Bottled water has been provided since July 1990 to more than 600 residents with DIMP in their well water. This water has been paid for by the state of Colorado, with costs shared the first year with EPA. Due to the widespread nature of DIMP contamination in the offpost, the state believes that the Army should provide all residents in the study area a perrnanent, municipal water supply.

Contamination or the Deeper Aquifer

Since 1990, testing by the state has revealed that DIMP is present in the deeper Arapahoe aquifer at depths greater than 100 feet. The levels found range from a trace to 39.7 ppb. The state has identified approximately 20 domestic use wells that should be closed because they may be allowing contamination

to move down to the deeper aquifer. The Army has not closed any of these wells, and the Proposed Plan does not address this problem. The Army has argued that contamination of the deep aquifer is a localized occurrence, that it is due to poor private well construction and is therefore not its responsibility. The Army believes that only wells with more than 600, ppb should be closed, while DIMP in lesser, but significant quantities continues to move into the Arapahoe aquifer. The state would like the Army to close wells to protect the Arapahoe aquifer from contamination.

Ground Water Cleanup Action

The Proposed Plan states that it will take approximately 15 to 30 years to clean-up the ground water in the northern plume. However, the Army's supporting documents state that it is not actually known how long it will take; the time estimates are only for comparing relative timeframes between alternatives. The state believes that the Army has significantly underestimated the actual time that will be required. Also, the Army eliminated a cleanup alternative (Alternative N-5 in their Proposed Plan) that it estimated would reduce the cleanup time to 10 to 20 years, a one-third reduction. This was based on the fact that this alternative would require one more year to put into place. In addition, the Army states it prefers Alternative N-4 because it allows the Army to make improvements to the ground water cleanup system as needed; but according to the Army's Feasibility study, so does Alternative N-5. Alternative N-5 would actually cost less because it would clean up the ground water more quickly. The state believes that the Army should design a more aggressive system that will clean up the ground water faster.

State Ground Water Standards

Under federal law, state environmental standards which meet certain criteria must be used, at Superfund sites. The Army does not plan to use state standards in the offpost cleanup, saying there is "inconsistent application and ambiguous language". These standards, however, are enforced at all other Superfund sites in Colorado, and have been used by the Army itself for earlier ground water cleanup at the RMA. The state wants the Amy to recognize these standards for cleanup in the offpost.

Surface Water

The surface water in First Creek currently has contamination that exceeds several state surface water standards. The Proposed Plan does not address surface water because the Army maintains that if ground water is cleaned up as it leaves RMA, it will eventually cleanse First Creek. The state agrees that this action will have a beneficial effect on First Creek water quality since ground water seeps into First Creek during part of the year, but there is no clear estimate as to how long this cleansing process will take, In the meantime, the contamination will con-
continue to migrate into O'Brian Canal and ultimately into Barr Lake. The state wants the Army to commit to

further water sampling and to attempt to meet state surface water standards.

4. What role does the state have in the Proposed Plan?
The state and the public have a similar role at this stage of the process. The Army must consider state, local government and community comments to the Proposed Plan before the Record of Decision (ROD) is issued. The state has reviewed and commented on all the supporting documents which led up to the Proposed Plan; the Army is therefore very familiar with the state's concerns. To date, however, the Army has not changed the Proposed Plan to address the state's concerns. It is therefore essential for the public to contribute its views during this review.

5. What happens next?
All comments received will be reviewed by the Army and EPA. Responses to all comments will appear in a document called the ROD. The Army plans to release this document October 30, 1993. This ROD announces the selection of the final clean-up alternative. This will be the "final word" on cleanup for the offpost; no public comment period or public meetings are required on that document.

6. How can I voice my opinion?
The public comment period on the Proposed Plan is from March 21, 1993 through May 21, 1993. Please mail your comments to: Offpost Proposed Plan Comments, Program Manager for the Rocky Mountain Arsenal, Attn: AMXRM-PM/Col. Eugene H. Bishop, Bldg. 111-RMA, Commerce City, CO 80022-2180.
The state would appreciate copies of written comments submitted on the Proposed Plan which are submitted to the Army. We urge the public to attend a meeting on the Proposed Plan to be held April 28, 1993, 7 p.m., at the Dupont Elementary School, 7970 Kimberly Street, Commerce City. This comment period is your only opportunity to comment on the Army's proposed plan.

More Information
For a copy of the 12-page Proposed Plan, or to ask additional questions or express concerns related to the Proposed Plan, call the CDH RMA Team at 692-3410 and leave a message, and appropriate team member will respond. Or you can call Marion Galant, Community Relations Manager, at 692-3304.

Office of the Program Manager

Mr. and Mrs. Robert E. Temmer
16250 E. 104th Avenue
Commerce City, Colorado 80022

Dear Mr. and Mrs. Temmer:

Thank you for your comments. The Army appreciates the many comments received on the Offpost Proposed Plan for Rocky Mountain Arsenal (RMA). Public input is a key part of the cleanup process at RMA. I will respond to your comments in the order we received them.

Enclosed is a copy of the Army responses to State comments. The State's comments are also included with the responses for easier reading. The State's comments include the items listed in their fact sheet titled "State Concerns".

