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September 1990

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Superfund Record of Decision:

Sand Creek Industrial, CO

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Sand Creek Industrial site is chemical manufacturing facility in Commerce City, Adams County, Colorado. Land use in the area surrounding the site is primarily industrial and residential with 13 residents onsite. Production wells north and downgradient of the site supply drinking water to the county. The Sand Creek Industrial site lies in the vicinity of three other Superfund sites: Woodbury Chemical, Chemical Sales, and Rocky Mountain Arsenal. Beginning in the 1960s, the Colorado Organic Chemical Company (COC) conducted pesticide manufacturing operations onsite. Disposal and onsite storage areas include a landfill and acid pits. Onsite fires in 1968 and 1977, as well as improper pesticide storage practices, resulted in pesticide-contaminated soil, ground water, and surface water. In 1978, COC removed some contaminated soil, and in 1984, COC removed drummed wastes, excess product, additional contaminated soil, and implemented site access restrictions including fencing. The site has been divided into six Operable Units (OU) to facilitate remediation. A 1989 Record of Decision (ROD) addressed OU1, which included remediating some of the subsurface soil. This second ROD addresses OU5, and includes the final response action for the 14,000

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Sand Creek Industrial, CO
Second Remedial Action
Contaminated Medium: soil
Key Contaminants: organics (pesticides), metals (arsenic, chromium)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

cubic yards of contaminated soil present onsite at the COC area. Subsequent RODs will address the remaining contamination including the landfill, acid pits, and ground water. The primary contaminants of concern affecting the soil are organics including pesticides; and metals including arsenic and chromium.

The selected remedial action for this site includes excavating approximately 14,000 cubic yards of surface soil above the health-based action levels, treating the soil onsite using soil washing and subsequently backfilling the treated soil onsite; grading and revegetating the site; incinerating the soil washing wastewater offsite; and ground water monitoring. The estimated present worth cost for this selected remedial action is $4,490,734, which includes an estimated annual O&M cost of $20,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Remediation goals are based on health-based action levels or RCRA treatability variance action levels, whichever is more stringent. Health-based action levels were established for soil based on a 10-6 cancer risk and include dieldrin 0.155 mg/kg and heptachlor 0.553 mg/kg. Treatability variance action levels were established for arsenic (90-99% reduction), chromium 0.5-0.6 mg/l (TCLP), chlordane (90-99% reduction), 2,4-D (90-99% reduction), and 4,4-DDT 0.5-20 mg/l (Total Waste Analysis).

SAND CREEK SUPERFUND SITE
OPERABLE UNIT 5
COLORADO ORGANIC CHEMICAL
AND GALLAGHER PROPERTY
SHALLOW SOILS

September 1990

RECORD OF DECISION

DECLARATION STATEMENT

SITE NAME AND LOCATION

Sand Creek Industrial Site
Commerce City, Colorado
Operable Unit No. 5
Colorado Organic Chemical and Gallagher Property Shallow Soils

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for remediation of shallow soils, from Operable Unit Five (OU5) of the Sand Creek Industrial NPL Site in Commerce City, Colorado. The remedy was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan. This decision is based on the Administrative Record for this site. The State of Colorado has not yet concurred with the selected remedy. The State postpones concurring until completion of on-site pilot testing of the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF SELECTED REMEDY

The selected remedy for OU5 addresses shallow soils contaminated with pesticides and metals in the Colorado Organic Chemical Company area at the site. This is the second ROD for this site which consists of six operable units. This response action, when completed will be the final response action for the Colorado Organic Chemical Company area surface and subsurface soils. Response actions addressing the remainder of the entire site and the groundwater underlying the entire Sand Creek Industrial site will be addressed in separate Record of Decision documents. The ROD for OU1 addressed subsurface soils, OUs 3 and 6 concern a landfill on the site, OU4 will address the site wide groundwater contamination and OU2 addresses the L.C. Corporation acid pits.

The selected remedy will address the principal threats posed by the shallow soils and will protect groundwater resources and prevent direct contact risks through the treatment and disposal of contaminated soils. The remedy will ensure the long-term protection for the public and the environment through treatment of hazardous substances. The selected remedy, soil washing, is an innovative treatment technology and is determined to be the most appropriate remedy for the operable unit. Elements of the selected remedy are:

- Excavation of contaminated surface soils which are contaminated in excess of action levels described in Table 7.
- Soil washing of the excavated soil to treatment levels described in Table 8.
- Incineration of wastewater.
- Backfill of the treated soil.
- Grading and revegetating the soil.

STATUTORY DETERMINATIONS

Consistent with CERCLA as amended by SARA and the National Contingency Plan, I have determined that the selected remedy for Operable Unit No. 5 of the Sand Creek Industrial Site is protective of human health and the environment. I have also determined that the remedy complies with Federal and State requirements that are legally applicable or are relevant and appropriate to the remedial action, and is cost effective. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that result in the reduction of the volume, mobility, and toxicity of soil contamination at the site as a principal element.

Because the selected remedy may possibly result in hazardous substances remaining on site above health-based levels for a land use not anticipated for the area, a review of the remediation will be conducted within five years after commencement of the remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment.

James J. Scherer
Regional Administrator
EPA Region VIII

Sept. 28, 1990
Date

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Record of Decision

Sand Creek Industrial Site
Colorado Organic Chemical Company Area
Operable Unit No. 5

Decision Summary

I. Site Name, Location, and Description

This Record of Decision (ROD) describes the remedial action for hazards for OU5, located within and immediately adjacent to the Colorado Organic Chemical Company (COC) property. The hazards addressed in this remedial action are shallow soils contaminated with pesticides and metals.

The OU5 area is located within the Sand Creek Industrial Site, a site listed on the NPL in December 1982. The Sand Creek Industrial Site is located in Commerce City, a city north of Denver, Colorado (Figure 1). The site and surrounding area are industrialized and contain trucking firms, petroleum and chemical production/supply companies, warehouses, small businesses, and several residences. The site study area is bounded on the north by Sand Creek, on the south by 48th Avenue, and on the east by Ivy Street. The western boundary is approximated by Colorado Boulevard, and Vasquez Boulevard. Figure 2 illustrates the location and boundaries of OU5.

Within the Sand Creek Industrial Site study area, there are approximately 13 residences with a total population of about 25. The day use population, however, reaches several hundred due to the business and industrial nature of the study area. Water users within the site study area are served by the South Adams County Water and Sanitation District (SACWSD). Private wells exist on the site; however, this water is used for industrial and irrigation purposes.

Treated groundwater is the source of water supply to the SACWSD. Production wells are located north (downgradient) of the study area. Approximately 30,000 customers in Commerce City and Adams County are served by the SACWSD.

OU5 is located above the 100-year floodplain of Sand Creek. The majority of OU5 is located on a bench of relatively flat terrain that slopes down to railroad tracks to the north and rises to an alluvial terrace to the south.

The Sand Creek Industrial Site lies within the vicinity of three other Superfund sites; Woodbury Chemical, Chemical Sales, and Rocky Mountain Arsenal.

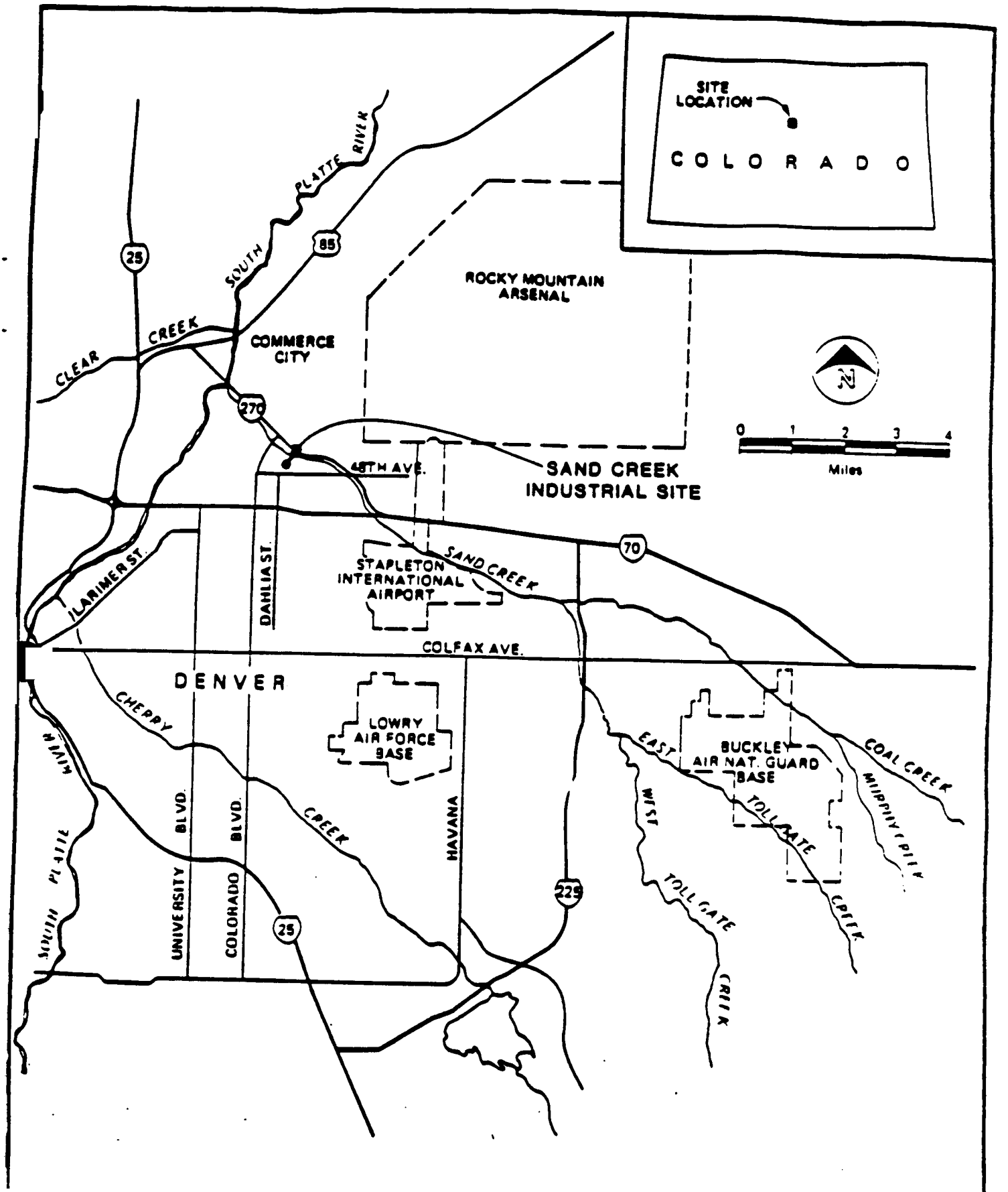
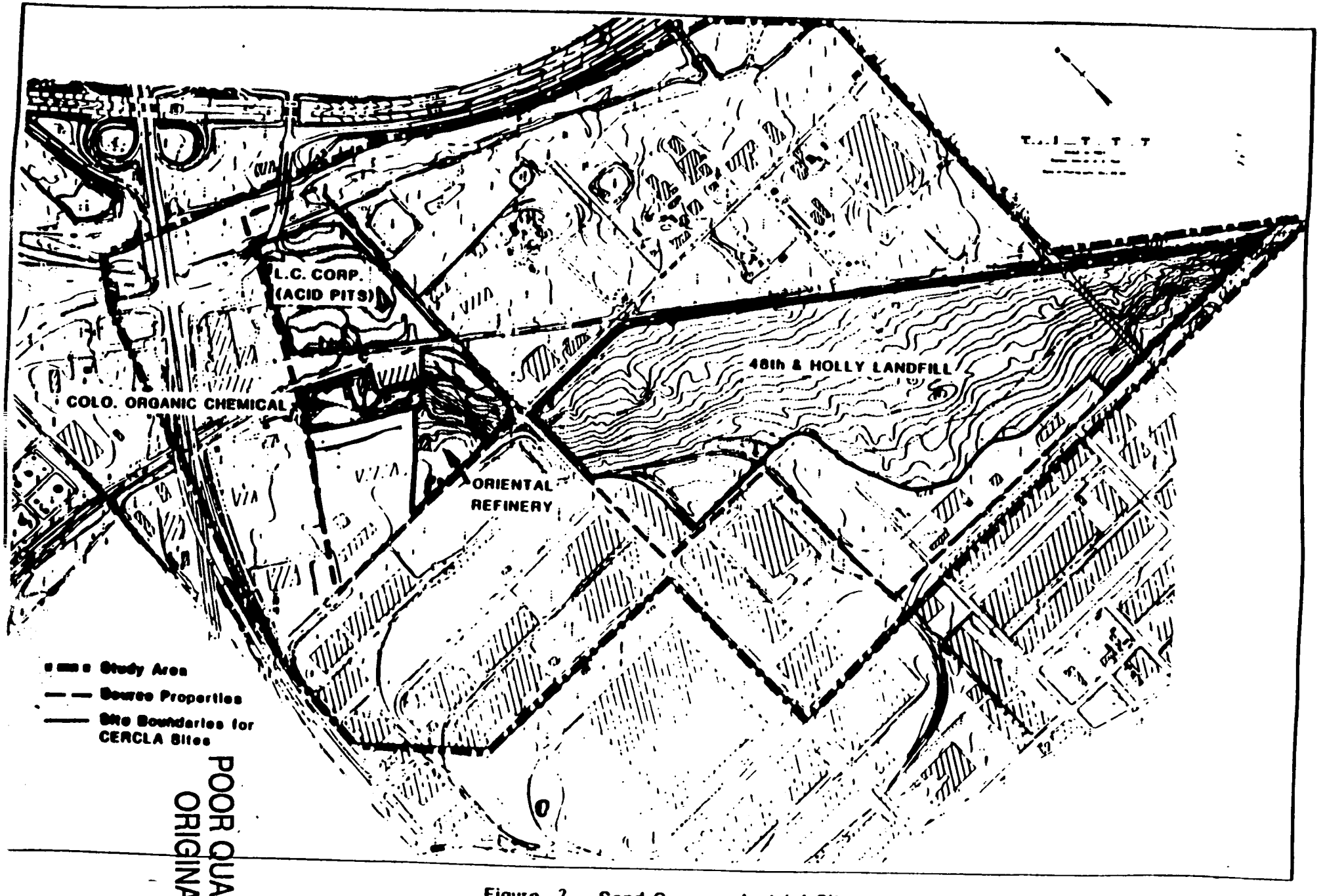


