



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

RECORD OF DECISION AMENDMENT

**DENVER RADIUM SITE
OPERABLE UNIT VIII
DENVER, COLORADO**

JUNE 16, 2000

PART 1: THE DECLARATION

A. Site Name and Location

Denver Radium Site Operable Unit VIII ("the Site") is located in southwest Denver, northeast of the intersection of Evans Avenue and Santa Fe Drive. The Site includes the 5.9 acre S.W. Shattuck Chemical Company, Inc. ("Shattuck") property located at 1805 South Bannock Street; Bannock Street adjacent to the Shattuck property; the 4.3 acre railroad right-of-way located to the west of the Shattuck property; and nearby ("vicinity") properties located within the area bounded by South Broadway, South Santa Fe Drive (U.S. Highway 85), Evans Avenue, and Iowa Avenue.

South Santa Fe Drive borders the Site west of the railroad right-of-way. Overland Park Golf Course lies west of South Santa Fe Drive. The South Platte River forms the west boundary of the golf course.

The topography of the area surrounding the Site is relatively flat and generally slopes to the north and west toward the South Platte River. Most of the area, with the exception of the Overland Park Golf Course, is typical urban development, ranging from industrial to residential.

The Site is located in an area of the city designated as commercial/industrial. Land use within two blocks south and east of the Shattuck property is predominantly industrial, although some residential use exists. The industrial/commercial area extends from the Shattuck property north for several blocks following the railroad lines.

Residential areas are located three blocks east of the Site (east of South Broadway) and south of the golf course and west of South Santa Fe Drive (approximately 600 feet southwest of the Shattuck property). Water for domestic use is supplied to the area by the Denver Water Department. The Site is located within the drainage basin of the South Platte River, which is located approximately 3000 feet west of the Site. A shallow, unconfined aquifer exists below the Site. The shallow aquifer is perched on bedrock and merges with the alluvial aquifer beneath the floodplain of the South Platte River. The shallow groundwater is not used as a drinking water source, and there are no institutional controls (ICs) in place to preclude such use. Groundwater in the area of the Site generally flows west across the Site and then northwest toward the South Platte River. Groundwater contours within the alluvium indicate that the South Platte River adjacent to the Overland Park Golf Course is a gaining reach that receives discharge from the groundwater system.

Facilities are no longer located on the Shattuck property. Surface water on the Site generally follows the topography toward the northwest.

B. Statement of Basis and Purpose

This decision document amends the original remedy for the Site. The original decision was documented in the Superfund Record of Decision (ROD): Denver Radium Operable Unit VIII, Denver, Colorado, January 1992. After the original decision was implemented, all the buildings and facilities were demolished and disposed of offsite. A monolith was placed on the Site consolidating the excavated Shattuck facility soils along with soils from vicinity properties and from the adjoining railroad right-of-way. This monolith was capped with low-infiltration barrier materials and a rip-rap armored surface. The monolith is 12-15 feet above the Bannock Street curb level. This amendment to the original decision is based on the Administrative Record file for this Site. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP). This amendment does not change the original remedy for groundwater, including the storm sewer remediation, selected in the original ROD.

The State of Colorado concurs with the selected remedy contained in this amended Record of Decision (ROD). A letter from the State is included in Part 4 of this amended ROD.

C. Assessment of Site

The original remedy identified Site soils as principal-threat wastes because these materials were considered to be mobile source materials which generally could not be contained in a reliable manner. These principal-threats received treatment from the solidification and stabilization process. The statutory preference for treatment of principal threat wastes was thus satisfied in the original remedy, although the treatment increased the mass of materials and a visually imposing structure was created. The original remedy imposed a minimum 300-year effectiveness criterion and, in effect, the Site became a permanent waste management facility located in a commercial, light industrial, and residential area. The monolith does not now constitute a principal-threat waste because the radioactive contaminants of concern are relatively immobile in air or groundwater. Nonetheless, as part of the statutory five-year-review process, concerns were raised as to the long-term effectiveness of the monolith and the reliability of ICs. It is clear that groundwater was contaminated before the monolith was constructed, when the radioactive materials were not contained and were being released into the surface water and groundwater. However, it is not clear that the monolith will not present a source of groundwater contamination in the future. In addition to the technical concerns raised by the five-year review, the State, the City and County of Denver, elected officials, and the local community requested that EPA consider other alternatives to the onsite remedy to allow for the unrestricted use of the Site.

The response action selected in this amended ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the

environment, or from actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

D. Description of Selected Remedy

The selected remedy provides for the removal of the monolith from the Site along with any additionally identified contaminants in excess of cleanup levels specified in this amended ROD. The monolith and any additionally identified contaminated soils would be excavated and disposed of offsite at a licensed/permitted land disposal facility or would be recycled at a licensed facility. Complete excavation and offsite removal of the monolith and any additionally identified contaminated soils will leave no residual contamination which could constitute a future threat to groundwater.

The scope of the selected remedy addresses the monolith only. The monitoring of the groundwater and the storm sewer remediation will continue pursuant to the original remedy, and a supplemental field investigation program will be conducted to address the deficiencies found with the groundwater data by the five-year review.

The overall Site management strategy was formulated to respond to several concerns identified in the November 1999 five-year-review report. The five-year-review report identified concerns related to the long-term effectiveness of the monolith and the reliability of ICs imposed in the original ROD. Also the State, the City and County of Denver, and the local community requested that EPA consider other alternatives to the onsite remedy. The combination of these technical concerns, the request from these stakeholders to reconsider the remedy, and the State's withdrawal of support has influenced EPA to amend the original remedy.

E. Statutory Determinations

Part 1: Statutory Requirements

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Part 2: Statutory Preference for Treatment

Because the waste was treated as part of the original remedy, the statutory preference for treatment has already been met. Thus, soils and debris in the monolith no longer constitute principal-threat wastes and the statutory preference for any further treatment is no longer expected.

Part 3: Five-Year-Review Requirements

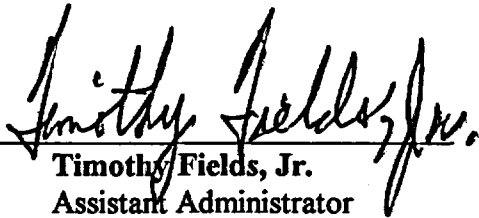
Because the groundwater, Bannock Street, and the railroad right-of-way will remain contaminated with hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure, a five-year review will be required for the Site. The review will not include the Shattuck property, because wastes there will be completely removed.