The Army continues to monitor offpost wells and will do so until the groundwater (water beneath the ground surface) is cleaned to applicable federal and state regulations. Currently, the Army's criteria for well closure, which was approved by the U.S. Environmental Protection Agency (EPA), provides for closure of wells under specific conditions. The first condition requires that a poorly constructed or damaged 'well be identified. Second, the upper groundwater aquifer must be exceeding EPA standards for one or more chemicals. Third, the upper aquifer must be leaking into the lower aquifer because of the poorly constructed or damaged well. If all of these conditions are met, the Army will close the offpost well. Additionally, many wells offpost are no longer being used. The Army is currently working with the State of Colorado and Tri-County Health Department to discuss how we will work together to close abandoned wells offpost.

Any other questions regarding the Offpost Proposed Plan may be directed to Mr. Tim Kilgannon of this office at 289-0201. Thank you again for your comments.

Sincerely,

Eugene H. Bishop
Colonel, U.S. Army
Program Manager

Enclosure
Copies Furnished:

Captain Jonathan Potter, Litigation Attorney, Rocky Mountain Arsenal
Building 111, Commerce City, Colorado 80022
Mr. Bradley Bridgewater, U.S. Department of Justice, 999-18th Street,
Suite 501, North Tower, Denver, Colorado 80202
Document Tracking Center, AMXRM-IDT, Room 132, Building 111, Rocky
Mountain Arsenal, Commerce City, Colorado 80022

Appendix 8
INSTITUTIONAL CONTROLS

1.0 OFFPOST INSTITUTIONAL CONTROLS

This Appendix to the Rocky Mountain Arsenal (RMA) Final Offpost Operable Unit (OU) Record of Decision (ROD) presents the institutional controls for the Offpost OU selected remedy. The combination of Alternative NA and NW-2 is identified as the selected remedy in the ROD and the Final Offpost Endangerment Assessment/Feasibility Study (EA/FS) for the RMA Offpost OU and is described fully in the Section 9.0 of the ROD and in the EA/FS. The ROD identifies the following objective for institutional controls as a component of remedial action in the Offpost OU: prevention of the use of the ground water underlying areas of the Offpost OU exceeding groundwater containment system remediation goals.

The State of Colorado and the local governmental agencies that have regulatory authority over certain activities in the Offpost OU land area have several current regulations that significantly limit or prevent use of the groundwater from the alluvial aquifer. Attachment 1 (Controls of Alluvial [Unconfined] Aquifer Use, RMA Offpost Operable Unit) and Attachment 2 (Land and Water Use, Management, and Approval Processes - Adams County, City of Brighton, Commerce City) provide the current regulations applicable to groundwater use, well construction, building permits, and zoning requirements. Attachment 1 particularly describes the institutional controls relied upon to meet the objectives for institutional controls established in the selected remedy.

This appendix identifies the authority for use of institutional controls under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §9601 et seq. and the National Contingency Plan (NCP), 40 CFR Part 300.

2.0 THE USE OF INSTITUTIONAL CONTROLS UNDER CERCLA

Section 121 of CERCLA requires that EPA select remedial actions that assure protection of human health and the environment. 42 U.S.C. § 9621. EPA has recognized that this protection can be achieved through a variety of methods, including institutional controls (Preamble to the NCP, 55 Fed. Reg. 8666, 8703 [March 8, 1990]; 40 C.F.R. § 300.430[a] [1] [iii] [C]). Institutional controls may be an integral component of a remedy that is necessary for such remedy to achieve CERCLA's protectiveness mandate. (See for example, Preamble to the NCP, 55 Fed. Reg. at 8703, 8706, 8711, and 8734). Additionally, institutional controls may be a component of a completed remedy to protect human health and the environment from treatment residuals and untreated wastes. (40 C.F.R. § 360.430[a] [1] [III] [C]-[D]). Institutional controls are a necessary supplement when some waste is left in place, as it is in most response actions (Preamble to the NCP, 55 Fed. Reg. at 8706).

EPA identifies examples of institutional controls in the NCP Preamble, and expressly acknowledges that institutional controls have a valid role in CERCIA cleanups:

> Examples of institutional controls, which generally limit human activities at or near facilities where hazardous substances, pollutants, or contaminants exist or will remain on-site, include land and resource (e.g. water) use and deed restrictions, well-drilling prohibitions, building permits, and well use advisories and deed notices. EPA believes, however, that institutional controls have a valid role in remediation and are allowed under CERCLA (e.g., 55 Fed. Reg. at 8706, section 121[d][2][B][kk]).

Within ninety days of the issuance of the Offpost ROD, the Army will issue an Implementation Plan which will contain a schedule for finalization of the Institutional Controls provided for in the ROD. That plan will provide that all Institutional Controls will be in place not later than September 1, 1996. All dates contained in that Plan will be enforceable as provided in CERCLA Section 3 10 and the FFA.

3.0 SITE DESCRIPTION

A detailed description of the Offpost Study Area is presented in Section 1.0 of the ROD and in the EA/FS. The Offpost Study Area was defined to include the area bounded by 80th Avenue, the South Platte River, Second Creek, and the north and northwest boundaries of RMA. The Offpost

Study Area also includes the surface waters of Barr Lake, the O'Brian Canal, and Burlington Ditch from 80th Avenue to Barr Lake.

The Offpost OU is a portion of the Offpost Study Area north of RMA. The Offpost OU consists of the area within the Offpost Study Area that requires remediation; specifically, the groundwater containment system remediation goals exceeding cleanup standards.

Attachment 1

CONTROLS OF ALLUVIAL (UNCONFINED) AQUIFER USE
RMA OFFPOST OPERABLE UNIT

U.S. Department of the Army

Telephone No: (303) 289-0202

1. The Army will provide the Office of the State Engineer, State of Colorado, with a map identifying those areas in the Offpost Study Area where groundwater could potentially exceed containment system remediation goals. This map will be updated based on each sampling round.