Figure 1 Site Location, Sand Creek Industrial Site



POOR QUALITY
ORIGINAL

Figure 2 Sand Cr ndustrial Site

II. Site History and Enforcement Activities

The Colorado Organic Chemical Company plant was first operated at OU5 by Times Chemical in the 1960s to manufacture pesticides. The company name was later changed to Colorado International Company (CIC). In 1968, a fire destroyed three buildings at the CIC plant. An inspection of CIC by Tri-County District Health Department personnel in June 1974 indicated unsatisfactory waste management practices and unsatisfactory worker safety conditions.

In March 1976, the Colorado Department of Health (CDH) conducted a field inspection at CIC. The inspectors observed several hundred 55-gallon drums containing pesticides stored at various places across the COC area. They observed washwater, storm drainage, and boiler feed water draining into a common surface drainage that flowed off property towards Sand Creek. CIC was cited for storage and handling violations. A fire occurred at CIC in December 1977, releasing parathion fumes over northeast Denver. The State of Colorado issued an Emergency Cease and Desist Order against CIC to clean up the COC property and adjacent areas contaminated by the fire. CIC declared bankruptcy and re-opened the operations as Colorado Organic Chemical (COC). COC operations were essentially the same as CIC operations.

Soil sampling at COC in early 1978 revealed high levels of organophosphate pesticides, chlorinated hydrocarbons, and thermally-altered pesticides. The State filed a preliminary injunction against COC/CIC to clean up the residues of the fire. Some contaminated soil was removed in October 1978.

COC was cited for unsafe drum storage and improper storage areas under RCRA regulations in 1980. Samples of surface liquids collected during the inspection revealed that surface water discharge contained pesticides (dieldrin, heptachlor, DDE, and DDT), inorganics (chromium and arsenic), and other organics (chlorinated benzenes and phenols).

Subsequently, EPA filed a number of complaints against COC for other Resource Conservation and Recovery Act (RCRA) violations. In 1982, a Consent Agreement and Final Order were issued for the RCRA case. In March 1983, EPA referred to the Department of Justice the matter of COC's RCRA violations and violation of the previous settlement. In June of 1983 a spill of the herbicide 2, 4-D resulted in an additional Compliance Order to clean up the spill and to comply with previous orders. EPA issued a CERCLA 106 Order in March 1984 for cleanup of the site. Between April and September 1984, removal action was taken pursuant to those orders by COC, which resulted in the removal of drummed wastes and product, contaminated soil, and fencing of the site.

III. Highlights of Community Participation

All requirements for public participation in Section 113(k) (2) (B) (i-v) and 117 of CERCLA were satisfied during the remedial action process.

Community relations activities for the Sand Creek site began in April 1985 when EPA distributed an introductory fact sheet to residents, businesses, and agencies in the area. The fact sheet described the site and explained the Superfund process, with emphasis on the Remedial Investigation/Feasibility Study (RI/FS). In the next few months, EPA personnel attended a public meeting organized by Citizens Against Contamination; they also compiled a list of people who owned property in the study area.

EPA mailed a second fact sheet in November 1985. This fact sheet provided information typically requested during investigation and cleanup of hazardous waste sites. That same month, EPA also provided a report on water contamination for another public meeting of Citizens Against Contamination.

In January 1986, EPA contacted property owners and Commerce City officials to inform them of activities at the site. In the spring, EPA prepared a photo display illustrating the RI/FS process.

Because South Adams County ground-water contamination and its effects on household supplies were of concern, EPA surveyed South Adams County residents about their water use habits during April 1987. Later that year, EPA spoke with residents and businesses near the site to check the status of methane venting systems near the 48th and Holly landfill located in the Sand Creek Industrial Superfund Site listed on the NPL, now part of Sand Creek OU3. The landfill owners had installed these systems after an explosion in 1977 resulting from a buildup of methane that had migrated from the landfill.

A Remedial Investigation report describing the extent of contamination within the COC area was released for public review in March 1988. In May 1988, EPA contacted property owners to obtain permission to sample and monitor soils on those properties.

In October 1988, EPA met with Commerce City officials to inform them of plans for the site. The Commerce City representatives also gave their reactions to the cleanup methods being considered.

In January 1989, the Feasibility Study (FS) which focused primarily on the COC area was completed, and a remedial alternative was proposed. The remedial action initially proposed would have involved: excavation and off-site incineration of the most highly contaminated surface soils; vacuum extraction of VOC's above the ground-water table; and demolition and off-site disposal of the contaminated tanks and buildings in the COC area.

EPA took several measures to announce the proposed remedial alternative choice and to seek comments and questions from the public on the Feasibility Study. First, EPA made copies of the FS Report available to the public in the Adams County Public Library, the Colorado Department of Health, and the EPA Region VIII library in downtown Denver. At the same time, EPA mailed its third fact sheet, which described a proposed plan as well as four other remedial alternatives that had been evaluated. Third, EPA announced a public comment period during which the public was invited to submit comments and questions. The comment period originally ran from January 13 to February 13, but at the request of the potentially responsible parties (PRPs), EPA extended the period to February

22. Fourth, EPA conducted a public meeting on January 31 to describe the results of the RI/FS and answer questions from the public. EPA published a press release and a public notice in each of the Commerce City newspapers, The Commerce City Sentinel and The Commerce City Beacon, announcing all of these activities.

In response to public comment and subsequent re-examination of the site, a FS Addendum was completed in July 1989 which presented two additional and innovative remedial technologies for potential use on the contaminated surface soils in the COC area: biological treatment and soil washing. It was concluded from the FS Addendum that treatability studies would be required before implementing either of the additional alternatives.

EPA made copies of the FS Addendum report available to the public and mailed its fourth fact sheet describing the new proposed plan. The remedy selected in the new proposed plan included: excavation and off-site incineration of approximately 1,000 cubic yards (CY) of shallow soils highly contaminated with HOCs ($\leq$5 ft and >1000 ppm); vacuum extraction of the volatile organic compounds in the subsurface soils above the ground-water table; demolition and off-site disposal of the contaminated tanks and buildings; and either bioremediation or soil washing for the shallow soils contaminated with HOCs above action levels. It was proposed that excavation and off-site disposal of the contaminated surface soils be retained as a contingency remedy, since the implementation of bioremediation and/or soil washing depended upon the results of treatability studies to be performed subsequent to a Record of Decision. An absence of proven bioremediation and/or soil washing results on soils contaminated with similar compounds further warranted retention of the off-site disposal option.

EPA provided a public comment period in effect from July 19 through August 21, 1989 during which the public was invited to submit comments and questions regarding the FS Addendum and the new proposed plan. EPA conducted another public meeting on August 1 to describe the new remedial alternative and answer questions from the community. Press releases and public notice were again published in The Commerce City Sentinel and The Commerce City Beacon announcing all these activities.

Only the City of Commerce City responded in writing, and there was limited comment on the selected remedy during the August 1 public meeting. The primary concern of the City of Commerce City was that the COC property be remediated to residential-use standards. A Record of Decision was subsequently prepared which addressed only the highly contaminated surface soils and the subsurface soils contaminated with volatile organic compounds. The decision was to implement the preferred alternative which consisted of vacuum extraction of VOC's, demolition and off-site disposal of the contaminated tanks and buildings and excavation and incineration of highly HOC contaminated soils.

Remedial action alternatives for the remaining contaminated surface soil were addressed in a second feasibility study (FS OU5) which incorporated results from treatability tests. A proposed plan which was prepared and sent out to the public on July 30, 1990. A public meeting was held August 9th, at 7:00 PM at the Commerce City community room in Commerce City. A responsiveness summary addressing the public's comments on OU5 was prepared and is attached to this Record of Decision.

IV. Scope and Role of Operable Unit Response Action

During the course of the remedial investigation, conducted from 1984 to 1988, EPA determined, in accordance with 40 CFR Section 300.68(c), of the 1985 NCP that the Feasibility Study should be divided into operable units in order to remediate site-specific problems. This conforms with sections 300.5 and 300.430 of the new NCP (March 8, 1990).

Originally, the Sand Creek Industrial Site was divided into four operable units according to the type of contamination present, type of media affected, and physical characteristics of the units. The four original operable units are described below:

Operable Unit No. 1 -	Soils contaminated by pesticides, volatile organics, arsenic, and chromium in the Colorado Organic Chemical (COC) area; contaminated buildings and tanks in the COC area;
Operable Unit No. 2 -	Contaminated soils and ground water in the vicinity of the L.C. Corporation property;
Operable Unit No. 3 -	Gaseous emissions, contaminated surface water and ground water in the vicinity of the 48th Avenue and Holly Street Landfill;
Operable Unit No. 4 -	Contaminated ground water underlying the entire NPL site.

As discussed in section III, treatability tests were required to determine the potential effectiveness of the bioremediation and/or soil washing options for soils contaminated with HOC's above health based action levels. In an effort to expedite remediation while the treatability studies were being performed, the original scope of the remediation described in the OU1 proposed plan was reduced. Accordingly, OU1 was reduced in scope to include only the most highly contaminated surface soils, the tanks, buildings and other structures; and the VOC contaminated subsurface soils. A new operable unit, OU5, was defined to address the remaining pesticide and metals contaminated surface soils.