F. Data Certification Checklist

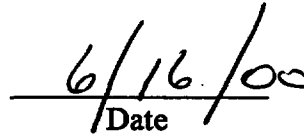
The following information is included in the Decision Summary section of this ROD Amendment. Additional information can be found in the Administrative Record file for this Site.

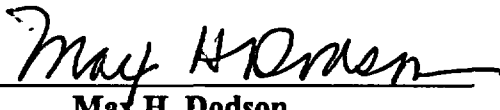
- Chemicals of concern (COCs) and their respective concentrations.
- Cleanup levels established for chemicals of concern and the basis for these levels.
- How source materials constituting principal threats will be addressed.
 - ▶ Treated materials in the monolith no longer constitute a principal threat; therefore a discussion of principal threats will not be addressed.
- Current and reasonably anticipated future land use assumptions, and current and potential future beneficial uses of groundwater used in the baseline risk assessment and original ROD.
 - ▶ The baseline risk assessment and the risk analysis conducted in the five-year review did not address future beneficial use of the groundwater. Therefore, potential future beneficial uses of groundwater will not be discussed.
- Potential land use that will be available at the Site as a result of the selected remedy.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factor(s) that led to selecting the remedy.

G. Authorizing Signatures

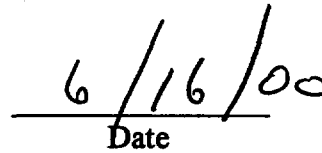


Timothy Fields, Jr.
Assistant Administrator
Office of Solid Waste and
Emergency Response


Date



Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection and
Remediation, EPA Region 8


Date

PART 2: THE DECISION SUMMARY

A. Site Name, Location, and Brief Description

The Site is located in southwest Denver, northeast of the intersection of Evans Avenue and Santa Fe Drive. The Site includes the 5.9 acre Shattuck property located at 1805 South Bannock Street; Bannock St. adjacent to the Shattuck property; the 4.3 acre railroad right-of-way located to the west of the Shattuck property; and nearby vicinity properties located within the area bounded by South Broadway, South Santa Fe Drive (U.S. Highway 85), Evans Avenue, and Iowa Avenue.

In January 1992, a ROD was issued that called for the excavation of soils from the Shattuck property the railroad rights-of-way, and the vicinity properties; treatment of those soils along with the soils from the initial phase of the remediation in a mixture of cement and flyash; placement of the treated materials into a monolith; and capping of the final monolithic structure. That work was, for the most part, completed in 1999. Ongoing work includes quarterly monitoring of monolith compliance wells and quarterly monitoring for a limited set of offsite wells for direct observation of attenuation of pre-existing contamination.

B. Site History and Enforcement Activities

INTRODUCTION

The Denver Radium Site originated with the United States radium, vanadium, and uranium extraction industry of the early 1900s. The United States Bureau of Mines, in cooperation with private industry, established the National Radium Institute (NRI), which successfully developed radium processing in the Denver area. In 1979, EPA noted a reference to the NRI in a 1916 United States Bureau of Mines Report. Subsequent field research revealed the presence of thirty-one radioactive sites within the City and County of Denver. After identifying these properties, the Radiation Control Division of the Colorado Department of Health (now the Colorado Department of Public Health and Environment or CDPHE) notified affected property owners of the presence of radiologic contamination. Pursuant to a cooperative agreement with EPA, CDPHE initiated engineering assessments of the majority of the identified properties. In October 1981, the Denver Radium Site was placed on the Superfund Interim Priorities List. The Site was included on the National Priorities List on September 8, 1983.

In December 1983, EPA began a remedial investigation to determine the nature and extent of the contamination present on those properties which the State did not previously study, as well as several additional properties where contamination was suspected. With the additional properties, the Denver Radium Site included more than forty properties.

Because of the complexity of the Denver Radium Site, response actions were divided into operable units based primarily upon site conditions and location. The site was grouped into eleven operable units; the property located at 1805 South Bannock Street being Operable Unit VIII. In April 1986, EPA published the Denver Radium Site Remedial Investigation report which addressed all eleven operable units.

Prior to proceeding with the cleanup of Operable Unit VIII, the EPA notified potentially responsible parties of the opportunity to perform a more detailed remedial investigation and feasibility study. Although negotiations took place with the S.W. Shattuck Chemical Company, Inc., no potentially responsible parties elected to perform the studies. Under a cooperative agreement with the EPA, CDPHE performed the remedial investigation and feasibility study which supported the original ROD.

CDPHE began the remedial investigation in November 1988. Since 1979, CDPHE, EPA, and Shattuck have conducted various studies of the Site media, which have included a substantial number of soil and groundwater samples. The remedial investigation studies evaluated the existing data and included collection of additional data to characterize the nature and extent of the contamination.

The S.W. Shattuck Chemical Company was invited to enter into a consent decree with the United States to conduct the response action and to reimburse EPA for its oversight costs. Negotiations with Shattuck were unsuccessful, and a unilateral administrative order was issued to the Company effective August 31, 1992. Later, the United States and Shattuck entered into a consent decree on January 22, 1996, under which the Company reimbursed EPA for its response costs through March 31, 1995.

OPERATIONAL HISTORY

The Shattuck property has been the location of several mineral-processing operations, including the processing of tungsten ores, carnotite ores (for uranium and vanadium), radium slimes, molybdenum ores, and depleted uranium. The contamination of the Site is due to historical use of the Site for various mineral-processing operations. Approximate time frames for some of the processing activities that have taken place at the Site follow:

1920s - Treatment of molybdenum ores and extraction of ferric vanadate from vanadium and uranium ores or by-products.

1930s - Processing of radium slimes for recovery of radium, as well as production of radium salts, uranium compounds and other rare mineral products from carnotite ores.

1940s - Processing of uranium compounds and molybdenum.

1950s - Processing of uranium ores.

1960s - Continued operation under the Atomic Energy Commission (AEC) Source Material License R-104 until reissuance as Source Material License SMB-479. Licensing authority was transferred from AEC to the State of Colorado when it became an Agreement State in 1968.

1970s & 1980s - Processing of uranium compounds, molybdenum and rhenium.