2. The Army will establish procedures to ensure that the well notification program is operating effectively. The Army will inspect, or oversee inspection, of all well construction activity to monitor conformance with the State Board of Examiners well drilling regulations.

3. The Army will fund analytical sampling of any future domestic well constructed in the area of contamination, if requested.

4. The Army will provide Commerce City, the City of Brighton, and Adams County officials with the same map (as described in item No. 1) provided to the Office of the State Engineer. The Army will make arrangements with these governmental agencies to ensure that the map is used in the most effective manner possible to reduce exposure to potentially contaminated groundwater.

5. For new domestic wells with DIMP levels of eight ppb or greater (or other relevant CBSG at the time), the U.S. Army and Shell Oil Company will pay for hook-up to the SACWSD distribution system or provided deep well or other permanent solution.

6. Additional elements of exposure control and requirements for alternate water supply are presented in Section 7.1 of the main text.

Shell Oil Company

Telephone No.: (303) 860-8621

1. To eliminate potential exposure to contaminated groundwater under the Shell Oil Company properties, Shell Oil Company will execute and record proper documentation (e.g., covenant/ negative easement) for its properties to: (i) preclude drilling of all groundwater wells into any alluvial aquifer water under Shell's property for future use until such groundwater no longer contains contamination in exceedance of groundwater containment system remediation goals established in the ROD, and (ii) preclude any use of any deeper aquifer water (e.g., Denver Basin) containing contamination in exceedance of groundwater containment system remediation goals in the ROD. The recorded documents shall be enforceable by the U.S. EPA, the U.S. Army, and the State of Colorado, and shall touch upon and run with the land.

2. Deed restrictions on the Shell property shall be in place no later than forty-five days after the issuance of the ROD.

Colorado Department of Natural Resources

Office of the State Engineer - Contact: Steve Lautenschlader

1. Alluvial groundwater in the Operable Unit is part of the South Platte River Flow System (which is over appropriated). Therefore new large appropriations (uses) will not be approved without appropriate augmentation plans (replacing the water to be used with water from another aquifer or another off site source). Augmentation plans are often quite expensive and hard to get approved due to the associated requirements.

2. On parcels less than 35 acres created prior to June, 1972 - One permit for a wen is allowed under a presumption of no injury to other holders of water rights [CRS 37-92-602(3)(b)(H)(A)]. This well is allowed for used inside of one dwelling only and may be from any aquifer.

3. On parcels less than 35 acres not created prior to June, 1972 - This land would only come into existence by being subdivided and would therefore have to go through the County or City subdivision process and meet applicable regulations (CRS 30-28-101 - a.k.a. SB 35). Prior to issuance of any permit a water rights and/or an augmentation plan would have to be submitted and approved by "water court." (CRS 37-90-137(l) et seq. and/or CRS 37-92-302(2), et seq.).

4. On parcels greater than 35 acres - Permits may be issued serve up to 3 homes, irrigation of up to one acre of home garden and lawn (person use) and watering of domestic animals and/or livestock. This use is also allowed under a presumption of no injury to other holders of water rights [CRS 37-92-602(3)(b)(11)(A)].

5. Permits will be issued for replacement (into the same aquifer) of currently permitted or adjudicated wells as requested. (CRS 37-90-137(l), CRS 37-92-602(3).)

6. All wells installation must be done in compliance with State of Colorado, Office of the State Engineer, State Board of Examiners of Water Well Construction and Pump Installation Contractors, Revised and Amended Rules & Regulations of the Board or Examiners of Water Well Construction and Pump Installation Contractors (2 CCR 402-2) (most current version).

7. The Office of the State Engineer will include a distinctive notice on each well permit application correspondence, each well permit, and each drilling permit. The area included in this requirement is any part of the Offpost Study Area where groundwater could potentially exceed groundwater containment system remediation goals. This notice would require the applicant to contact the Tri-County Health Department and the EPA for information regarding groundwater quality and the options provided by the Army to avoid use of potentially contaminated groundwater.

8. The Office of the State Engineer will contact the Tri-County Health Department, EPA, and the Army regarding any application or permit issued with the notice.

South Adams County Water & Sanitation District (SACWSD)

Water & Wastewater - Contact: Larry Ford

1. Rules & Regulations - South Adams County Water & Sanitation District - New Service Area - February 1992. Application for Service, as well as, Petition for Inclusion within the Boundaries of the District both require that the Property/Parcel owner convey all rights to groundwater for each Parcel or Subdivision Parcel to the District upon inclusion [4.0 (4.1.3) & 5.0 (5.1.3)]. The District may at its sole discretion abandon right conveyed to it and physically abandon the wells in accordance with the above referenced state Water Well Regulations 15.0 (5.1.4)].

2. Rules & Regulations - South Adams County Water & Sanitation District - Existing Service Area - January 1992 (Updated February 24, 1993). Application for Service, as well as, Petition for Inclusion within the Boundaries of the District both require that the Property/Parcel owner convey all rights to groundwater for each Parcel or Subdivision Parcel to the District upon inclusion [4.1 (4.1.3) & 5.0 (5.1.3)]. The District may at its sole discretion abandon rights conveyed to it and physically abandon the wells in accordance with the above referenced State of Colorado Water Well Regulations [5.1 (5.1.4)].