The redefinition of operable units will not reduce the overall plan for remediation at the Sand Creek Industrial Site. OUs 2, 3 and 4 remain unchanged. As of the date of this ROD, the Sand Creek Industrial Site has been subdivided into the six operable units described below:

Operable Unit No. 1 -	Within the COC area, excavation of 10 CY of soils highly contaminated with pesticides (concentrations ≥ 1,000 ppm Halogenated Organic Compounds); subsurface soil contaminated with volatile organic compounds; and contaminated buildings and tanks;

Operable Unit No. 2 -	Contaminated soils and ground water in the vicinity of the L.C. Corporation property;
Operable Unit No. 3 -	Contaminated surface water and ground water (Class II aquifer) in the vicinity of the 48th Avenue and Holly Street Landfill;
Operable Unit No. 4 -	Contaminated ground water underlying the entire site;
Operable Unit No. 5 -	Within the COC area surface soils contaminated with arsenic, chromium and pesticides (concentrations < 1,000 ppm Halogenated Organic Compounds).
Operable Unit No. 6 -	Gaseous emissions from the 48th Avenue and Holly Street Landfill.

This Record of Decision addresses remediation of Operable Unit No. 5. Remediation of the remainder of the site will be addressed in separate decision documents.

The purpose of the response action for OU5 is to protect surface water and ground-water resources, and address the principal threat in this OU by preventing direct contact with contaminated soils by the public and site workers. This decision represents the second remedial action decision for this NPL site, and upon completion, will allow the COC area to be returned to industrial use.

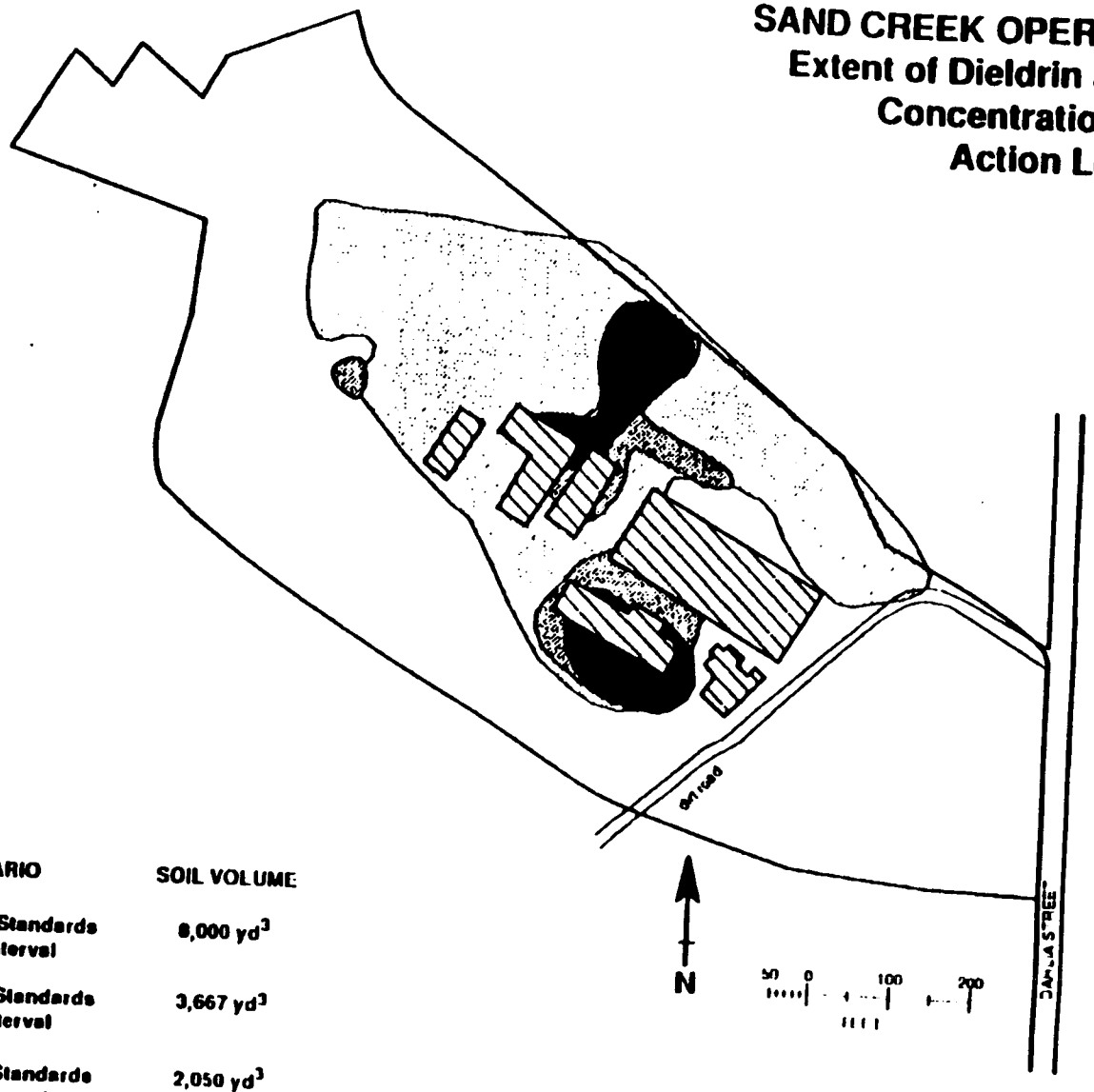
V. Summary of Site Characteristics

Contaminant Characteristics

The contaminants of concern at the Sand Creek Site OU5 include the metals; chromium, arsenic, and the pesticides dieldrin, heptachlor, 2,4' -D, 4-4 DDT, and chlordane. Most of the contamination present in concentrations above action levels is localized in hot spots identified during the remedial investigation. Analytical results of soil samples indicated chlorinated pesticides are present in concentrations above action levels in the surficial and/or shallow soils throughout the OU5 area. High concentrations of arsenic have been detected in surficial and shallow soils on the COC property and the northern portion of OU5 in localized hot spots within areas contaminated with pesticides above action levels. Figure 3 shows the approximate areal extent of contamination at the 0-1', 1'-3', and 3'-5' depth. The soil volumes to be remediated are defined by the action levels for dieldrin and heptachlor. These compounds present the greatest risk based on their toxicities. These compounds are also reflective of the total areal extent of the other compounds. Therefore, the remaining compounds would be inherently remediated during the clean-up activities focused on the soil volumes for dieldrin and heptachlor.

Figure 3

SAND CREEK OPERABLE UNIT NO. 5
Extent of Dieldrin and Heptachlor Concentrations Above Action Levels



LEGEND

Buildings and Loading Docks

ACTION LEVEL SCENARIO	SOIL VOLUME
Industrial - Use Standards 0-1 foot depth interval	8,000 yd^3
Industrial - Use Standards 1-3 feet depth interval	3,667 yd^3
Industrial - Use Standards 3-5 feet depth interval	2,050 yd^3
TOTAL VOLUME	13,717 yd^3

Affected Matrices Characteristics

Operable Unit No. 5 has been defined as contaminated soils not addressed by OU1 at the COC area. The OU5 soils include surface soils contaminated with arsenic, chromium, and pesticides (< 1,000 ppm HOC's). The contaminants are found distributed in many locations throughout the site, mostly in localized hot spots. The surface soil is found to contain higher concentrations of pesticides than soils at depth.

The volumes of soil to be remediated were calculated for the compounds which present the greatest health risk. Those compounds were found to be dieldrin and heptachlor. Total soil volume calculated for remediation of both compounds in the reasonable maximum exposure scenario is approximately 14,000 cubic yards. Soil volumes for other compounds were not calculated separately since they are addressed in the soil volumes for dieldrin and heptachlor.

Potentially Exposed Populations

The current population at risk of exposure consists of industrial workers at the site and surrounding business locations. The risk assessment for the site delineates the exposure pathways and presents the potential health risks to the industrial worker. Currently, there are no residences within the site boundaries and a relatively minor population of less than 25 residences exists in the area. The nearest residents are located three quarters of a mile from the site. The City of Commerce City presently has this area designated for industrial use through the year 2010, consistent with present and historic use for the surrounding area.

Migration Pathways

The potential migration pathways for the contaminants include surface water run off, airborne distribution and groundwater migration. Surface water runoff is the most probable pathway due to the fact the surface soils are the most highly contaminated. Airborne distribution would be possible during any high construction activities occurring at the site but otherwise would not be considered a major migration pathway since the contaminants are not highly volatile and natural vegetation covers much of the site. Groundwater migration is not a primary concern due to the tendency of the contaminants of interest to adhere to soil particles. Downward movement of contaminants would occur slowly with water infiltration rates common to the area.

VI. Summary of Site Risks

An Endangerment Assessment (EA) for OU1 was conducted for the Sand Creek site (CDM 1988) to evaluate the risks posed by the presence of contaminated soils in the COC area. The results of the 1988 EA were used in the OU1 ROD.

The 1990 EA for OU5 utilizing the Risk Assessment Guidance (July, 1989) identified a number of chemical compounds that because of health risks, are chemicals of concern for OU5. The chemicals of concern identified in the initial RI/FS (CDM 1987) were used in preparing the OU5 endangerment assessment which incorporated new data obtained during

OU1 remedial design activities. New action levels and soil volumes were a result of this effort.

The objectives of the risk assessment were to identify chemicals of concern, define exposure pathways; determine exposure point concentrations, estimate human intakes, identify known hazards for each chemical of concern, and determine a carcinogenic and noncarcinogenic risk for the chemicals of concern.

The chemicals of concern were first identified in the original 1988 site wide endangerment assessment. The selection process for chemicals of concern was originally presented separately for each medium. For the OU5 risk assessment, only contaminants identified as chemical of concern for soils were addressed. These chemicals of concern are; arsenic, chromium, chlordane, 2-4D, 4,4-DDT, dieldrin, and heptachlor.

The exposure pathways were identified in the risk assessment and are summarized in tables 1 and 2. The exposure route for wind erosion air-borne particulates is inhalation. The exposure routes for direct contact with soil are ingestion and dermal absorption.

The site assumptions used for the risk calculations including route, medium, group, frequency, and duration are summarized in Table 3. The assumptions used for human intake including; age, ingestion, inhalation, exposed skin, body weight, and time on-site are also included in Table 3. Although the Reasonable Maximum Exposure Scenario for the area is industrial, risk calculations were made for industrial and residential scenarios for comparison purpose. The City of Commerce City has previously asked for this comparison.

In order to address areas affected by high concentrations of pesticides and average concentrations of pesticides, the data were separated into "hot spot" contamination and average contamination.

Hot spot contamination represents a potential maximum exposure for the chemicals present at high concentrations. Both maximum and average concentrations were used in risk calculations. Exposure point concentrations for the site average and hot spots were determined from the combined data sets of OU1 and OU5. These values are presented in Table 4.

Best estimates of the average exposure concentrations were determined by the 95% confidence level of the arithmetic mean for each chemical of concern. Hot spots values were determined from analytical results for the high concentration areas. These values are presented in Table 4. These values were then used in the calculations shown on Tables 5 and 6. Table 5 shows that the site average risk is within the EPA's acceptable risk range Table 6, however, shows that the hot spots on the site fall outside EPA's acceptable risk range of 10^{-4} to 10^{-6}. As was shown in Figure 3, the hot spots comprise most of the OU5 area, thus requiring remediation. Soil concentrations for non carcinogenic and carcinogenic risks of 10^{-6} are also presented on the tables. By obtaining the soil concentrations through remediation, the excess lifetime cancer risk from combined exposure to all compounds would be within the EPA acceptable 10^{-4}-10^{-6} range. Without remediation of the hot spots, the baseline site risk presented by the hot spots would be 2.41×10^{-3}, outside the acceptable risk range.