From 1969 to 1984, the operations at the facility consisted primarily of processing molybdenite for the recovery of molybdenum compounds, with recovery of rhenium as a by-product. In addition, a small batch operation existed for the production of uranium products from depleted uranium. Operations at the Shattuck facility ceased in 1984. The Shattuck property is currently fenced, and access is restricted by security provided by the S.W. Shattuck Chemical Company.

The railroad right-of-way includes two rail lines which have been operating since the late 19th century. In addition, a rail spur onto the Shattuck property was in place by 1915. The two rail lines are utilized as main lines through the Front Range and handle approximately twenty to thirty general freight and coal trains per day. The east rail line is located on property owned by the Burlington Northern/Santa Fe Railway Company, and the western line is owned by the Southern Pacific Railroad Company. At present, one line is utilized for northbound traffic and the other is utilized for southbound traffic.

C. Community Participation

The public participation requirements of sections 113(k)(2)(B)(i-v) and 117 of CERCLA were met in the remedy selection process.

A mailing list of persons interested in the Site was developed to keep the public informed of the progress on the five-year review. EPA has published fact sheets at project milestones to inform the public of opportunities for input. EPA/CDPHE representatives have also met with a local community group and the local City Council representative to discuss the project.

The Proposed Plan for this ROD amendment was made available to the public in December 1999. It can be found in the Administrative Record file and the information repository maintained at the EPA Docket Room in Region 8 and at the Decker Public Library. The selected remedy in this amended ROD is the remedy identified in the Proposed Plan as the preferred alternative. The notice of the availability of the Proposed Plan was published in the Denver Post and Denver Rocky Mountain News on December 23, 1999, and distributed through a mailing list. A public comment period was held from December 23, 1999 to March 17, 2000, including a 45-day extension. In addition, a public meeting was held on January 20, 2000 to present the Proposed

Plan to a broader community audience than those that had already been involved at the Site. At the public meeting, representatives from EPA and CDPHE answered questions about problems at the Site and the remedial alternatives. EPA's response to the comments received during this period is included in the Responsiveness Summary, which is Part 5 of this amended ROD.

The Decker Branch of the Denver Public Library, located at 1501 South Logan, has been used as a repository so that the primary documentation is available at a location close to the Site. In addition, the Administrative Record is available at EPA and CDPHE offices in Denver.

This decision document presents the selected remedial action for the Site, chosen in accordance with CERCLA and the NCP. The decision for the remediation of the Site is based on the Administrative Record.

D. Scope and Role of Operable Unit or Response Action

The Denver Radium Site consists of more than 40 properties grouped into 11 operable units. The RODs for the other operable units addressing radiologic contamination identified excavation and permanent offsite disposal as the principal remedy in each case, except Operable Unit VII. Operable Unit VII includes sections of nine Denver streets where contaminated materials were left in place based on the limited threat they pose to public health and the environment. The RODs incorporated various combinations of consolidation and temporary storage units until a permanent offsite repository would be available. Remedial action at these operable units has now been completed and site-specific supplemental standards have been developed at some of these operable units where hazardous substances, pollutants, or contaminants could not be removed without unacceptable disturbance to buried infrastructure or existing buildings. In these cases, radioactive materials were left buried in soils above levels that allow unlimited use and unrestricted exposure.

EPA selected the original remedy for soils and groundwater in a ROD signed on January 28, 1992. This original ROD specified that the remedial action objectives for the Site were to eliminate the potential health threat that may be posed and, in particular, to reduce potential for exposure to excess gamma radiation and radon gas which posed the principal threats at the Site.

Concerns were raised in the five-year review about whether these objectives are being met by the current remedy. This amended remedy addresses those concerns and is designed to address the potential risks associated with this Site. It does not address groundwater contamination.

As with many Superfund sites, the problems at the Site are complex. As a result, EPA has organized the work into two response actions:

- Removal of the monolith and
- Restoration of the groundwater aquifer, including the storm sewer remediation.

This amended ROD addresses only the capped monolith and is the final response action for this Site, unless changes are made to the groundwater remedy.

E. Site Characteristics

The topography of the area surrounding the Site is relatively flat and generally slopes to the north and west toward the South Platte River. Most of the area, with the exception of the Overland Park Golf Course, is typical urban development, ranging from industrial to residential. The Site is located in an area designated as commercial/industrial. Land use within two blocks south and east of the Site property is predominantly industrial, although some residential use exists. The industrial/commercial area extends from the Site property north for several blocks following the railroad lines.

SOILS

Radiologically contaminated soils were identified on the Shattuck property, the railroad right-of-way, and the vicinity properties. Areas were considered contaminated if the radium-226 concentration in soil exceeded 5 picocuries per gram (pCi/g) above background in the top 15 centimeters (cm) of soil or 15 pCi/g above background in any layer below the top 15 cm (40 CFR 192.12).

Radioactive soil contamination on the Site property originally covered approximately 230,000 square feet. A total of 43,214 cubic yards (in place) of radioactive soil contamination were excavated at the Site. Those soils were consolidated into an actual solidified volume of 83,610 cubic yards.

The estimates of soil contamination were based primarily on radium-226 contamination. Additional metals contamination, including radioactive lead-210, thorium-230, and uranium, as well as non-radioactive metals such as lead and arsenic, have also been identified in Site soils. The majority of the additional contaminants are co-located with the radium-226 contamination and were addressed by solidification with the radium-contaminated soils.

GROUNDWATER

Data from the supplemental monitoring system installed during the remedial investigation were used in conjunction with data from monitoring performed by the Shattuck Chemical Company to characterize groundwater flow and quality for the Site. Potentiometric surface maps indicate that contaminated groundwater from the Site flows in a west to northwest direction and is contained beneath the Overland Park Golf Course. The golf course obtains its water from ponds supplied

from the South Platte River. There is no current use of groundwater affected by the Site. Projected use in the future is unknown. Contaminated groundwater from the Site does not flow beneath the residential area located to the south of Overland Park Golf Course. Water for domestic use is supplied to the area by the Denver Water Department.