3. It is the policy of SACWSD not to serve wastewater without providing water service and vice versa.

Adams County Water Quality Association Management Agency (see attached By-Laws)

(Wastewater (DRCOG) Clean Water Plan Amendment, 1991)

Member Agencies: City of Commerce City, Adams County, City of Brighton, South Adams County Water & Sanitation District.
Contact: Board President Harry Tate (Commerce City Councilman)

This Agency reviews and may approve or reject all major additions or changes to sewer lines, lift stations and plant improvements. Essentially any new line is considered a major line. This Agency is intended to prevent line overlap and encourage intergovernmental cooperation.

Tri-County Health Department
Contact(s): Tom Butts or Warren Brown
Regulation NO. 1-88, Individual Sewage Disposal Systems
Promulgated by the Board of Health of the Tri-County Health Department
Effective Date, February 1, 1988
Pursuant to Title 25, Article 10, Paragraph 104, CRS & Guidelines Adopted by the Colorado Department of Health

The Health Officer may refuse to grant a permit for the construction of an individual sewage disposal system where a sewage treatment works is available within 400 feet of the nearest property line and connection can be made thereto. Section M(3-14) CRS 30-1-1006(1)(a) (Special Districts), 31-35-601 (municipalities), 30-20-416 (counties).

City of Commerce City
Contact: Steve Hause, Community Planning Director
Lands currently within the City of Commerce City
-South of 120th Avenue while west of Highway 2 and then further north to the east.

"Commerce City Code - Article V. Subdivisions". Section 17-105 - Water Facilities (a) General requirements. This section essentially defers water service issues to SACWSD for either connection to the public water supply system immediately or in some cases allows use of individual wells or community water systems until lines reach the subdivision when connection is then required. (see SACWSD above) Building Code (UBC & UPC 1991) - Requires proof of water and sewer taps (or well permit & approved septic system application) prior to issuance of building permit.

City of Brighton
Contact(s): Chief Building Official, City Planner
- Areas north of 120th Avenue including the triangular area between Peoria and State Highway 51, north of 112th/Highway 2

"Land Use and Development Regulations and Guidelines" (Zoning Regulations)
"Subdivision Regulations" Section V, (B.) The subdivider is required to provide and connect the following utilities (Water lines and fire hydrants, Sanitary sewer lines...) to existing public systems. Building Code (UBC & UPC 1991) - Requires proof of water and sewer taps (or well permit and approved septic system application prior to issuance of building permit.
Water & Sewer service are provided by Brighton Utilities Department within the City. Connection to the municipal water system may be recommended for developments within two miles of the current City. However, staff recommendations may not be included as part of the final approval by the City Council.

Adams County
Contact(s): Planning Dept., Director of Planning and Development, Building Dept.
Remainder of Lands in the Offpost OU not in Brighton or Commerce City
See attached "Development Review Overview"
Adams County Zoning Regulations
Adams County Subdivision Regulations
Building Code (UBC & UPC 1991) - Requires proof of water and sewer taps (or well permit and approved septic system application) prior to issuance of building permit.
Staff recommends connection to public water and sewer if with a reasonable distance, however, these commendations may not be retained by either the Planning Commission or Board of County

Commissioners.

LAND AND WATER USE, MANAGEMENT, AND APPROVAL PROCESSES

ADAMS COUNTY, CITY OF BRIGHTON, COMMERCE CITY

<IMG SRC 0896128G4>
<IMG SRC 0896128G5>
<IMG SRC 0896128G6>

Shall determine. No subdivision shall be approved unless adequate drainage will be provided continuously to an adequate drainage watercourse or regional facility.

(7) The city council may, when it considers it necessary for the health, safety, or welfare of the public, including the conservation of water and the effect on drainage and sanitary facilities, prohibit the subdivision of any portion of the property which lies within the floodplain of any stream or drainage course. Floodplain areas shall be preserved from any and all destruction or damage resulting from clearing, grading, or dumping of earth or other materials. (Ord. No. 1026, § 1, 6-21-93)

Sec. 17-105. Water facilities.

(a) General requirements.

(1) The applicant shall extend or create a potable water supply system capable of providing domestic water use and fire protection, according to approval by the appropriate fire district ans the South Adams County Water and Santitation District.

(2) Where a public water main is accessible, the subdivider shall install adequate water facilities (including fire hydrants) subject to the specifications of the South Adams County Water and Sanitation District and the appropriate fire district.

(3) All water mains shall be a minimum of eight (8) inches in diameter, and shall be subject to approval of the South Adams County Water and Sanitation District and the appropriate fire district.

(b) Individual wells, central water systems.

(1) At the discretion of the South Adams County Water and Sanitation District, individual wells may be used or a central water system provided in such a manner that an adequate supply of potable water will be available to every lot in the subdivision. Water samples shall be submitted to the Tri-county Health Department and the state water conservation board as deemed necessary by such entities to ensure a potable water supply.

(2) The applicant shall agree, as a condition of approval for an individual well or central water system, that a connection to a public water main eventually shall be provided.

The Applicant shall make arrangements for future water service at the time the plan receives final approval. Collateral may be required to ensure compliance.

(Ord. No. 1026, § 1, 6-21-93)

Sec. 17-106. Sewerage facilities.

(a) General requirements.

(1) The applicant shall install sanitary sewer facilities in a manner prescribed by the South Adams County Water and Sanitation District construction standards and specifications. All plans shall be designed in accordance with the rules and regulations and standards of the South Adams County Water and Sanitation District and the Tri-county Health Department. Plans shall be approved by these agencies prior to approval of the final plat by the city council.