TABLE 1

EXPOSURE PATHWAYS IN OU5

Reasonable Maximum Exposure Scenario: Industrial

SOURCE	RELEASE MECHANISM	RELEASE MEDIUM	TRANSPORT MEDIUM	EXPOSURE POINT
COC Facility	Spills Leaks	Soil	Surface Soils	Entire Site
Contaminated Soil	Wind Erosion, Dust Generation	Air	Airborne Particulates	Entire Site
Contaminated Soil	Vehicular Traffic	Air	Airborne Particulates	Entire Site

TABLE 2

CONTAMINANTS, ROUTES AND SOURCES
OF EXPOSURES TO BE ADDRESSED IN THE RISK ASSESSMENT

CONTAMINANTS EVALUATED

METALS	INSECTICIDES	HERBICIDES
Arsenic	Chlordane	2,4-D
Chromium	4,4' -DDT	
	Dieldrin	
	Heptachlor	

EXPOSURE ROUTES AND SOURCES

RECEPTOR	ROUTE	SOURCE
Worker	Inhalation	Air/Particulates
	Ingestion	Soil
	Dermal Contact	Soil
Child		
	Inhalation	Air/Particulates
	Ingestion	Soil
	Dermal Contact	Soil

TABLE 3

ASSUMPTION SUMMARY FOR RISK EVALUATIONS

ROUTE	MEDIUM	GROUP	FREQUENCY	DURATION
Inhalation	Airborne Soil	Children	40 Days/Year 5 Hrs/Day	5 Years
	Airborne Soil	Worker	170 Days/Year 8 Hrs/Day	30 Yrs
	Airborne Soil	Resident	183 Days/Year Age Specific	70 Yrs
Ingestion	Soil	Children	40 Days/Year	5 Years
	Soil	Worker	240 Days/Year	30 Yrs
	Soil	Resident	365 Days/Year	70 Yrs
Dermal Contact	Soil	Children	40 Days/Year	5 Years
	Soil	Worker	240 Days/Year	30 Yrs
	Soil	Resident	365 Days/Year	70 Yrs

Intake Assumptions

Age	Ingestion Rate mg/day	Inhalation Rate m^3/hr	Exposed Skin Surface Area m^2	Body Weight kg	Residential Time On Site Hrs
0 - 1	0.0	.21	0.0	16	20
1 - 6	200	.21	0.36	16	20
6 - 9	100	.80	0.49	25	16
9 - 11	100	1.00	0.62	35	16
11 - 17	100	1.05	0.50	50	14
Adult	100	1.05	0.50	70	14

TABLE 4

EXPOSURE POINT CONCENTRATIONS

	Surface(a) (ppm)	(Hot Spot) Surface(b) (ppm)
Arsenic	18.04	
Chromium	55.64	
Chlordane	20.94	355.00
Dieldrin	3.95	343.00
DDT	89.24	
2,4-D	1.16	38.00
Heptachlor	3.70	10.20

a. 95% confidence level of the arithmetic mean.
b. Maximum concentration.

RISK CHARACTERIZATION FOR SAND CREEK: INGESTION OF SOIL (INDUSTRIAL-WORKER)

Table 5 Site Average

COMPOUND	Noncarcinogenic Human Intake Factor (kg/kg-day)	Carcinogenic Human Intake Factor (kg/kg-day)	95% Confidence Level of the Soil Conc. Arithmetic Mean (mg/kg)	Chronic Dose (mg/kg/day)	Chronic Dose Av. over 70 y (mg/kg/day)	Noncarcin. Effects: Hazard Index (Dose/RfD)	Excess Lifetime Individual Carcinogenic Risk (Dose x q1*)	Soil Conc. Based On Noncarcin. Risk (mg/kg)	Soil Conc. Based On 10-6 Carcinogenic Risk (mg/kg)
INORGANICS									
Arsenic	9.39E-07	4.02E-07	18.04	1.69E-05	7.25E-06	1.69E-02	3.63E-06	62.220	0.995
Chromium	9.39E-07	4.02E-07	55.64	5.23E-05	2.24E-05	1.05E-02	NC	1555.499	NC
ORGANICS									
Chlordane	9.39E-07	4.02E-07	20.94	1.97E-05	8.42E-06	3.28E-01	1.09E-05	0.224	0.303
2,4-D	9.39E-07	4.02E-07	1.16	1.09E-06	4.66E-07	1.09E-04	NC	6224.212	NC
4,4'-DDT	9.39E-07	4.02E-07	89.24	8.38E-05	3.59E-05	1.68E-01	1.22E-05	15.561	1.463
Dieldrin	9.39E-07	4.02E-07	3.95	3.71E-06	1.59E-06	7.42E-02	2.54E-05	0.156	0.031
Heptachlor	9.39E-07	4.02E-07	3.70	3.47E-06	1.49E-06	6.95E-03	6.69E-06	15.561	0.111
Hazard Index: Combined Exposure						6.04E-01			
Excess Lifetime Cancer Risk: Combined Exposure							5.89E-05		

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RISK CHARACTERIZATION FOR SAND CREEK: INGESTION OF SOIL (INDUSTRIAL-WORKER)

Table 6 Hot Spots

COMPOUND	Noncarcinogenic Human Intake Factor (kg/kg-day)	Carcinogenic Human Intake Factor (kg/kg-day)	Hot Spot Soil Conc. Maximum Conc. (mg/kg)	Subchronic Dose (mg/kg/day)	Chronic Dose Av. over 70 y (mg/kg/day)	Noncarcin. Effects: Hazard Index (Dose/RfD)	Excess Lifetime Individual Carcinogenic Risk (Dose x q1*)	Soil Conc. Based On Noncarcin. Risk (mg/kg)	Soil Conc. Based On 10-6 Carcinogenic Risk (mg/kg)
INORGANICS									
Arsenic	9.39E-07	4.02E-07		0.00E+00	0.00E+00	0.00E+00	0.00E+00	62.220	[illegible]
Chromium	9.39E-07	4.02E-07		0.00E+00	0.00E+00	0.00E+00	NC	1555.499	NC
ORGANICS									
Chlordane	9.39E-07	4.02E-07	355.00	3.33E-04	1.43E-04	5.56E+00	1.86E-04	0.224	1.914
2,4-D	9.39E-07	4.02E-07	38.00	3.57E-05	1.53E-05	3.57E-03	NC	6224.212	NC
4,4'-DDT	9.39E-07	4.02E-07		0.00E+00	0.00E+00	0.00E+00	0.00E+00	15.561	7.316
Dieldrin	9.39E-07	4.02E-07	343.00	3.22E-04	1.38E-04	6.44E+00	2.21E-03	0.156	0.155
Heptachlor	9.39E-07	4.02E-07	10.20	9.58E-06	4.10E-06	1.92E-02	1.85E-05	15.561	0.553
Hazard Index: Combined Exposure						1.20E+01			
Excess Lifetime Cancer Risk: Combined Exposure							2.41E-03		

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The general hazards associated with the chemicals of concern for OU5 are shown below:

Arsenic

Arsenic is associated with an increased incidence of lung, liver, bladder, and skin cancer in individuals exposed via drinking water and with an increased incidence of lung cancer in occupationally exposed workers. EPA has classified arsenic in Group A--Human Carcinogen.

Acute effects of arsenic are generally seen only following a large dose. Acute arsenic poisoning due to ingestion is manifested in gastrointestinal disturbances. The intensity and onset of symptoms is determined by the physical form, purity and time since last eaten. Symptoms of acute poisoning are tightness of the throat, difficulty in swallowing, and violent abdominal pain. Arsenic consumption can also lead to severe high blood pressure and widespread damage to the central nervous system (CNS). Death may result from cardiac failure. In less severe cases of occupational exposure, recovery often occurs and may be complete or show signs of chronic poisoning. Lethal doses of arsenic range between 70 and 180 ug. Chronic and subchronic exposures to arsenic generally affect many of the same organ systems as those affected by acute exposure. In most cases, effects can be seen only after chronic low dose exposure. The skin is one of the prime targets of chronic exposures.

Chromium

Chromium is an essential micronutrient and is not toxic in trace quantities. High levels of soluble chromium(VI) and chromium(III) produce kidney and liver damage. Chromium is transported across the placenta and concentrated in the fetus. Chronic inhalation exposure may lead to respiratory damage. Occupational exposures to chromium compounds cause severe skin problems and inflammation of the larynx and liver. EPA has classified chromium(VI) in Group A - Human carcinogen based on epidemiological studies of workers exposed to chromium(VI) via inhalation.

Pesticides

All the pesticides at the Sand Creek Operable Unit No. 5 can be classified as chlorinated hydrocarbons. The environmental and biological persistence of chlorinated hydrocarbon pesticides presents the special problem of chronic mammalian toxicity resulting from repeated low-level exposure to these compounds.

Chlordane

Chlordane has been used for control of insects and agricultural use. In recent years, it has been extensively used to control household pests and for certain insects. The principal toxic effects in humans following acute and chronic exposures to chlordane include central nervous system excitation, immune system deficiencies and blood disorders. Chlordane has not been a common cause of poisoning. All established cases have been associated with gross exposures. In most instances, including those with fully recovery, convulsions appeared within 0.5 to 3.0 hours after consumption or after dermal exposure.

Following ingestion, some people experienced nausea and vomiting before signs of central nervous system over-activity. EPA's Carcinogen Assessment Group (CAG) has classified chlordane in Group B2 -- Probable Human Carcinogen.

4,4'-DDT

4,4'-DDT has been shown to be carcinogenic to mice, primarily causing liver tumors, but also causing lung tumors and lymphomas. 4,4'-DDT is also a reproductive toxin, causing reduced liter size, reduced growth of offsprings, and fetal death. Chronic exposure causes adverse effects to the liver and central nervous system. Acute exposure to large doses or chronic exposure to lower doses may cause seizures. 4,4'-DDT is bioconcentrated and stored in the fat tissue of most animals. In studies of workers occupationally exposed to 4,4'-DDT by inhalation, no increased incidence of cancer was reported (Ortelee 1958, Laws et al. 1967).

Experimental and accidental exposures have revealed that a single dose of 10 mg/kg produces illness characterized by vomiting, headache, and confusion. Acute poisonings cause a slight decrease in red blood cells and obvious neurological effects. 4,4'-DDT has been classified by EPA's Carcinogen Assessment Group (CAG) in Group B2--Probable Human Carcinogen.

2,4-Dichlorophenoxyacetic Acid

2,4-D is not believed to cause cancer, but has been shown to produce weak mutagenic effects in cultured cells, and to cause birth defects in rats, mice, and hamsters. Considerable uncertainty exists regarding the toxicity of 2,4-D to human; the minimal toxic case may be as low as 80 mg/kg, with an average oral dose likely to be fatal estimated to be 400 mg/kg. Based on clinical data, poisoning can occur following dermal exposure or consumption. The principle acute symptoms are vomiting, fever, diarrhea, and profound muscle weakness. Pathological changes have also occurred in the gastrointestinal tract, liver, lungs, and kidneys. No known chronic human health effects exist.

Dieldrin

Dieldrin can be absorbed by humans from the gastrointestinal tract following ingestion of the pesticide, and absorbed through the skin following skin exposure. Dieldrin affects the central nervous system, producing incoordination, headache, gastrointestinal disturbances, and convulsions. EPA has classified dieldrin in Group B2 -Probably Human Carcinogen.

Heptachlor

The human toxic effects of heptachlor have not been well documented. Animal studies indicate that heptachlor causes the same kind of illness as that produced by similar pesticides such as chlordane. It has also been shown to cause chromosomal mutations. However, no lethal genetic changes were produced when male mice received large doses of the pesticide. The deleterious effects of chromosomal changes in humans in inconclusive.

EPA's Carcinogen Assessment Group has classified heptachlor in Group B2--Probable Human Carcinogen.

Exposed Population and Site Risk

The Sand Creek site is highly industrialized. The day use population may reach several hundred. The City of Commerce City has projected future land use for the area as industrial. Therefore, the maximum reasonable exposure scenario for the site is considered to be for the industrial worker. The risk to the industrial worker was calculated for each exposure pathway, inhalation, ingestion and dermal. The ingestion pathway was considered to present the greatest risk. Table 7 shows a comparison of the 10^{-6} action levels to the maximum and average concentrations found at the site.