Data indicate that groundwater associated with the Site is infiltrating a storm sewer located along South Santa Fe Drive. Samples collected from the storm sewer discharge were contaminated with heavy metals, especially molybdenum, which was known to be associated with chemicals used and released from the Site. The storm sewer discharges into the South Platte river just south of Louisiana Avenue. The original remedy recognized this exposure pathway and dictated that remedial measures be undertaken on cracks in the storm sewer line to seal out groundwater. Data for samples from the storm sewer outfall obtained after two attempts to remediate the sewer line still show elevated levels of ammonia, molybdenum, copper, and uranium. Any additional storm sewer remediation will be conducted pursuant to the original ROD and the unilateral administrative order issued in 1992, and is unaffected by this amended ROD.

The groundwater portion of the remedy is now subject to further evaluation because the Site conceptual model and monitoring data may be insufficient to determine whether remedial objectives for groundwater can be attained. The groundwater project will identify data gaps and provide detailed recommendations on additional data needs.

F. Current and Potential Future Land and Water Uses

The original remedy achieved cleanup levels that did not allow the entire Site to be available for unrestricted use. The original remedy created a long-term waste management area for containment of solidified, low-level waste on a major portion of the Site. Where future land use is uncertain, EPA guidance on land use (OSWER Directive No. 9355.7-04, "*Land Use in the CERCLA Remedy Selection Process*") suggests that previous remedial decisions should be revisited when future land use results in a situation that may have an effect on human health or the environment. Interaction with the public, which includes all stakeholders affected by the Site, has cast doubt on the certainty in the original assumptions made regarding future land and groundwater use at the Site.

The onsite disposal alternative required a restricted land use. It became essential that it include ICs to ensure that it remain protective. ICs are non-engineered instruments such as administrative or legal controls that minimize the potential for exposure to contamination by limiting land or resource use. ICs are generally to be used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment. Some examples of ICs include easements, covenants, well-drilling prohibitions, zoning restrictions, and special building permit requirements. Deed restriction is a phrase often used in remedy decision documents to describe easements or other forms of ICs.

In all cases, EPA recognizes that ICs, which play a key role in ensuring long-term protectiveness should be evaluated and implemented with the same degree of care given to other elements of the remedy. The five-year-review report evaluated the types of ICs to be used, the existence of the authority to implement the ICs, and the appropriate entity's resolve and ability to implement the ICs. While the original ROD did not specify the precise type of control to be imposed, new information contained in the five-year-review report questions their effectiveness.

For example, the five-year-review report questioned whether the ICs are required to restrict the use of contaminated groundwater could ever be implemented. The City and County of Denver has the authority to control use of groundwater downgradient from the Site or anywhere within the service area of the Denver Water Board. Accordingly, an offsite IC can be implemented by enacting an ordinance. However, the City and County of Denver has indicated that it will not enact such an ordinance. Shattuck does not consider itself responsible for ensuring offsite land use, and the State/City governments have not provided definitive assurances of ICs for the design life of the remedy specified in the original ROD (200 years).

ICs were a vital element of the original ROD because they simultaneously influenced and supplemented the original remedy. EPA guidance on ICs suggests that limitations in ICs may require reevaluating and adjusting the remedy components, including the proposed ICs. At some sites, remedy contingencies may be required to protect against uncertainties in the ability of the ICs to provide the required long-term protectiveness. EPA has concluded that the limitations in ICs at the Site help justify offsite disposal.

G. Summary of Site Risks Identified by the Five-year-review Report

Pursuant to Section 121(c) of CERCLA, EPA conducted a five-year review in 1999 to evaluate the protectiveness of the Site remedy. The review found site-specific deficiencies in:

- The monolith cover design;
- The structural and chemical integrity of the monolith; and,
- The monolith's compliance monitoring program.

The review recommended that the Site remedy be re-evaluated because these deficiencies are associated with the long-term performance of the cover and monolith.

The remedy selected in the original ROD was intended to address human health risks based on a baseline risk assessment. However, the 1999 five-year-review report concluded, based on a risk analysis, that there is uncertainty whether the risks are addressed in the long term. The response action selected in this ROD amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment, or actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

H. Remedial Action Objectives

The specific remedial action objectives (RAOs) for this operable unit have been derived from the individual performance standards discussed in the feasibility study for the original ROD and referenced in it. The RAOs for radium and thorium have been updated to reflect EPA CERCLA guidance issued post original OU VIII ROD (OSWER Directive No. 9200.4-25, "Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites"). They involve not only the reduction or control of exposure, but also the elimination of potential future exposure to treated radioactive soils contained in the monolith. The basis and rationale for these restated RAOs were originally identified in the risk assessment and have been discussed further in the five-year review. Elimination of the risk posed by these soils will permit unrestricted use of the Site which conforms to reasonably anticipated future land use. The following RAO statements are established for each contaminant of concern:

- Eliminate the potential for direct contact with soil or ingestion of soil with the potential to cause excess cancer risks of greater than 10^{-6} from gamma radiation.
- Eliminate the potential for inhalation of soil with the potential to cause excess cancer risks of greater than 10^{-6} from thorium ²³⁰ in wind-blown dust and radon progeny.
- Eliminate the potential for exposure to soil having radium ²²⁶ activity levels greater than 5 pCi/g occurring in any six-inch layer of the monolith from its top surface to its bottom surface, including any original soils not incorporated into the monolith which are above the groundwater table.
- Eliminate the potential for exposure to soil having thorium ²³⁰ activity levels greater than 5 pCi/g occurring in any six-inch layer of the monolith from its top surface to its bottom surface, including any original soils not incorporated into the monolith which are above the groundwater table.
- Eliminate the potential for direct contact with soil or ingestion of soil with natural uranium activity levels greater than 75 pCi/g.
- Eliminate the potential for inhalation of radon progeny at an activity greater than 0.02 working levels.
- Eliminate the potential for future groundwater contamination.

I. Description of Alternatives

The 1999 five-year review was conducted to determine whether the remedy at the Site is protective of human health and the environment. The review concluded that the original remedy should be re-evaluated because of deficiencies in the monolith cover design, the structural and chemical integrity of the monolith, and the monolith's compliance monitoring program, as well as the ineffectiveness of the ICs and O & M implementation. The report states that the cover design overlooked four technical issues that should have been addressed at the time of the design: water balance analysis, shrinkage potential, hydraulic conductivity of the RS/CL slope, and settlement.