(2) The applicant shall extend the sanitary sewer district systems for the purpose of providing sewerage to the subdivision, subject to the provisions of paragraph (b) below.

(b) Connection to South Adams County Water and Sanitation District.

(1) If South Adams County Water and Sanitation District facilities are accessible and a sanitary sewer is placed on a street or easement abutting upon the property, the owner thereof shall be required to connect to the sewer for the purpose of disposing of waste, and it shall be unlawful for any such owner or occupant to maintain an individual sewage disposal system.

(2) Where South Adams County Water and Sanitation District systems are not reasonably accessible, but will become available within a reasonable time, the applicant may choose one (1) of the following alternatives:

a. Central sewerage system, the maintenance cost to be assesed against each property benefitted. Where plans for the future provide for the South Adams County Water and Sanitation District to install the sewer lines, the laterals and mains of the development shall be in conformance with the plans of the district and shall be ready for connection to the proposed sewer mains of the district.

b. Individual disposal systems, provided the applicant shall install sanitary sewer lines, laterals, and mains from the street curb to a point in the subdivision boundary where a future connec-

tion with the South Adams District shall be made. Sewer lines shall be laid from the building to the street line and a connection shall be available in the structure to connect from the individual disposal system to the South Adams County Water and Sanitation District system when it becomes available. The sewer systems shall be capped until ready for use and shall conform to all plans for installations of South Adams County Water and Sanitation District, where they exist, and shall be ready for connection to the sewer main.

(3) Where South Adams County Water and Sanitation District facilities are not reasonably accessible, and will not become available within a reasonable period of time the applicant may, at the discretion of South Adams Water and Sanitation District and with the approval of Tri-county Health Department, install sewerage systems as follows:

a. For medium- and high-density residential (R-2, R-3) and nonresidential areas, a central sewerage system shall be installed. The applicant shall install all sewer lines, laterals, and mains to be in conformance with plans of the South Adams County Water and Sanitation

District and shall be ready for connection to the public sewer main when the main becomes available.

b. For low-density residential (R-1) areas, individual disposal systems or central sewerage systems may be used, subject to approval of the South Adams County Water and Sanitation District.

(4) Where individual systems are proposed, minimum lot areas shall conform to the requirements of the zoning ordinance and percolation tests and test holes shall be made as directed by the Tri-county Health Department and the results submitted to the department of community development. The individual disposal system, including the size of the septic tanks and size of the tile fields or other secondary treatment device, shall be approved by Tri-county Health Department prior to final approval of the plat by the city council.

(Ord. No. 1026, § 1, 6-21-93)

Sec. 17-107. Sidewalks and trails.

(a) Required improvements.

(1) Sidewalks and disabled ramp access shall be included within the dedicated non-pave-

ment right-of-way of all roads as described in design standards of the city, unless waived by the city council as not being required for the public health, safety, and welfare of the inhabitants of the city.

(2) Concrete curbs and gutters are required for all streets where sidewalks are required by this article or where required at the discretion of the city council for the public health, safety, and welfare of the inhabitants of the city.

(3) In residential subdivisions, a median strip of grassed or landscaped areas at least five (5) feet wide shall separate all sidewalks from adjacent curbs, unless waived by the city council as not being required for the public health, safety, and welfare of the inhabitants of the city.

(b) Pedestrian access.

(1) In order to facilitate pedestrian access from the streets to schools, parks, playgrounds demonstrate that no hazard or nuisance exists on the property.

<IMG SRC 0896128G7>

3.13 Denials of permits shall be made in writing by the Health Officer stating reasons for the denial and requirements reconsideration of the application.

3.14 The Health Officer may refuse to grant a permit for the construction of an individual sewage disposal system where a sewage treatment works is available within 400 feet of the nearest property line and connection can be made thereto.

3.15 Any applicant who is denied a construction permit, or any person who is adversely affected by the denial or issuance of a permit, within thirty (30) days following such denial, may requaet and receive a hearing before the Board of Health.

3.16 The State Administrative Procedure Act (Article 4 of Title 24, C.R.S.)shall govern any hearings held by the Department under the "Individual Sewage Disposal Systems Act."

3.17 The issuance of a permit and specifications of terms and conditions therein shall not constitute assumption or create a presumption that the Department or its employees may be liable for failure of any system nor act as a certification that the equipment used in the system or any component thereof used in its operation or that the system for which the permit was issued insures continuous compliance with the provision of Title 25, Article 10, C.R.S. 1973, the rules and regulations adopted thereunder or any terms and conditions of a permit.

SECTION IV. APPLICATION REQUIREMENTS:

The Application shall include such information, data, plans,

<IMG SRC 0896128G8>

Summary

This document is designed to provide a brief overview of the process for making land use decisions in Adams county and who participates in the process. Its purpose is to give citizens the background they need to effectively participate m that decision-making process and influence decisions that affect them. The term "land development" is intended to be general and includes rezonings, conditional uses, subdivisions and exemptions, from subdividing, variances, special uses and certificates of designation. Except for differences between which board or commission makes the ultimate decision, the steps that are taken to make the particular decision are very similar. Adams County has land use jurisdiction over all public and private property located in the unincorporated portions of the County. The county does not have land use jurisdiction over any property located in a City.

The steps that are taken when an application for Land development is made are the following:

1. A potential applicant calls or visits the Planning and Development Department and discusses their land development idea. The staff advises what action would need to be taken to achieve the end result that is desired.