The exposure scenarios presenting the highest risk at OU5 is incidental ingestion of pesticide (HOC) contaminated soils. Other exposure scenarios for the site (inhalation of contaminated dust and inhalation of compounds volatilizing from the soil) generally present lower risks.

Two chemicals of concern, dieldrin and heptachlor, were chosen as driver compounds for OU5 remediation due to their carcinogenicity and concentrations present at the site. If only these two compounds were to be removed from the targeted surficial soils, a 2.7×10^{-5} carcinogenic risk (ingestion pathway) would remain on-site for industrial workers. While this is within the acceptable risk range, it is important to note that the soils exceeding dieldrin and heptachlor remediation goals largely include the extent of contamination from other identified carcinogenic chemicals of concern (4,4'DDT, chlordane, arsenic, and chromium concentrations did not present a site risk outside of the acceptable 10^{-4}-10^{-6} range). Therefore, the remediation alternative selected in this ROD will result in the removal or reduction in concentration of these chemicals of concern to below the 2.7×10^{-5} carcinogenic risk for industrial workers.

VII. Description of Alternatives

The detailed analysis of remedial alternatives, presented in the feasibility study for OU5, resulted in the development of four alternatives for site remediation. These alternatives are summarized below.

Alternative No. 1 - No Action

The No Action alternative is presented as a basis for comparison with the other alternatives. Under no action, soil would remain contaminated with toxic chemicals and the risks described above would remain. No action could be considered feasible only if the other alternatives could not substantially reduce toxicity, mobility, volume, or the health risk associated with the site. Selection of the no action alternative would require monitoring of ground-water for thirty years to evaluate movement of contaminants from the site. The Public Health Evaluation (PHE) would be performed at 5-year intervals as is required under CERCLA/SARA when contaminated material is left on site. Operation and maintenance costs of approximately 20,000 per year are projected for periodic sampling

TABLE 7

CHEMICALS OF CONCERN, MAXIMUM AND AVERAGE SOIL CONCENTRATIONS, AND HEALTH BASED ACTION LEVELS FOR OU5

Chemicals of Concern	**Maximum Concentration** ppm	**Average Concentration** ppm	Action Levels Based on **Carcinogenic Risk** ppm
Arsenic	1170	18.04	
Chromium	66	55.64	
Dieldrin	343	3.95	0.155
Heptachlor	76	3.70	0.553
Chlordane	355	20.94	
2-4 D	15,000	1.16	
44 DDT	203	89.24	

Action levels for 10^{-6} risk.

By remediating the soils to the carcinogenic risk levels for Dieldrin and Heptachlor, the overall site risk is lowered to the acceptable risk range of 10^{-4}-10^{-6}.

inspection, and performing the PHE. Assuming a monitoring period of 30 years this equates to a present worth cost of $604,000.

Alternative No. 2 - Capping/Institutional Controls

Alternative No. 2 would involve reducing the areal extent of contaminated soil by excavating approximately 140,000 cy of the surface soil contaminated above industrial use action levels listed in Table 7, placing the excavated soil in a designated area of contamination, and constructing a cap over the entire contaminated area. The cap, constructed of a three-layer design to comply with RCRA requirements, would prevent direct contact with contaminated soil, minimize airborne emissions, and minimize surface infiltration (thereby protecting ground-water resources). Alternative No. 2 would be considered on-site containment.

Land use restrictions would be required to ensure long-term maintenance of the cap and to prevent activities that would disturb the cap or result in contact with or release of contaminated soil. The long-term effectiveness or permanence is questionable because containment does not permanently address the contamination and the cap may ultimately fail. Also, because no treatment would occur, toxicity and volume of contaminants would not be reduced. Because contaminants are left on-site, monitoring of ground-water would be required for thirty years, and re-evaluation of the PHE would be performed at 5- year intervals. Land use would be restricted to industrial use. Institutional controls would be implemented to maintain the integrity of the cap. Without restricting the land use of the capped area it is highly likely the cap would fail. Restriction of on-site digging and well installation would be probable institutional controls required to maintain the cap. The estimated present worth cost to construct a cap at OU5 is approximately 2,547,170. The estimated cost for maintenance of the cap is $70,000/yr.

Alternative No. 3 - Off-site Landfill Disposal

Alternative No. 3 involves excavation of approximately 14,000 cy of the contaminated soil with concentrations above action levels identified in Table 7, transport and disposal at an off-site hazardous waste landfill, backfilling the excavated area with clean soil and revegetation of the site. Mobility of contaminants would be reduced through off-site containment. Long-term effectiveness is considered to be high. A PHE would be required every 5 years based on CERCLA section 121(c). The estimated present worth cost for alternative No. 3 is $4,903,000. Annual O & M costs of $67,000 are expected for short-term monitoring during remediation activities.

Alternative No. 3 was originally proposed as a contingency remedy to augment the preferred remedy, which is an innovative technology, and in the event that the pilot test for the selected remedy (Alternative No. 4) demonstrates that field scale soil washing is not successful. However, since the development of the FS and proposed plan, additional requirements regarding the application of Land Disposal Restrictions to Alternative Numbers 3 and 4 became apparent. This information indicates that off-site disposal of soils in a hazardous waste landfill cannot occur without treatment prior to disposal. The required treatment for soils with most of the contaminants found at OU5 is incineration, which is the BDAT for most contaminants in the soils. Rough estimates for incineration

are currently $1,000 per cubic yard of soil. This would raise the cost of Alternative No. 3 by approximately $14,000,000. The total cost of Alterative No. 3 would be approximately $22,000,000. EPA decided to drop Alternative No. 3 as a contingency to the selected remedy at this time, based upon confidence in the selected remedy and the difference in costs resulting from the different soil volumes to be incinerated.

Alternative No. 4 - On-Site Soil Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Washing Residuals

Alternative No. 4, involves excavation and treatment on site by soil washing of approximately 14,000 cy of surface soil with concentrations above health risk-based industrial action levels listed in Table 7. Excavated areas would be backfilled with treated soil, and revegetated. The contaminated liquids generated during soil washing would be treated off-site in accordance with Land Disposal Restrictions (LDRs) with residuals disposed of in a subtitle C landfill.

Soil washing treatment of hazardous substances is an innovative technology. Therefore, bench scale treatability tests were performed to evaluate the effectiveness of the process and aid in designing the treatment system. Toxicity and volume of the contaminated soils would be reduced through treatment (soil washing) and destruction (incineration of liquids and residual soils). This alternative offers a permanent solution for the site. Ground-water monitoring would be required for 30 years following completion, and the PHE would be re-evaluated after 5 years. After additional field testing and design Alternative No. 4 would take approximately 9-12 months to implement and 2-3 years to complete. The estimated present worth cost is $4,490,734. Annual operation and maintenance costs are expected to be $20,000 per year. This alternative will comply with the LDRs through a Treatability Variance for the contaminated soil and debris.

VIII. Summary of Comparative Analysis of Alternatives

This section presents a comparison of alternatives using nine component criteria. These criteria, are set forth in OSWER Directive 9355.3-02 and the NCP (40 CFR 430(e)(9)(iii).

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost

8. State acceptance

9 Community acceptance

CRITERION 1: PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative No. 1 - No Action
Under the No Action alternative, no remediation would take place and risk to public health and the environment would not be reduced, eliminated, or controlled. Toxicity, mobility, and volume of contaminants would be unchanged. Thirty-year monitoring of ground water would be required. Re-evaluation of the PHE at 5-year intervals would be necessary because material contaminated above health based action levels would be left on site.

Alternative No. 2 - Capping/Institutional Controls
The cap would protect human health to the extent that it eliminates exposure via dermal contact, ingestion, and inhalation. It would also reduce the potential for leaching of contaminants into ground water. Because contaminants would be left on-site, reevaluation of the PHE would be required at 5-year intervals to evaluate the continued effectiveness of the cap, assess the remaining risks and develop necessary corrective actions to reduce the risk if warranted.

Alternative No. 3 - Off-Site Disposal of Soils
Alternative No. 3 provides a high degree of protectiveness of human health and the environment. Contaminated soils would be excavated and removed from the site, eliminating the health threat that the contaminated soils presently pose through direct contact and potential migration to ground water. A portion of the risk would be transferred to an off-site landfill that is designed and managed to contain the contaminants.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
Alternative No. 4, the soil washing alternative, provides a high degree of protectiveness to human health and the environment. The contaminated soil would be excavated and treated on-site with a soil washing process. Once soils are treated to acceptable health risk-based action levels, they would be backfilled and the site revegetated. Residuals from the soil washing process would be incinerated off-site and disposed of in a RCRA Subtitle C landfill. This alternative would reduce the health threat posed by direct contact to levels which would safely allow reuse of the OU5 area as an industrial area.

CRITERION 2: COMPLIANCE WITH ARARs

CERCLA Section 121 requires selection of a remedial action that is protective of human health and the environment. The determination of protectiveness is based on compliance of the selected remedy with ARARs and/or health-based action levels.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law 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.

The ARARs for the alternatives described above are set forth in Appendix A. The tables of ARARs in the appendix present the Federal and State chemical, location and action specific ARARs and those regulations to be considered as they apply to the alternatives 1-4.

Alternative No. 1 - No Action
The no action alternative at OU5 does not attain ARARs, cleanup goals, or other human health and the environment protection requirement.

Alternative No. 2 - Capping/Institutional Controls
Capping could be performed in compliance with ARARs. ARARs include OSHA worker protection regulations, ambient air quality standards for particulate and vapor emissions and Colorado noise abatement standards. The cap would be constructed to comply with substantive and technical requirements of RCRA. During cap construction Federal Clean Air Act National Air Quality Standards and State of Colorado Air Quality Regulations necessitate the control of vapor and particulate emissions.

Alternative No. 3 - Off-Site Landfill Disposal of Soils
All ARARs pertaining to Alternative No. 3 can be attained. ARARs include LDRs for off-site treatment and disposal, OSHA worker protection regulations, particulate and vapor emission regulations, RCRA regulations, including LDR, and the rules and regulations governing the transportation of hazardous materials within Colorado. Federal Clean Air Act National Air Quality Standards and State of Colorado Air Quality Regulations necessitate the control of vapor and particulate emissions.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
The ARARs associated with the soil washing alternative pertain to excavation, stockpiling, demolition, soil washing, and backfilling activities for on-site operations, and hazardous waste transport, incineration emissions and LDRs for on-site and off-site activities. During on-site activities, dust generation, excavation and incineration noise, and vapor emissions would be of concern. Workers would have to follow OSHA health and safety regulations during all phases of remedial action. Federal Clean Air Act National Air Quality Standards and State of Colorado Air Quality Regulations necessitate the control of vapor and particulate emissions. This alternative will comply with LDRs for soil and debris through a treatability variance.

LDR Comparative Analysis

Alternatives 2, 3, and 4 were evaluated for to application of the Land Disposal Restrictions (40 CFR 268, Subpart D) to which, generally, require excavated soils to be treated using the "best demonstrated available technology," or BDAT, prior to being "placed" on the land or disposed of outside the area of contamination.

The NCP addresses EPA's policy regarding the Land Disposal Restriction's (LDR's) treatment standards as applied to soil and debris and their utility at CERCLA sites. EPA is of the belief that treatment standards developed pursuant to the RCRA LDR program are, generally, inappropriate or unachievable when applied to contaminated soil and debris because BDAT treatment may yield little benefit over other treatment methods. A treatability variance to utilize a different treatment method other than BDAT is available. A Federal Register Notice dated October 10, 1989 (54 FR 41566) was issued by EPA prior to the final NCP (March 8, 1990), concerning the use of LDR's in Superfund sites. The Final NCP also addressed the same concerns and policy. The consideration of alternatives was in conformance with this Notice and the Final NCP (which deals expressly with treatability variances) and the need not to undertake a case by case demonstration that BDAT standards are inappropriate. The principle reason that BDAT would be inappropriate is the complexity of the soil and debris mixtures resulting in interference with treatability.