In addition, the State withdrew its support of the original remedy, and the City and County of Denver and the community requested that EPA re-evaluate the original remedy

As a result, two other alternatives in addition to the current remedy were evaluated.. The other alternatives developed for a detailed analysis and comparison included: Alternative #2 (Enhanced Onsite Waste Repository), and Alternative #3 (Offsite Disposal). In addition, the NCP requires a no action alternative be considered at every site. In this case, Alternative #1 (the No Further Action alternative or current remedy), serves primarily as a point of departure for the other alternatives. These alternatives are identical to those proposed in the 1999 Proposed Plan.

The alternatives under consideration are the following:

- Alternative 1 No Further Action (Perpetual O & M of onsite waste repository, perpetual groundwater monitoring of monolith isolation, and monitoring of offsite impacted groundwater with existing network)
- Alternative 2 Enhanced Onsite Waste Repository (all the activities described in Alternative 1, and cap replacement, supplemental monolith performance monitoring, and supplemental monitoring of offsite impacted groundwater with expanded well network)
- Alternative 3 Offsite Disposal (direct disposal and/or recycling of the monolith)

ELEMENTS OF THE ORIGINAL REMEDY THAT ARE UNAFFECTED BY THIS ROD AMENDMENT

Shattuck will continue the ongoing remediation of the storm sewer located west of the Site along South Santa Fe Drive in accordance with the original ROD, and take corrective action as required to comply with the Clean Water Act and Colorado Water Quality Control regulations (5 CCR 1002-2 3.1, 3.8 & 6.1 et seq.) . The means of compliance could involve eliminating the infiltration or treating the discharge, and will be evaluated during the long-term surveillance monitoring of contaminated groundwater.

The on-going bio-remediation activity for the oily soils area identified in the original ROD would continue.

Groundwater investigations will continue as specified under the original ROD.

DISTINGUISHING FEATURES OF EACH ALTERNATIVE

Alternative 1 would leave the existing monolith structure in place in accordance with all requirements of the original ROD with an additional requirement to add approximately eight groundwater monitoring wells at select locations both on and offsite. The additional monitoring wells would provide better assessment of the performance of the monolith. These multi-purpose wells would also provide additional characterization of the groundwater, although that activity and its associated implementation time are not part of this Alternative.

ALTERNATIVE 1	
Estimated Capital Cost	\$27,000
Estimated Present Worth Annual O&M Costs (7% discount rate)	\$5.97 million
Estimated Present Worth Total Costs	\$6.00 million
Estimated Implementation Time	3 months for well installation plus 30 years of monitoring

Alternative 2 includes all activities under Alternative 1, and the following additional activities:

- Designing and constructing a new, more protective cover system.
- Additional performance assessment modeling of the monolith designs to demonstrate long-term performance.
- Upgrading the monolith-monitoring plan to assure compliance with RAOs.
- Performing a more comprehensive evaluation to further characterize onsite and offsite risks.
- Performing an updated baseline risk assessment utilizing current models.
- Installing instruments within the cover system to allow on-going evaluation of its performance.

ALTERNATIVE 2	
Estimated Capital Cost	\$1.0 million
Estimated Present Worth Annual O&M Costs (7% discount rate)	\$6.0 million
Estimated Construction Costs	\$2.9 million
Estimated Present Worth Total Costs	\$9.9 million
Estimated Implementation Time	1-2 years for construction plus 30 years of monitoring

Alternative 3 includes the removal of the monolith from the Site along with any additionally identified contaminants in excess of clean-up levels specified in this amended ROD. The monolith would be excavated and disposed offsite at an NRC licensed/permitted land disposal facility or would be recycled at a licensed facility.

ALTERNATIVE 3	
Estimated Capital Cost	N/A
Estimated Present Worth Annual O&M Costs (7% discount rate)	\$ 1.5 million
Estimated Construction Costs	\$20.0 million
Estimated Present Worth Total Costs	\$21.5 million
Estimated Implementation Time	2-3 years

J. Comparative Analysis of Alternatives

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the amended ROD evaluates the relative

performance of each alternative against the nine criteria, noting how it compares to the other alternatives under consideration.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The three alternatives have been assessed to determine whether they can adequately protect human health and the environment, in both the short and long term, from unacceptable risks posed by contaminants present at the Site by eliminating, reducing, or controlling exposures. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. The five-year-review report indicated that all of the alternatives provide adequate short-term protection of human health and the environment. However, the report raised significant concerns about the long-term effectiveness of Alternative 1 because deficiencies in the monolith/cover design result in an inability to demonstrate long-term performance criteria specified in the original ROD, as well as ineffective implementation of ICs. The report also raised significant concerns about the long-term reliability of Alternative 2 because after-the-fact design retrofits are inherently difficult to successfully enact and may, themselves, be subject to failure. Furthermore, the ERT Report also raises concerns about the cap and monolith design, stating that "the monolith is above grade which would lead to the possibility of freeze-thaw mechanical weathering conditions that may compromise the integrity of the cap or monolith." The Report also states that "measurements taken during the design phase indicate that the potential for the monolith to leach if infiltrated by water is high."

Although some comments received during the comment period question the conclusions reached by the five-year-review panel, and indicate that issues brought up by the panel could be resolved through additional studies, EPA believes that additional studies cannot fully overcome the deficiencies identified by the panel. As long as the material remains in place, there will always be a possibility that the monolith will fail or the monitoring program will not detect releases of contaminants.

Although all of the alternatives would provide varying degrees of protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, and/or ICs, Alternative 3 is the least dependent upon ICs that historically have been difficult to implement, and removes the dependency on long-term O&M. Alternative 3 achieves the greatest overall protection as it does not raise the long-term effectiveness and reliability concerns associated with Alternatives 1 and 2, and removes the contaminated radioactive materials from the Site.

Alternative 1 can only achieve short-term protectiveness. Its long-term protectiveness cannot be reasonably assured even with reliance on long-term ICs and operation and maintenance (O&M). This recognizes the uncertainty with the long-term performance of the monolith and cover system and the resulting impact on groundwater from potential failure. Protectiveness under Alternative

1 is the most dependent upon adoption and reliability of ICs and on the effectiveness of long-term O&M. Because of the number of uncertainties and the dependency on ICs and long-term O&M, Alternative 1 is the least protective alternative.