2. A "pre-application meeting" is scheduled. For simple and straight-forward applications, the pre-application meeting may take place during the initial contact by a potential applicant. An example of such an application could be a variance from the side yard setback to construct a garage. More complicated applications, such as the platting of land for a new two-hundred acre subdivision require research by the staff to be knowledgeable about a given area or property so that a meaningful pre-application meeting could be conducted.

Pre-application meetings have two purposes: a) to advise potential applicants what they need to submit in order for their application to be placed an the appropriate agenda and b) to advise applicants what the staff reaction to an application is likely to be, given what we know about the issues that are likely to affect that application.

3. An application is submitted. The staff reviews it for completeness and if it is complete, it is placed on the next available agenda for the appropriate board or commission which meets the notice and referral time requirements.

4. Copies of the application materials are mailed out to a number of governmental agencies and any citizens groups that have expressed a being applied for, asks for comments within a deadline, and provides the name of the staff person who can answer questions about the application.

5. Letters are mailed out to property owners near the site of the application. In the case of Board of Adjustment hearings, abutting property owners are mailed letters. In the case of Planning Commission and Board of County Commissioner hearings, property owners within at least 500 feet are mailed letters. These distances may be expanded at the discretion of the County staff.

6. The staff reviews the application and writes a written report with consideration being given to the criteria for review of the particular application and the comments received from citizens and agencies. The report is sent to the appropriate Board or Commission for their review
prior to the hearing.

7. The public hearing is held and a decision is made on the application. The Board of Adjustments makes a final decision on variances and special uses. The Planning Commission makes a recommendation to the Board of Commisioners who, in turn, make a final decision on rezonings, conditional uses, subdivisions and certificates of designation. Except for minor differences, the Board of Commissioners, the Planning Commission and the Board of Adjustment conduct their hearings in a very similar manner. First, the staff introduces the case with a brief summary of what is being applied for and provides the staff recommendation. Next, the applicant makes a presentation of the application and responds to the staff's recommendation and any conditions being recommended. After the applicant has made the presentation, the public is invited to be heard. The Chairman will ask for public comment in favor of the application, in opposition to it, and any questions that the public has for information only. Often, questions are asked by

those who are speaking in favor or in opposition or just for information. At the conclusion of the public input portion of the hearing, the appropriate persons (usually the applicant but also staff or a board or commission member) will answer questions which have been asked. At any time during the hearing, a board or commission member may be recognized by the chairman in order to ask questions or get clarification of the information being given. The application is then discussed by the board or commission members and a motion for action on the application is made by one of the members. A majority vote of the board or commission is required for the motion to pass, with one exception (see Glossary of Terms, Appeals of Administrative Decisions).

The Planning Commission

Planning Commissioners are citizens appointed by the Board of County Commissioners. They have three basic duties:

1. To adopt and amend, as appropriate, the County Comprehensive Plan. This Plan is the official policy of the County for how the County should grow and develop (or redevelop) in the future. The Plan provides guidance for decisions to be made on development application and public capital improvement projects. The Plan is not regulatory; It is a statement of policy. The Planning Commission functions as a legislative body when they perform this duty.

2. To review applications for land use changes and land subdivision and recommend action on those applications to the Board of Commissioners. In making their decision, he Planning Commission considers the consistency between the application and Comprehensive Plan, the compatibility between the requested development and existing development in the area and the ability of the proposed development to meet the requirements of the Zoning Regulations or Subdivision Regulations, as appropriate. The Planning Commission functions as a quasi-judicial body when they perform this duty.

3. To recommend adoption of the County Zoning Regulations and Subdivision Regulations. The Planning Commission may recommend amendments to the Zoning Regulations and Regulations but the Board of Commissioners has the final decision-making authority on regulatory amendruents. The Planning Commission functions as a legislative body when they perform this duty.

The Board of County Commissioners

The County Commissioners are the elected representatives of the citizens. They perform many duties other than those relating to land development applications and only their duties concerning land development applications are discussed here. The County Commissioners make the final decisions on all change of use applications, subdivisions and regulatory amendments. They hold hearings in a similar manner to those of the Planning Commission. The County Commissioners consider all the input that the Planning Commission does plus the Planning Commission recommendation in making their decision on an application. The Board of County Commissioners functions as a quasi-judicial body when they hear change in use or subdivision applications and as a legislative body when they hear proposed regulatory amendments.

The Board of Adjustment

Board of Adjustment members, like the Planning Commissioners, are citizens appointed by the Board of County Commissioners. The Board of Adjustment hears applications for variances, special uses and appeals of administrative decisions. Unlike the Planning Commission, however, the decisions of the Board of Adjustment are final and not appealable to the Board of County Commissioners. The Board of functions as a quasi-judicial body.

Planning and Development Department Staff

The staff members of the Planning and Development Department (staff) are employees of the County. The Director of the Department reports to the County Administrator who, in turn, reports to the Board of County Commissioners. Staff administers the processes for land development applications, provides public information, and makes recommendations to the appropriate board or commission on the particular applications.

Glossary of Terms

Appeal of an Administrative Decision--The Zoning Regulations delegate authority to County staff to make administrative decisions. These staff members may be the Director of Planning and Development, the Chief Building Official, or other County staff. An appeal may be made to the Board of Adjustment by an applicant concerning an interpretation of the Zoning Regulations, denial of a building permit due to a zoning standard, or some other decision which is not agreed with the applicant. The Board of Adjustment reviews the decision made and may uphold it or reverse it in whole or in part. For a decision to be reversed, four of the five Board of Adjustment members must vote for the reversal of the decision.