Under the NCP, to evaluate the need for the treatability variance it is necessary to conduct an evaluation of the following factors. It is first necessary to determine if restricted RCRA hazardous wastes are present and compare the Superfund contaminants of concern (from the baseline risk assessment) with BDAT constituents requiring control so that all constituents for which remediation may be required are identified. The next consideration is to evaluate whether remedial alternatives involve "placement" to determine applicability of the LDR's and then whether the treatment will ensure that the respective technology process will attain the appropriate treatment levels either through the LDR treatment standard or a treatability variance alternative treatment level. In accordance with Superfund goals, reduction of 90% or greater for Superfund primary contaminants of concern should be attained. The alternatives presented in this ROD were evaluated under this process.

Alternative 2 requires excavation of soils and construction of a cap over the contaminated area. Consolidation of soils on-site would not constitute placement and thus the LDR's would not be triggered.

Alternative 3 requires excavation and placement in an off-site hazardous waste landfill. The soil would need to be treated on-site or off-site prior to placement in the landfill. BDAT for contaminants in the soils includes different and conflicting treatment technologies. Therefore, a treatability variance would be necessary..

Alternative 4 requires excavation of soil to be treated by soil washing and placement of the clean soils back to the place from which it was excavated. It also requires that the contaminated soil washing wastewater resulting from the soil washing process be removed from the site, incinerated, and placed in a landfill off-site. A treatability variance is

required when the soils treated by soil washing are replaced on-site. The resulting waste water will be largely a mixture of highly contaminated (over 1,000 mg/ℓ) fluids, silts, and clays and will be taken off-site for incineration and disposal, as required by BDAT for California list fluids.

CRITERION 3: REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Alternative No. 1 - No Action
No reduction in toxicity, mobility, or volume would be achieved under the No Action alternative. Contaminants would continue to move from the site, affecting surface water, ground water, and soils.

Alternative No. 2 - Capping/Institutional Controls
The capping alternative would not reduce toxicity or volume because the waste would not be treated. Mobility would be reduced to the extent that the cap prevents surface water and soil movement from the site and to the extent that the cap prevents infiltration of water and potential movement of contaminants to ground water. A significant reduction in mobility is expected for the capping alternative.

Alternative No. 3 - Off-Site Disposal
Alternative No. 3 would achieve a significant reduction in toxicity, mobility, and volume through transferring soils to a facility designed to contain hazardous wastes. The potential for movement of contaminants into groundwater beneath OU5 from the surface soils would be eliminated.

Alternative No. 4 - On-site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
The soil washing alternative would significantly reduce the toxicity and volume and mobility of contaminants on-site and by eliminating the source of surface soil contaminants.

CRITERION 4: LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative No. 1 - No Action
Because contaminants would continue to move from the site, posing a potential health threat, the No Action alternative would not provide a long-term or permanent solution. Continued monitoring of the site would provide data on how natural attenuation and chemical degradation would reduce the threat to human health and the environment and the time period to reduce the threat.

Alterative No. 2 - Capping/Institutional Controls
Capping is not considered a permanent solution because wastes would remain untreated on site. Long-term effectiveness for protection of human health and the environment would be related to maintenance and monitoring the effectiveness of the cap. Long-term maintenance of the cap could provide control of contaminant movement and prevent risk of direct contact with contaminants and exposure to airborne emissions. With proper maintenance, the cap would be effective in preventing leaching of contaminants into the ground water.

Alternative No. 3 - Off-Site Disposal of Soils
Alternative No. 3 cannot be considered a completely permanent environmental solution, because contaminants and incinerator residuals would be transferred to an off-site facility. Alternative No. 3 would provide long-term effectiveness for protection of human health and the environment at the site.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
This alternative would achieve significant long-term effectiveness and permanence through the soil washing process which would extract chemicals of concern from less contaminated soils and achieve acceptable health risk-based levels on-site. This would provide a permanent solution for the site. Off-site landfilling of all incinerated residuals would effectively immobilize any remaining contaminants, and long-term risks would be negligible.

CRITERION 5: SHORT-TERM EFFECTIVENESS

Alternative No. 1 - No Action
The No Action alternative would not provide any short-term effectiveness.

Alternative No. 2 - Capping/Institutional Controls
The success of alternative No. 2 to achieve short-term effectiveness is related to the degree that production of airborne particulates and vapor is controlled during remediation, to minimize exposure risk to workers and the surrounding populace. The degree of short-term risks would be less than that of other alternatives due to a relatively quick construction period. Air monitoring during implementation would be required to evaluate risk and institute any corrective action.

Alternative No. 3 - Off-Site Disposal of Residuals and Soils
Effectiveness presented by alternative No. 3 would be less than that of the no action alternative. Implementation time would be reduced because there would not be a need to construct a landfill or backfill soils into it. The off-site landfill would have the necessary facilities and pollution control equipment to contain soils and prevent emissions during treatment/disposal.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
Remediation of soils at the COC area employing soil washing would take approximately 2-3 years to complete. Workers and the nearby community could potentially be exposed to slightly elevated risks during soil handling and treatment activities. These risks, however, can be reduced to acceptable levels by instituting protective and preventative measures. A site-wide air monitoring program would be in operation during remedial activities with this alternative.

CRITERION 6: IMPLEMENTABILITY

Alternative No. 1 - No Action
The No Action alternative is readily implementable.

Alternative No. 2 - Capping/Institutional Controls
The cap alternative is highly implementable using standard construction techniques. The alternative poses some logistical problems associated with the presence of a building, railroad, underground pipeline, and other utilities adjacent to the site. Detailed planning would be required to address reconstruction or rerouting of these rights-of-way.

Alternative No. 3 - Off-Site Disposal of Residuals and Soils
The construction aspects of Alternative No. 3 are highly implementable using standard construction techniques and equipment. Implementability of landfill disposal would be dependent on the capacity of these facilities at the time of remedial action. These problems could result in a delay in remedial action, but do not preclude off-site disposal.

Alternative No. 4 - On-site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
This alternative combines incineration, containment, and soil washing technologies. The limited staging and operations space at OU5 would necessitate a phased construction and treatment approach. Off-site land disposal is implementable with standard techniques and equipment, but is dependent on the capacity of these facilities at the time of remedial action. Although soil washing has been successfully demonstrated with certain types of compounds, its effectiver in treating the area's complex mixture of contaminants is uncertain. Bench scale treatability test results of the OU5 soils indicates effective removal of the contaminants is dependent upon the soil washing solution chemistry to determine if all the contaminants can be removed and to aid in designing the treatment system. A pilot test would be necessary to determine actual implementability.

CRITERION 7: COST

Alternative No. 1 - No Action
The cost of the No Action alternative is due primarily to site operations and maintenance which includes periodic sampling, inspection, groundwater monitoring and performance of a PHE at 5-year intervals. Annual cost is estimated at $20,000 and present worth cost over 30 years is estimated at $604,000.

Alternative No. 2 - Capping/Institutional Controls
The estimated present worth cost for construction of a cap at OU5 is approximately $2,547,170. This cost includes construction, O&M, and periodic monitoring. Annual O&M costs are expected to be $67,000.

Alternative No. 3 - Off-site Disposal of Residuals and Soils
The estimated present worth cost for Alternative No. 3 is $4,903,000 plus approximately $14,000,000 to accommodate off-site incineration prior to disposal in accordance with LDRs. The cost assumes disposal at an in-state landfill, and the cost may be higher if transport out

of state is required. Annual O&M costs are expected to be $67,000 per year during remediation activities.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
Costs associated with the soil washing alternative are uncertain since this is an innovative technology. The estimated present worth cost for this alternative is $4,490,739 for an industrial scenario. Annual O&M costs are expected to be similar to alternative 3 at approximately $70,000 per year.

CRITERION 8: STATE ACCEPTANCE

The State has not yet concurred with the selected remedy. The State postpones concurring until completion of on-site pilot testing of soil washing. The State has indicated a preference for the alternative in correspondence with EPA. The correspondence is attached to this ROD following the Responsiveness Summary.

Alternative No. 1 - No Action
The State finds this alternative unacceptable due to continued exposure to the public, potential contamination of surface and groundwater, and lack of usability of the site.

Alternative No. 2 - Capping/Institutional Controls
The State is not in favor of this alternative because the contaminated soil will remain on-site and require long-term maintenance of the cap to ensure protection of public health and containment of the waste. The land use will be excessively restrictive.

Alternative No. 3 - Off-Site Disposal of Residuals and Soils
The State finds this alternative acceptable as it fulfills all the remedial objectives.

Alternative No. 4 - On-Site Washing Treatment of Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
This alternative is preferred by the State because it fulfills all the remedial objectives and in addition minimizes waste. As the projected cost of this alternative is speculative, the State will re-evaluate this alternative as compared to alternative No. 3 when new cost figures become available.

CRITERION 9: COMMUNITY ACCEPTANCE

Comments in writing were received from four parties, the State of Colorado, the City of Commerce City, one of the Potentially Responsible parties, and a trust set-up by the same PRP. The City and others who attended the August 9, 1990, pubic meeting were in agreement with EPA's preferred and contingency remedy.

The former property owner and the trust set-up by the former property owner believe that capping will adequately remedy the health risk presented by the site.

Specific comments received by the EPA are listed and responded to in the Responsiveness Summary (Appendix B).

Alternative No. 1 - No Action
The community would prefer an alternative that reduces the risk present at the COC area.

Alternative No. 2 - Capping/Institutional Controls
Community acceptance of capping is expected to be greater than for no action but less than that for a treatment alternative. However, one Potentially Responsible party indicated that capping would be the least expensive method of addressing the problem.

Alternative No. 3 - Off-Site Disposal of Residuals and Soils
Alternative No. 3 would be acceptable to the local community and the City of Commerce City. Contaminants would be removed, and the health threat would be reduced such that certain uses of the land would be permissible.

Alternative No. 4 - On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals
It was indicated that this alternative would be preferred by the City of Commerce City since contaminants would be removed, and the health threat would be reduced to permit industrial use of the land.

IX. The Selected Remedy

Based on consideration of the requirements of CERCLA and the NCP, the detailed evaluation of the alternatives, a statutory preference for treatment, and public comments, EPA has selected Alternative No. 4 on-site soil washing of contaminated soil/off-site incineration and disposal of soil wash residuals.

Specifically, the selected remedy is composed of the following elements:

- Excavation of surface soil contaminated above the action levels listed for the primary contaminants of concern in Table 7.
- Soil washing of the excavated soils in an on-site treatment unit to the action levels listed in Table 7.
- Off-site incineration of soil washing wastewater.
- Replacement, grading, and re-vegetation of the area.

Excavation of the approximately 14,000 CY of contaminated surface soil will be accomplished using standard construction implements (backhoes, bulldozers, etc.). The excavated soil will be placed in a hopper on the soil washing unit. The soil washing unit will likely be mounted on flat-bed truck trailers and be composed of several washing and soil separating units. The soil is separated into various size particles to simplify the washing process and increase the overall efficiency. Typically, the very fine (small) particles are not washed very efficiently or separable from the wastewater due to their physical characteristics and are taken off-site for incineration.

The remaining products from the soil washing process are the larger soil particles treated to action levels, and the waste water. The treated soil will then be replaced on-site and re-vegetated. The alternative would take approximately 9-12 months to implement and 2-3 years to complete. The estimated present worth cost is $4,490,734. Annual O&M costs are expected to be $20,000 per year.

Because hazardous material may remain on-site above health base levels for a land use not anticipated, a Public Health Evaluation and will be performed every 5 years for the purpose of reevaluating the hazards posed by the site and assuring that the remedy remains protective.

The public will likely observe some excavation activities and increased truck traffic near 52nd Avenue and Dahlia Street under this remedial effort. There will also likely be additional fencing, storage of equipment, and some decontamination activities (truck washing) visible from Dahlia Street.