Alternative 2 would provide short term protection by preventing exposure to contaminated soils and preventing leakage of these contaminated source materials to the groundwater by recapping the monolith; however, long-term surveillance, maintenance, and monitoring would be required to ensure that the cap remained protective. Alternative 2 improves upon the short-term and long-term protectiveness achieved by Alternative 1. Alternative 2 reduces the uncertainty found in Alternative 1 through substantial cap improvement and/or replacement. However, the long-term reliability of this retrofitted system would still raise significant concerns.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

All alternatives would meet their respective ARARs from Federal and State laws.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternatives have been assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that have been considered, as appropriate, include the following: (1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate. (2) Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

Alternative 3 is more effective and permanent over the long term than either Alternative 1 or Alternative 2 because deficiencies in the five-year-review report are addressed in full by removing

the monolith and any original residual unstabilized contaminated soil. Alternative 3 is more permanent than either Alternative 1 or Alternative 2 because reasonable assurance of long-term reliability is difficult to obtain when the monolith remains in place no matter whether it is enhanced. Alternative 3 would reduce the inherent hazards posed by the contaminants at the Site to health-based levels, and further controls would not be necessary to ensure the long-term effectiveness and permanence.

Alternative 2 would prevent the direct contact exposure and contaminant migration. However, monitoring would be necessary to ensure the long-term effectiveness and permanence of this alternative, and reliable ICs must still be implemented. Alternative 2 addresses, to a limited extent, the deficiencies identified in the five-year-review report but does not eliminate the long-term uncertainty with a re-engineered containment remedy, and would provide some assurance of the long-term integrity with a redesigned cap, supplemental performance monitoring, and long-term O&M of the cement-stabilized soils. This alternative has more reliable controls due to re-engineering and redesigning the cap but does not eliminate the possible need for further work in the future should this remedy fail. Alternative 2 is intended to minimize the need for an active maintenance program, but does not eliminate it. It is also not capable of providing any forewarning of chemical failure of the monolith. The five-year-review summary states that "the reviewers believe that "...after-the fact design retrofits are inherently difficult to successfully enact and may, by themselves, be subject to failure."

Alternative 1 does not address the deficiencies identified in the five-year review and would provide the least long-term effectiveness and permanence due to the uncertainties concerning the cap and long-term performance of the monolith as noted in the five-year-review report. The ERT report points out the high degree of dependence on ICs and long-term O&M.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS THROUGH TREATMENT

Neither Alternative 1 nor 2 will achieve any more reduction than has already been achieved with the existing stabilized/solidified soil cement. With Alternative 3, there would be some opportunity for toxicity, mobility, or volume reductions if an offsite recycling facility is chosen.

SHORT-TERM EFFECTIVENESS

Alternative 1 provides the greatest short-term effectiveness because the limited activities to be conducted would pose the least short-term risk. Alternative 2 would create some additional short-term risks due to conducting more activities. Alternative 3 involves excavation of contaminated soils stabilized in the monolith and thus presents the greatest potential for short-term risks.

Alternative 3 presents a higher short-term risk than Alternative 2 because of the potential for exposure to contaminated soils by transporting the 150,000 tons of material to an offsite facility. The contaminants are not volatile, so the risk of release is principally limited to wind-blown soil transport or surface water run-off from rain or snow when the monolith is demolished and prepared for the transportation container. Control of dust and run-off will limit the amount of materials that may migrate to potential receptors. Airborne dust and noise suppression may be achieved through more extraordinary methods, such as enclosures, than would be necessary for Alternative 2. In addition, a higher-intensity traffic control plan would be necessary for Alternative 3 compared to the more limited transportation logistics needed under Alternative 2.

Alternative 2 does not present as great a short-term threat except to the extent that the uncovered monolith presents direct contact or migration potential during the time it takes to fully implement the replacement cap. Alternative 2 could be completed in 6-12 months until a re-engineered containment is constructed, with achievement of the remedial action objectives within one year. Alternative 3, on the other hand, would require 24-30 months to complete.

IMPLEMENTABILITY

All alternatives utilize readily available equipment and techniques. Alternative 3 may be slightly more difficult to implement than Alternatives 1 and 2 if the material is recycled at an offsite facility because the facility may require modifications to federal or state permits and further treatability studies. These studies would be designed to meet the material acceptance criteria established in any potential amendments needed to their operating licenses.

COST

Alternative 1 is the least costly, followed by Alternative 2, and then by Alternative 3. Estimated capital costs are lower for Alternative 2 than for the full cost of offsite removal under Alternative 3. The estimated annual O&M costs would be much greater for Alternative 2 than for Alternative 3 because of the needed monitoring program that would last for hundreds of years.

STATE SUPPORT/AGENCY ACCEPTANCE

The State of Colorado supports the selected alternative. A letter from the State of Colorado concurring with the remedy is included in Part 4 of this amended ROD.

COMMUNITY ACCEPTANCE

The community supports the selected remedy. Community acceptance of the selected alternative is evidenced by the comments received during the public comment period. All significant comments are described in the Responsiveness Summary in Part 5 of this ROD amendment.

K. Principal Threat Wastes

The monolith does not now constitute a principal-threat waste because the radioactive contaminants of concern are relatively immobile in air or groundwater.

L. Selected Remedy

SUMMARY OF THE RATIONALE FOR THE SELECTED REMEDY

The selected alternative for cleaning up the Site is Alternative 3. It is the alternative that best meets the evaluation criteria. Alternative 3 is preferred over Alternative 1 and 2 because it removes the uncertainties concerning long-term protection of human health and the environment. Alternative 3 is the only alternative supported by the State, the City and County of Denver, and the community. Alternative 3 was selected over Alternative 2 because it allows for unrestricted land use upon remedy completion, achieves greater long-term risk reduction, eliminates reliance on ICs, eliminates the need for perpetual O&M, provides absolute assurance against future groundwater contamination from the contaminant source, and is the only alternative supported by the State and community. Although the selected alternative is more costly than Alternatives 1 and 2, it is still considered to be cost effective because it provides for the public health and environmental certainty that cannot be afforded by the other alternatives. The actual costs associated with Alternatives 1 and 2 may be much greater if the potential defects identified in the five-year review, such as settlement or chemical deterioration, result in remedy failure and the need for additional engineered solutions.

Based on the information available at this time, EPA believes the selected alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. If a recycling facility is chosen instead of a direct disposal facility, the remedy also would meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

COST ESTIMATES FOR THE ALTERNATIVES

The information for the cost estimates is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference (ESD), or another ROD amendment. Estimates shown here are order-of-magnitude engineering cost estimates that are only expected to be within +50 to -30 percent of the actual project costs.