Certificate of Designation--A type of use approval that is limited to waste management operations such as landfills or waste incinerators. Certificate of Designation is a State of Colorado review process that requires a recommendation of approval by the Colorado Department of Health before the County may grant a certificate. The State review involves technical considerations concerning whether a proposed operation will be consistent with the State's waste management regulations. The County review involves land use considerations such as compatibility with a existing uses, effect on the Comprehensive Plan objectives for an area and traffic impacts.

Compatibility--A condition that exists, or is believed to be possible, between two or more uses whereby the conduct of one use does not injure the ability to conduct other uses. It does not mean that the uses are the same or even similar. It does mean that if uses are compatible, property owners may use their properties without being unreasonably affected by the other use(s).

Conditional Use--An additional use of land within a given zone district, not otherwise allowed as a use-by-right, that may be authorized by the County and may be restricted by conditions to establish compatibility between the use and adjacent uses. Conditional uses may only be authorized by the Board of Commissioners after review by the staff and the Planning Commission in a due process review.

Due Process--A method of making decisions that is based on following previously adopted rules of procedures. In the context of land development review, it means a process for making those decisions that ensures that all parties have an opportunity to provide information on an equal basis which is intended to influence the outcome of the decision-making process.

Ex Parte Contacts--A legal principle that means contact by a decision-maker in a quasi-judicial decision-making process with a party or parties to an application outside the public hearing. A party to an application is the applicant, affected citizens, or any other person who will potentially be benefitted or injured by the action taken on the application. Ex Parte contracts should be avoided so that all parties to an application may have an equal opportunity to provide information in the public hearing and influence the ultimate decision.

Legislative Process--A decision-making process that seeks information from all citizens on a matter of community-wide interest. Citizens are encouraged to contact their elected or appointed representatives and provide their viewpoint on such matters on a formal or informal basis.

Quasi-Judicial Process--A decision-making process that bases a decision on previously-established criteria for making the decision. Citizen input is encouraged that provides information concerning how an application does, or does not, meet those criteria. The input is restricted to a public hearing where the input is made and decisions are reached.

Special Use--Any use of the land, not prohibited within the zone district, authorized by the Board of Adjustment after a due process review, for a period not to exceed five years.

Subdivision Regulations--The document approved by the Board of Commissioners that provides for the standards by which the land is divided into smaller parcels or combined into larger parcels and how the description of these parcels is made a matter of public record. It also provides standards for the configuration of parcels, access provisions, and roadway and drainage standards.

Subdivision--A legally recognized parcel of land, or collection of parcels of land that is defined by a narrative and graphic description. The document that depicts a subdivision is a

plat.

Temporary Use--Any use of land, not prohibited within the zone district, authorized by the Director of Planning and Development but for a period not to exceed ninety days. However, grading and hauling operations may be authorized under a Temporary Use permit for a period of up to one-hundred-eighty days on properties of ten acres or less.

Variance--A variance is authorized by the Board of Adjustment. Variances relate to the physical requirements of the Zoning requirements only, not to use of property. In theory, all property in the same zone district is the same--in practice, lots are not alike but the standards of a given zone district apply to all lots in the zone district. The variance process allows the Board of Adjustment to "adjust" the zoning standards to accommodate for differences between the physical layout of lots so that all property owners may by able to enjoy their properties in an equitable manner.

Zoning-The practice of establishing districts within a jurisdiction that allow specific uses to be conducted, under standards, in order to establish separation between uses which otherwise would conflict.

Zoning Map-The Official map of the County that shows the boundaries of all zone districts. The map is adopted by the Board of Commissioners by resolution and each change to the map is also adopted by resolution. Both the map (which is really a collection of approximately 80 sheets to cover-the entire County) and the resolution are recorded in the office of the County Clerk and Recorder.

Zoning Regulations-The document approved by the Board of Commissioners that defines all zone districts and the standards expected of all uses within zone districts. These regulations also provide for the process by which zoning is changed, zoning enforcement procedures, andgeneral standards that apply to any land use in all zone districts.

BY-LAWS OF

ADAMS COUNTY WATER QUALITY ASSOCIATION

ARTICLE I

OFFICES

Section 1.

The office of the Adams County Water Quality Association ("Association") shall be at the office of South Adams County Water and Sanitation District, 6595 East 70th Avenue, Commerce City, Colorado- 80037-0597 or much other place the board of directors may from time-to-time determine.

ARTICLE 2

DIRECTORS

Section 1.

The board of directors for the Association shall consist of one representative elected by each participating entity, consisting of the City of Commerce City, Colorado; City of Brighton, Colorado; county of Adams, Colorado; and South Adams County Water and Sanitation District.

Section 2.

In the absence of the appointed director, the appointed alternate director may act in place of the absent director.

ARTICLE 3

OFFICERS

Section 1.

The office of the Association shall be a president, a vice-president-and a secretary.

ARTICLE 4

ELECTION OF OFFICERS

Section 1.

Officers shall be elected by a majority vote of the directors at the organizational meeting held in 1991.

Section 2.

Beginning in 1992, and every year thereafter, election of Officers shall be held at the first annual meeting of the Association.

Section 3.

There shall be no prohibition against an officer succeeding him or herself in any of the offices of the Association.

ARTICLE 5

MEETINGS

Section 1.

Unless otherwise noted, regular quarterly meetings of the Association shall be held on the second Thursday of January, April, July and October as set forth in the Memorandum of Understanding between members of the Association.

Section 2.

In the event there shall be no business to conduct at such quarterly meeting, the president may cancel such meeting in writing to all directors setting forth the reason for such cancellation.