Land Disposal Restriction Treatability Variance for the Selected Remedy

Alternative 4 concerns excavation of soil to be treated by soil washing and placement of the clean soils back to the place from which it was excavated. It also requires that the contaminated soil washing wastewater resulting from the soil washing process be removed from the site, incinerated, and placed in a landfill off-site. A treatability variance is required when the soils treated by soil washing are replaced on-site. The resulting waste water will be largely a mixture of highly contaminated (over 1,000 mg/ℓ) fluids, silts, and clays and will be taken off-site for incineration and disposal, as required by BDAT for California list fluids.

Alternative 4 is the selected remedy premised upon the results of treatability studies which provided technically sound reasons to believe soil washing will perform effectively. This innovative technology has not been tested on-site and treatment standards are not available since actual performance data is not available to indicate that LDR treatment standards can be meet consistently for all soils and debris. Though it is believed soil washing will achieve reduction of contamination to levels demonstrated on Table 7, it is necessary to seek a treatability variance due to the absence of performance data.

The need for the treatability variance resulted from a determination that restricted RCRA wastes were present on OU5 which were compared with the Superfund constituents of concern. The alternatives were evaluated to identify if "placement" would occur to determine if the technology will attain LDR treatment standards, or if necessary, alternative treatment levels established by a treatability variance. The presence of restricted RCRA wastes, the need for placement, and the decision to employ soil washing resulted in the need for a treatability variance for this selected alternative. During implementation of this remedy periodic analysis using the appropriate testing procedure will be undertaken to ensure alternate treatment levels for the BDAT constituents requiring control are being attained and thus can be land disposed without further treatment.

Remediation Goals

The excavation of the contaminated soils above the health based action levels listed in Table 7 will be guided by sampling during excavation, and accomplished through the use of standard construction equipment. The soil will be treated to the treatment levels listed in Table 8, which represents a combination of health based action levels and treatability variance action levels for the chemicals of concern, which ever is more stringent.

The intention of the remediation effort is to return the area to industrial use as planned for by the City of Commerce City. This can be accomplished, as described in the Summary of Site Risk section of this document, by excavation and treatment of dieldrin and heptachlor contaminated soils to the action levels listed in Table 7 (and repeated below in Table 8). However, in compliance with LDRs and the preamble of the NCP with respect to the use of treatability variances at Superfund sites, the treated soils cannot be replaced on-site until the chemicals of concern have been treated to treatability variance levels. Health based action levels for dieldrin and heptachlor are more stringent than the treatability variance levels, and will therefore be used. However, the soils contaminated with the remaining chemicals of concern will be treated to the treatability variance levels indicated in Table 8 prior to replacement on-site.

The wastewater resulting from the soil washing process will be a mixture of solvents, silts, and fine clays, all contaminated above 1,000 mg/ℓ HOCs. Since this fluid is a LDR "California list" waste which requires incineration prior to disposal, the remedial action will be performed accordingly.

Ground water on-site will be monitored for thirty years and a Public Health Evaluation (PHE) will be performed every five years following remediation. The net present worth for the selected remedy is $4,490,000 and implementation will take approximately 9-12 months.

X. Statutory Determinations

EPA's responsibility at Superfund sites is to select and implement remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA provides several other statutory requirements and preferences. These statutes specify that the selected remedial action for the site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a waiver is granted. The selected remedy must also be cost effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that permanently or significantly reduce the volume, toxicity, or mobility of hazardous substances. The following sections discuss how the selected remedy for Sand Creek OU5 meet these statutory requirements.

TABLE 8

TREATMENT LEVELS

Compound	Action Level	Rational
Dieldrin	0.155 ppm	Health Based
Heptachlor	0.553 ppm	Health Based
Arsenic	90-99% reduction	Treatability Variance
Chromium	0.5-6.0 (TCLP)	Treatability Variance
Chlordane	90-99% reduction	Treatability Variance
2,4-D	90-99% reduction	Treatability Variance
4,4-DDT	0.5-20 (TWA)	Treatability Variance

[1] TCLP Toxicity Characteristic Leaching Procedure.
[2] TWA: Total Waste Analysis.

1. Protection of Human Health and the Environment

This remedy will reduce the direct contact threat currently posed by soils and will minimize the possibility of future adverse effects on ground-water quality by treatment of the most concentrated sources of waste above the water table and restricting the area to industrial use through institutional controls. There are some short-term risks associated with the selected remedy during soil handling operations, but these can be minimized with protective and preventative measures such as dust control measures.

2. Attainment of ARARs

Remedial actions at Sand Creek (OU5) will be undertaken in accordance with all applicable or relevant and appropriate requirements (ARARs).

Any regulation, standard, requirement, criterion, or limitation under any federal or state environmental law may be either applicable or relevant and appropriate to a remedial action, but not both.

Criteria, advisories and guidelines that are not law may be used to ensure protectiveness in the absence of ARARs, or when ARARs are not sufficient. These criteria, advisories, and guidelines fall in the "to be considered" (TBC) category and can be used to ensure protection.

ARARs may be classified into three general categories:

- Chemical-specific - related to the level of contamination allowed for a specific pollutant in various environmental media (i.e., soil, water, and air),
- Location-specific - related to the presence of a special geographical (e.g., floodplain or wetland) or archeological area at or near the site, and
- Action-specific - related to a method of remedial action identified as an alternative for the site (e.g., disposal requirements or incineration standards).

The selected remedy of on-site soil washing of contaminated soil/off-site incineration and disposal of soil wash residuals would comply with all applicable or relevant and appropriate chemical-, location-, and action-specific requirements (ARARs). The primary ARARs pertinent to the selected remedy are summarized below.

- Chemical-specific ARARs
  - Land Disposal Restrictions - Threshold concentrations for treatability variance for Alternative No. 3.
  - BDAT for all alternatives.

- o Location-specific ARARs

None

- o Action-specific ARARs

Federal

- A PHE must be performed at least every 5 years (CERCLA 121(c))
- Occupational Safety and Health Act (OSHA)
- The requirements of 29 USC Sections 651-678, and 29 CFR 1910.120 which regulates worker health and safety, must be followed.

Land disposal restrictions 40 CFR 268 Subpart D.

State of Colorado

- CRS Section 25-123-101, et. seq. must be adhered to maintain compliance with the State of Colorado noise abatement requirements.
- 6 CCR 1007-3 Part 99 will need to be followed. This regulation requires notification of hazardous waste activities when hazardous waste is generated.
- The manifest requirements of 6 CCR 1007-3 Part 262 Subpart B must be followed for off-site transportation of hazardous waste.
- The pre-transport regulations of 6 CCR 1007-3 Part 262.30, .31 and .33 must be adhered to for off-site transportation of hazardous waste.
- An EPA identification number must be obtained for transporting of hazardous waste per the requirements of 6 CCR 1007-3 Part 263.11 (A).
- CCR 1001-3 Section VIB will be followed to regulate air emissions.

Appendix A presents the ARARs and TBC's for Sand Creek OU5. The ARARs as they are pertinent to each of the four alternatives noted in the last column of the table.

3. Cost Effectiveness

The selected remedy is cost effective in mitigating the risk posed by contaminated soils in a reasonable period of time. To provide further assurance that cost effectiveness is part of the choice of remedial action, a cost benefit analysis will be performed as part of the results of the pilot test. The selected remedy effectively and permanently reduces contamination to acceptable levels.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

US EPA and the State of Colorado believe the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final remedy at the Sand Creek site. Of the alternatives that are protective of human health and the environment and comply with ARARs, US EPA and the State have determined that the selected remedy provides the best balance of trade offs in terms of long-term effectiveness and permanent reduction in toxicity, mobility or volume achieved through treatment, short-term effectiveness, implementability, cost, also considering the statutory preference for the treatment as a principal element and considering state and community acceptance.

5. Preference for Treatment as a Principal Element

By washing the contaminated soil with solvents and water, the selected remedy satisfies the statutory preference for remedies that employ treatment of the principal threat which permanently and significantly reduces toxicity, mobility or volume of hazardous substances as a principal element.

Responsiveness Summary

The Responsiveness Summary is found in Appendix B of this document.

TABLE 1
ARARs FOR SAND CREEK OU5
CONTAMINANT-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
National Primary Drinking Water Standards	40 CFR Part 141	Establishes health-based standards for public water systems (maximum contaminant levels)	No/No		
LDR Treatment Standards	40 CFR 148	Establishes BDAT treatment standards for wastewater and non wastewater and effective dates	Yes/Yes		#3, 4
Dieldrin	40 CFR 148 P037	Non wastewater: Total TCLP 0/13 mg/ℓ; BDAT = Incineration wastewater: Total TCLP 0 017 mg/ℓ NA; Biological treatment or wet-air oxidation followed by carbon adsorption	Yes/Yes	Effective date 8/8/90	#3, 4
Heptachlor	40 CFR.148 PO59	Non wastewater: Total TCLP 0.066 NA; 0 066 (heptachlor epoxide); BDAT Incineration Wastewater: Total TCLP 0.0012 NA; 0.016; BDAT Biological treatment or wet air oxidation followed by carbon adsorption	Yes/Yes	Effective date 8/8/90	#3, 4
Arsenic	40 CFR 148 D004	Non wastewater: Total TCLP N/A 5.0; BDAT Vitrification Wastewater: Total TCLP 5.0 NA; BDAT Chemical precipitation	Yes/Yes	Effective date 5/8/92 nonwastewater, 5/8/90 wastewater	$3, 4

TABLE 1
ARARs FOR SAND CREEK OU5
CONTAMINANT-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description		Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs						
Chlordane	40 CFR 148 V036	Non wastewater Total TCLP 0.13 NA BDAT Incineration	Wastewater Total TCLP 0.0033 NA BDAT Biological treatment wet air oxidation followed by carbon adsorption	Yes/Yes	Effective date 8/8/90	#3, 4
2,4-D	40 CFR 148 D016	Non wastewater Total TCLP 10 NA BDAT Incineration	Wastewater No number developed BDAT Incineration or biodegradation or chemical oxidation	Yes/Yes	Effective date 8/8/90	#3, 4
DDT	40 CFR D061	Non wastewater Total TCLP 0.087 NA BDAT Incineration	Wastewater Total TCLP NA 0.0039 O,P'DDT 0.0039 P,P'DDT 0.023 O,P'DDD 0.023 P,P'DDD 0.031 O,P'DDE 0.031 P,P'DDL BDAT Biological treatment or wet air oxidation followed by carbon adsorption	Yes/Yes	Effective date 8/8/90	#3, 4
2,4-D	40 CFR V240	Non wastewater Total TCLP 10 NA BDAT Incineration	Wastewater Total TCLP 0.71 NA BDAT Biological treatment or wet air oxidation followed by carbon adsorption	Yes/Yes	Effective date 8/8/90	#3, 4