M. Statutory Determinations

Under CERCLA §121, and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, section 121(b) of CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes and a bias against offsite disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy, Alternative 3, will protect human health and the environment by eliminating the source of contamination and the potential for any leachate generation that might contribute to additional groundwater contamination.

The gamma radiation risk [10^{-3}] to future residents posed the risk identified in the baseline risk assessment. This radiation risk and the risk posed by radon gas have been reduced to within the acceptable 10^{-4} to 10^{-6} risk range by the current remedy, but the five-year-review report questions whether this risk range can be maintained in the long term. The selected remedy will remove any uncertainty that the original risk posed by the contaminants could resurface. The selected remedy will reduce the radiation risks from future potential exposure to radium-226, thorium-230, lead-210, and uranium. There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the selected remedy.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy will comply with all ARARs. The ARARs are presented in Part 3 of this amended ROD.

COST-EFFECTIVENESS

The selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent. The estimated present worth cost of the selected remedy is \$21,500,000. Although Alternative 2 is \$12 million less expensive, the potential future costs of remedy failure for Alternative 2 are substantial and corrective action could result in even higher costs. The selected remedy's additional cost for offsite disposal provides a significant increase in protection of human health and the environment. Therefore the remedy is cost-effective.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy provides a permanent solution. It also provides for an alternative treatment technology because it is an enhancement of the existing remedy that included as a major component the treatment of the waste material. The selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against offsite disposal without treatment and considering State and community acceptance.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The statutory preference for treatment has been met by the original remedy. The remedy in this amended ROD not affect the solidification and stabilization treatment already conducted.

FIVE-YEAR REVIEW REQUIREMENTS

Because this remedy will not address contaminated groundwater, railroad right-of-way, or Bannock St. that contain hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted on these components of the original remedy. The next review for this portion of the remedy will be conducted within five years of the five-year review completed in November 1999 to ensure that the remedy is protective of human health and the environment.

PART 3: APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARARs/TBCs					
1. Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings Radium-226	40CFR 192.12(a)	No	Yes, regulations are RAR because of site similarity with sites where this regulation is applicable.	Standard for clean-up of soils at inactive uranium processing sites.	Guidance for use of this regulation as an ARAR at Superfund Sites is provided by OSWER Guidance No. 9200.4-25.
2. Guidance on the Use of 40 CFR 192 to Establish Soil Cleanup Criteria at CERCLA Sites	OSWER 9200.4-25	No	TBC	Provides guidance regarding the circumstances under which the subsurface soil cleanup criteria in 40 CFR Part 192 should be considered ARARs for radium and thorium	The subsurface "finding tool" of 15 pCi/g is only a consideration when there is no significant contamination between 5 and 30 pCi/g, so that use of the finding tool will result in cleanup levels of 5 pCi/g or less. In situations where there is significant contamination between 5 and 30 pCi/g, 5 pCi/g is recommended as a cleanup level if this level is within the risk range.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
3. Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings Radon-222	40 CFR 192.02(a) &(b)(1)&(2)	No	Yes, regulations are RAR because of site similarity with sites where this regulation is applicable.	Control of residual radioactive materials and their listed constituents shall have design goals or standards.	Standard for post-closure management of uranium or thorium by-product material
4. Radiation Control Act - Standards for protection against radiation/licensing of radioactive materials	10 CFR 20,30,40,70	No	Yes, regulations are RAR because of site similarity with sites where this regulation is applicable.	Substantive provisions are potentially relevant and appropriate to non-licensed materials. These include provisions concerning permissible doses, levels and concentration standards. Use of PPE and environmental monitoring.	
	6 CCR 1007-1 Parts 1,2,4,10				
5. Standards for protection against radiation	10 CFR 20, 30,40,70	No	Yes, regulations are RAR because of site similarity with sites where this regulation is applicable.	Substantive provisions are potentially relevant and appropriate to non-licensed materials. These include provisions concerning permissible doses, levels and concentration standards. Use of PPE and environmental monitoring.	

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
6. Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings Radiation General	40 CFR 192.41(d)	No	Yes, regulations are RAR because of site similarity with sites where this regulation is applicable.		During operations and prior to closure operations shall be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive materials, radon- 220 and its daughters excepted, to the general environment.
7. Federal Guidance Report No. 11. Radiation Dose	Federal guidance Report No. 11		TBC		Federal guidance Report No. 11 provides recommended Annual limits on intake and derived air concentrations to be implemented by Federal agencies to limit intake of radioactive materials by workers.
8. National Emission Standards for Hazardous Air Pollutants	40 CFR 61	No	Yes		NESHAPs concerning radon emissions from the disposal of uranium mill tailings , subpart T, from underground uranium mines, Subpart B from Department of Energy facilities, Subpart Q, or from operating mill tailings, Subpart W may be relevant and appropriate. Also, NESHAPs concerning emissions of radionuclides other than radon from DOE facilities, Subpart H, and from federal facilities other than Nuclear Regulatory Commission Licensees and not covered by Subpart H, Subpart I may be relevant and appropriate.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
9. Clean Air Act, National Primary and Secondary Ambient Air Quality Standards	42 USC Sect. 7401-7642, 40 CFR Part 50	Yes	—	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources.	Emissions associated with proposed remedial actions are expected to be limited to fugitive dust emissions associated with demolition and earth moving activities. These activities are not expected to constitute a major source. Federal NAAQS more stringent than State standards may be applicable. Compliance with these standards will be addressed in a Fugitive Emissions Dust Control Plan.
10. Colorado Ambient Air Quality Standards	5 CCR 1001	Yes	—	Primary and secondary standards for PM10 in ambient air. Federal and State TSP standards have been replaced with PM10 and PM2.5 standards.	Compliance with ambient air standards will be achieved by adhering to a Fugitive Emissions Dust Control Plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
11. Colorado Air Pollution Prevention and Control Act, Regulation 8	5 CCR 1001-14; 5 CCR 1001-10, Regulation 8	Yes	—	Regulation No. 8 adopts the Federal NESHAPS. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard.	Fugitive dust emissions are expected to be of limited nature, occur in isolated areas and for short periods of time. Emissions may occur but are not expected to exceed the emission levels in Regulation 8. Compliance with Regulation No. 8 will be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.
12. Guidance on Cleanup Levels for CERCLA Sites with Radioactive Contamination	OSWER No. 9200.4-18	No	TBC	Clarifies that cleanups of radionuclides are governed by the risk range (generally 10 ⁻⁴ to 10 ⁻⁶) for all carcinogens when ARARs are not available or are not sufficiently protective.	Cancer risks should be estimated using slope factors. Also includes determination that dose limits in NRC decommissioning rule (e.g., 25/100 mrem/yr EDE) should not be used to establish cleanup levels under CERCLA.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
13. Radiation Risk Assessment Q & A	OSWER No. 9200.4-31P	No	TBC	Provides an overview of current EPA guidance for risk assessment and related topics.	Establishes guidance that dose assessments will be conducted only for ARAR compliance. Therefore, dose recommendations should not be used as TBCs.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs					
14. Resource Conservation and Recovery Act (RCRA), Subtitle D	40 CFR Part 258.10-15	No	Yes		Facilities where treatment, storage or disposal of solid waste will be conducted must meet certain location standards. These include location restrictions on proximity to airports, floodplains, wetlands, fault areas, seismic impact zones, and unstable areas. The wastes at Shattuck are not considered solid wastes, so these provisions are at most potentially relevant and appropriate.
15. Colorado Radiation Control Act - Licensing Requirements for the Disposal of Low Level Radioactive Waste	CRS 25-11-101 to 25-11-305	No	Yes		Portions of this regulation dealing with siting and design criteria for land disposal of low level radioactive waste may be relevant and appropriate.
	6 CCR 1007-1 Part 14, Subparts .2,.7,.8,.15,.19-.22,.23.1.1,.23.1.5,.23.1.6,.24,.26				
16. Colorado Radiation Control Act - Milling of Uranium, Thorium and Related Radioactive Materials	CRS 25-11-101 to 25-11-305	No	Yes		Portions of this regulation dealing with siting and design criteria for land disposal of uranium and thorium milling wastes may be relevant and appropriate.
	6 CCR 1007-1 Part 18				