ARTICLE 6

SPECIAL MEETINGS

Section 1.

A request for a special meeting of the board of directers may be requested by a director in writing to the president of the Association with copies to all member directors. Such request shall set forth the purpose of such request for a special meeting.

Section 2.

After receipt of a request for a special meeting, the president shall set a special meeting of the board of directors within twenty days after receipt of such request and shall give the members of the board of directors notice in writing of the date and time of such special meeting and the purpose of such meeting. Such notice shall also include copies of any reports, exhibits , or other material that may have been submitted to the president by the requesting director.

ARTICLE 7

COMMITTEES

Section 1.

The president shall appoint such committees as he or she deems necessary to carry out the purposes and the activities of the Memorandum Understanding between the member entities of the Association.

ARTICLE 8

RECOMMENDATIONS

Section 1.

All recommendation or decisions of the board of directors on all Clean Water Plan Amendments, 201 Facility Plans, proposals or other submittal shall be by majority vote, each director shall have one vote. In the absence of a director, his or her duly appointed alternate shall be entitled to vote.

Section 2.

The result of such votes shall be submitted by the president on all Clean Water Plan Amendments, 203 Facility Plans or such other plans, studies or reports submitted by the Association or one

of its director entities to Denver Regional Council of Goverrnnent or to the Colorado Water Quality Control Division or to any other regulating agency.

ARTICLE 9

EMPLOYEES OF ASSOCIATION

Section 1.

The Association may appoint a Recording secretary to take all of the minutes of the board of directors and to conduct such other activities deemed necessary by the Association.

Section 2.

The Association may employ such other employees it deems necessary to carry out the purposes and the activities of the Association.

Section 3.

Compensation for such employees shall be determined and allocated between the members of the Association in such a manner as may be determined by the Association.

ARTICLE 10

CONFLICT

Section 1.

In the event a conflict develops between the provisions of the Memorandum of Understanding entered into between the member entities and these By-laws, the provisions of the Memoradum of Understanding will control.

THESE BY-LAWS ADOPTED THIS_____DAY OF_____ ,1991

Appendix C

WELL CLOSURE CRITERIA

In June 1988, the Final Decision Document for the Interim Response Action for the Closure of Abandoned Wells at Rocky Mountain Arsenal was issued by the U.S. Department of the Army (Army). This final document was issued following review and comment by Region VIII U.S. Environmental Protection Agency (EPA) and the Colorado Department of Health. This Interim Response Action (IRA) included only onpost wells in its coverage. EPA proposed modification of this IRA to include offpost wells in a letter to the Army dated March 15, 1990. EPA proposed criteria for the selection of wells to be abandoned and closed in the Offpost Study Area. In a letter dated June 13, 1991 (U.S. Army, 1991) to the Colorado Department of Public Health and Environment (CDPHE), the Army agreed in principle with the EPA request to modify the Well Closure IRA to include wells meeting the criteria in the Offpost Study Area.

The following set of criteria were developed to identify wells to be abandoned in the Offpost Study Area.

1. Offpost wells will be abandoned according to the regulations set forth by the Office of the State Engineer

   a. if the well is completed in one or more aquifers below the alluvial aquifer, and

   b. if the well is judged to be of improper construction or is in deteriorating condition such that it is leaking from the alluvial aquifer to lower aquifers as indicated by physical parameters (such as hardness and conductivity measurements), and

   c. if the well contains contaminants which originated from RMA in excess of the remediation goals.

2. Offpost wells will be monitored a minimurn of annually

   a. if the well is completed in one or more aquifers below the alluvial aquifer, and

   b. if the well is within 500 feet of a groundwater plume which originated from the RMA, or

   c. if the well is judged to be of improper construction or is in deteriorating condition such that it is leaking from the alluvial aquifer to lower aquifers as indicated by physical parameters (such as hardness and conductivity measurements), and
   if the well contains contaminants originating from the RMA at any level.

3. If, based on current water table data, the well is located in an area of dry alluvium, the well will not be considered a candidate for closure.

4. Wells located on the property currently owned by Shell are included in this well closure plan.

5. Well closure will be at the expense of the United States.

6. Well closure methods will be identical to those used for the closure of oupost wells.

7. The United States and the Department of the Army are removed from liability for dealing with unpermitted wells.

8. Following identification of wells meeting all of the criteria listed in item 2 above, the Tri-County Health Department (TCHD) will notify individual well owners informing them of suspected faulty construction and request permission to enter the property and abandon the well. THCD will inform the Army if and when permission has been received from the well owner to close the well.

9. Well closure expenses will not be borne by the United States in the event that unused wells are listed for closure and the well owner is known. Pursuant to Rule 11.1.1, Abandonment Standards (2 Code of Colorado Regulations 402-2), it is the responsibility of the well owner

to have an unused well properly plugged and abandoned.

A list of wells meeting the closure criteria will be compiled at a meeting of the parties' technical staff. A list of wells to be monitored will also be compiled. A consensus will be reached on guidelines to be used to evaluate the hardness and conductivity data. At the time of the five year review the monitoring information will be reviewed and it will be determined by the parties if a continued monitoring of wells in the deeper aquifers is warranted.

REFERENCES

Shell Oil Company. 1991, Letter to U.S. Department of the Army, July 3.

U.S. Department of the Army, 1991, Letter to Colorado Department of Health, June 13.

U.S. Environmental Protection Agency, 1991, Letter to U.S. Department of the Army and Shell Oil Company, January 6.