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs/TBCs					
17. Colorado Air Pollution Prevention and Control Act, Fugitive Dust Control Plan/Opacity, Regulation No. 1	5 CCR 1001-3; § III.D.1.b,c,d. § III.D.2.a,b,cd,e ,f,g Regulation 1	Yes	—	Regulation No. 1 provisions concerning fugitive emissions for construction activities, material handling and storage, demolition activities, haul roads, and haul trucks are potentially applicable.	
18. Colorado Air Pollution Prevention and Control Act, APENs Regulation No. 3	5 CCR 1001-5, Regulation 3	Yes	—	Establishes emissions control regulations for construction or modification of stationary sources.	Substantive provisions are potentially applicable.
19. Colorado Air Pollution Prevention and Control Act, Odors, Regulation No. 2	5 CCR 1001-4	Yes	—	Applies to any remedial action that may create regulated odors.	Proposed remedial actions are not expected to create regulated odors.
20. Solid Waste Disposal Act (SDWA) as amended by RCRA, Criteria for Classification of Solid Waste Disposal Facilities and Practices (Subtitle D)	42 USC Sect. 6901-6987, 40 CFR Part 257	No	Yes	Establishes minimum standards, closure requirements, site standards, and engineering design standards for solid waste disposal facilities.	
21. Solid Wastes Disposal Sites and Facilities Regulations	CRS 30-20-101 to -118, 6 CCR 1007-2				

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
22. Colorado Noise Abatement Act	CRS §§ 25-12-101 to 108	Yes	—	Establishes maximum permissible noise levels for particular time periods and land use zones.	Applicable if construction activities occur in residential areas.
23. Colorado Water Quality Control Act Stormwater Discharge Regulations	5 CCR 1002.2	Yes	—	Establishes stormwater control requirements for construction activities.	Potentially applicable if construction activities occur as part of the remedial action.

Standard, Requirement, Criteria, or Limitation	Citation	Potentially Applicable	Potentially Relevant and Appropriate	Description	Comments
24. Colorado Hazardous Waste Regulations	6 CCR 1007-3, Part 264: Section 264.301, (g), (h), (i) and (j); Section 264.310 (a)(1) through (a)(4); Section 264.310, (b)(1) and (b)(5)	No	Yes	Specific provisions of Section 264 concern run-on control, run-off control, management of run-on and run-off control systems, and cap design standards	The wastes here are not hazardous wastes, but specific provisions of the hazardous waste regulations may be relevant and appropriate in certain circumstances depending on site-specific conditions. The determination of whether such requirements will be both relevant and appropriate to the activities to be undertaken in OUS will be based on best professional judgement and is conducted on a site specific basis taking into account the physical nature and location of the media involved, whether the requirements are well suited to the site conditions, and other factors.

PART 4: STATE OF COLORADO CONCURRENCE LETTER

STATE OF COLORADO

Bill Owens, Governor
Jane E. Norton, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

June 14, 2000

Timothy Fields
Assistant Administrator
Office of Solid Waste and Emergency Response
U. S. Environmental Protection Agency
401 M Street, SW (MC5101)
Washington, D. C. 20460

Dear Mr. Fields:

Subject: State of Colorado Concurrence on Record of Decision Amendment to the
Denver Radium Site Operable Unit # VIII

It is my great pleasure to provide the concurrence of the State of Colorado with the Environmental Protection Agency's amendment to the Record of Decision for the Shattuck Chemical site.

As you know, the State participated actively with the community, the City and County of Denver, Shattuck Chemical, and the citizens in the reevaluation of the Shattuck remedy throughout 1999. This included the Dialogue process which you convened, as well as the Ombudsman's investigation. Governor Owens has been represented throughout the process and applauds EPA for its decision to relocate the Shattuck waste to an appropriate facility.

The Colorado Department of Public Health and Environment looks forward to working with Region 8 in implementing the new remedy. We will be guided by Governor Owens' letter of December 2, 1999 in working with EPA and all of the other interested parties to get this waste out of Denver as soon as possible.

Sincerely,

Jane E. Norton
Executive Director

cc. Bill Owens, Governor of the State of Colorado
Rebecca Hanmer, Acting Regional Administrator, Regional VIII

**PART 5: RESPONSIVENESS SUMMARY VOLUMES I AND II
IN A SEPARATE DOCUMENT**