TABLE 1
ARARs SAND CREEK OU5
CONTAMINANT SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
Chromium	40 CFR 148 D007	Non Wastewater Total TCLP N/A 5.0 BDAT Chromium reduction followed by stabilization Wastewater Total TCLP 5 0 NA BDAT Chromium reduction followed by precipitation and dewatering	Yes/Yes	Effective date 8/8/90	#3, 4
Waste Stream Treatment/Disposal	Clean Water Act, Section 301B 40 CFR 122.44(a) 40 CFR 125.100	Control of direct discharges from point sources via waste water treatment technologies.	No/No	No site runoff to a surface water body via ditch, culvert, storm sewer, or other means.	
	Clean Water Act Section 310	Direct discharge of treated waste streams to on-site surface water.	No/No	No on site surface water.	
Clean Air Act	CAA, Bat 173 40 CFR 52.21(j)	Stationary sources which emit >100 tons/yr. of any regulated pollutant.	No/Yes	If emits >100 tons per year of air pollutant.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
LOCATION SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
National Historic Preservation Act	40 USC Sec. 470 40 CFR Sec. 6.301(b) 36 CFR Part 800	Requires Federal agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.	No/No	The remedy does not effect any district, site, building, structure, or object listed on or eligible for the National Register.	
Archeological and Historic Preservation Act	16 USC Sec. 469 40 CFR Sec. 6301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Fed. ily licensed activity or program.	No/No	The remedy does not effect historical or archeological data.	
Historic Sties, Buildings and Antiquities Act	16 USC Sec. 461-467 40 CFR Sec. 6.301(a)	Requires Federal agencies to consider the existence and location of Landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on each Landmark.	No/No	The remedy does not effect any Natural Landmark.	
ish and Wildlife Coordination Act	16 USC Sec. 661-666 40 CFR Sec. 6.302(g)	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	No/No	Alternatives developed will not modify streams.	
ndangered Species Act	16 USC 1531 50 CFR Part 200 50 CFR Part 401	Requires action to conserve endangered species within critical habits upon which endangered species depend, includes consultation with Department of Interior.	No/No	No endangered species are present on the COC site.	
lean Water Act	33 USC Sec. 1251-1376				
loodplain	40 CFR 264 18(b) 40 CFR 141.5	Design facilities to prevent washout of hazardous waste.	No/No	Not in floodplain.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
	40 CFR, Part 6 40 CFR 264, Subpart B 40 CFR 257-3.1(a) 16 DSC 661 Executive Order 11988	Avoid adverse effects, minimize harm and avoid incompatible development.	No/No	Not in floodplain.	
Dredge or Fill Requirements (Section 404) Clean Water Act, Section 404	40 CFR Parts 230, 231 33 CFR Parts 320-330	Requires permits for discharge of dredged or fill material into navigable waters.	No/No	A permit is not required for on-site CERCLA response actions, but substantive requirements would be met if an alternative developed would involve discharge of dredged or fill material into navigable waters. This is not anticipated.	
Executive Order on Floodplain Management	Exec. Order No. 11,988 40 CFR Sec. 6.302(b) Appendix A	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.	No/No	If an alternative developed that would affect a floodplain this would be applicable. Operable Unit No. 1 is located outside of the 100-year floodplain.	
Wilderness Act	16 USC Sec. 1131 50 CFR 35.1	Administer federally owned wilderness area to leave it unimpacted.	No/No	No wilderness area on-site or adjacent to site.	
National Wildlife Refuge System	16 USC Sec. 668 50 CFR Part 27	Restricts activities within a National Wildlife Refuge.	No/No	No wilderness area on-site or adjacent to site.	
Scenic River Act	16 USC Sec. 1271 40 CFR Part 6,302(e)	Prohibits adverse effects on scenic river.	No/No	No scenic river in area.	
Coastal Zone Management Act	16 USC Sec. 1451	Conduct activities in accordance with state approved management program.	No/No	Area is not in coastal zone.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
Wetlands	Executive Order 11990 40 CFR, Part 6	Avoid impacts and construction in wetlands, preserve and enhance.			
State ARARs					
Requirements for Siting of Hazardous Waste Disposal Sites	6 CCR 1007-2, Pt II, Sections 2.1, 2.4, and 2.5	Geologic/Hydrologic conditions must assure waste isolation from exposure pathways for 1000 years. Siting must assure short- and long term protection of human health and environment.	Yes/No	Applicable if an on-site hazardous waste disposal facility is planned. Not Anticipated.	
Colorado Hazardous Waste Management Regulations	6 CCR 1007-3	Siting is restricted in vicinity of recent faulting. No hazardous waste disposal can occur in a 100 year floodplain. Disposal into or below surface water and ground water is prohibited.	Yes/No	Applicable if an on-site hazardous waste disposal facility is planned.	
Regulations Pertaining to Solid Waste Disposal Sites and Facilities	6 CCR 1007-2, Sections 1.3.2, 2.1, 2.2, 2.4, 4.1, 6.1	Siting must maximize wind protection and minimize upstream drainage area. No solid waste disposal can occur in a 100-year floodplain. Disposal into or below surface water and ground water is prohibited. Impoundment design is controlled by a site's location in relation to the upper most aquifer and by water quality in the aquifer.	Yes/No	Applicable if on-site solid waste disposal facility is contemplated.	
Colorado State Historical Society	Sections 24 80-201, 202, 211; Sections 24-801-101, 102, 103, 104, 108	Sites within state or federal historic preservation areas will be required to preserve historic character.	No/No	No regulated sites.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
Federal ARARs					
Interim Treatment Standards for Soil and Debris, TBC July 27, 1990		BDAT standards have not been developed for the P and U wastes present in OU5 soils.	TBC		
Occupational Safety and Health Act	29 USC Sec. 651-678	Regulates worker health and safety.	Yes/No	Under 40 CFR Section 300.38, requirements of this Act apply to all response activities under the NCP.	#2, 3, 4
Hazardous Materials Transportation Act	49 USC Sec. 1801-1813				#3, 4
Hazardous Materials Transportation Regulations	49 CFR Parts 107, 171-177 also 40 CFR 262	Regulates transportation of hazardous materials.	Yes/No	Applicable only if an alternative developed would involve transportation of hazardous materials.	#3, 4
Land Disposal Regulation	40 CFR 268, Subpart D, 55 FR 8760-8762, 3/8/90	Regulates movement and placement of soils.	Yes/No	Applicable to wastes shipped off-site.	#2, 3, 4
Capping	40 CFR 264.310(a)(b) 40 CFR 264.117 to 120 40 CFR 264.258(b)	Standards for cap placement.	No/Yes	If Alternative 2 selected.	#2
Land Treatment	40 CFR 264.271, 273, 276, 278, 282	RCRA hazardous waste being treated or placed in another unit.	No/Yes	If Alternative 3 selected.	#3
Corrective Action for Solid Waste Management Units	Proposed regulation 55 FR 30798		TBC		

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Rules and Regulations Governing the Transportation of Hazardous Materials Within Colorado	4 CCR 723-18, HMT 1-9	Establishes specific requirements for the transportation of hazardous materials, especially regarding labeling and placarding.	Yes/No	Applicable if hazardous material is transported off-site.	#3, 4
Colorado Noise Abatement Statute	Sections 25-12-101, 012, 103, 104, 105, 106, 108	Establishes standards for controlling noise.	Yes/No	Applicable to alternatives that would generate noise.	#2, 3, 4
Colorado Wildlife Enforcement and Penalties	Sections 33 6-101, 102, 103, 104, 105, 108, 109, 110, 111, 113, 114, 116, 117, 119, 120, 124, 126, 128, 129, 130	Prohibits specific actions in order to protect wildlife.	Yes/No	Relevant and appropriate for protecting wildlife near the site during construction activities.	#2, 3, 4
Wildlife Commission Regulations	2 CCR 406 0, Articles I, III, IV, V, VI, VII, VIII, IX, X, XI	Establishes specific requirements for the protection of wildlife.	Yes/No	Relevant and appropriate for protecting wildlife near the site during construction activities.	#3, 3, 4
General Closure	6 CCR 1007-3, Part 264.111	Colorado Hazardous Waste Management Regulations. Must minimize the need for further maintenance; control, minimize or eliminate (to the extent needed to protect human health and environment) the post-closure escape of hazardous wastes, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to ground water, surface water, or the atmosphere.	Yes/No	COC generated and managed corrosive hazardous wastes and spilled commercial chemical products. COC generated and managed RCRA hazardous wastes after November 19, 1980.	#2, 3, 4
Stationary Emissions Sources; General controls for remedial activities	5 CCR 1101-5, Section IVD	Source cannot cause emissions to exceed any attainment area of any NAAQS.	Yes/No	COC site is in a non-attainment area. The site could be considered a major source if it emits more than 100 tons/year of CO or VOCs.	
	5 CCR 1001 5, Section IVD	Source cannot interfere with attainment and maintenance of any State NAAQS.	Yes/No	COC site is in a non-attainment area.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	5 CCR 1001-3, Section IIID	Minimize fugitive dust emissions.	Yes/No	Demolition and construction activities, storage and handling operations, and haul roads.	#2, 3, 4
Stationary Emission Sources; General controls for remedial activities	5 CCR 1001-3, Section II	No emissions exceeding 20% capacity are allowed.	Yes/No	Specific sources may have other limitations.	#2, 3, 4
	5 CCR 1001-4, Section 2A	Design action to provide odor-free operations.	Yes/No		#2, 3, 4
Tank Closure	6 CCR 1007-3 Part 264-197	All hazardous wastes and residues must be removed from tanks, discharge control equipment and discharge confinement structures.	Yes/No	Commercial chemical products in tanks become hazardous wastes when closure begins. See clean closure requirements for generator/transporter requirements. COC managed their hazardous wastes on tanks.	
Container Closure	6 CCR 1007-3 Part 264.178	All hazardous wastes and residues must be removed from containment system, if any. Remaining containers, liners, bases, and soil containing or contaminated with residues must be decontaminated or removed.	Yes/No	Commercial chemical products in tanks become hazardous wastes when closure begins. See clean closure requirements for generator/transporter requirements.	
Closure of hazardous waste management facilities (HWMF):	6 CCR 1007-3, Part 264.111	General closure, as above. Includes waste management facilities, waste piles, surface impoundments and tank systems.	Yes/No	Closure performance standards.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Closing in place (capping)	6 CCR 1007-3, Part 264.310(a)	Design and construct cover to: · Provide long term minimization of migration of liquids through the cap. · Function with minimum maintenance. · Promote drainage and minimize erosion or abrasion of the cover. · Accommodate settling and subsidence to maintain the cover's integrity. · Have a permeability less than or equal to the permeability of the bottom liner or natural sub soils present.	Yes/No	Spilled commercial chemical products are mixed with soils. Design, construction and monitoring requirements described herein also apply to caps placed over fixed wastes.	#2
	6 CCR 1007-3, Part 264.310(b)	Cap integrity must be maintained and repaired as necessary. Leak detection, leachate collection, and leachate removal systems must be operated and maintained. Surveyed benchmarks must be protected and maintained.	Yes/No		#2
	6 CCR 1007-3, Part 264.301(c)	Run on control must be designed and constructed to prevent flow onto the cap during construction. The peak discharge from at least a 100-year storm must be controlled.	Yes/No	Also applies to run-on control during fixed waste disposal cell construction.	#2
Closure of HWMF:	6 CCR 1007-3, Part 264.301(d) and (e)	Runoff control must be designed and constructed to collect and control the runoff from a 100-year 24 hour storm, both during cap construction and maintenance. Collection/holding facilities associated with run on and run off control must be designed to expeditiously maintain capacity after storms.	Yes/No	Also applies to fixed waste cell, liner and cap construction.	@2

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-3, Part 264.303(a)	During construction, cap systems must be inspected for uniformity, damage and imperfections. Synthetic membranes must be inspected to ensure tight seams and joints and the absence of tears, punctures or blisters. Soil based and admixed caps must be inspected for holes, or other structural nonconformities that may cause any increase in the permeability of the cap.	Yes/No	Also applies to fixed waste cell, liner and cap construction.	@2
	6 CCR 1007-3, Part 264.309	The exact location and dimension, including depth, of disposal cells must be shown on site maps relative to permanently surveyed benchmarks. The contents of each cell and location of each hazardous waste type must also be shown.	Yes/No	Also applies to fixed waste disposal cells and caps.	#2
Closure of HWMF:	6 CCR 1007-3, Part 264.91(4 Part 264.92)	Implement a ground water detection monitoring program to ensure that the ground water protection standard is complied with. Concentrations of hazardous constituents cannot exceed: - table values, or - background levels, where no table value is specified.	Yes/No	Will also apply to waste treatment/on-site disposal alternatives like fixation and soil washing or incineration, if residues cannot be delisted.	#2, 3, 4
	Part 264.97(a)	Ground water monitoring must consist of a sufficient number of wells with appropriate depths and locations to yield samples capable of determining background water quality and water quality passing a point of compliance.	Yes/No	Existing well field will need to be reviewed during remedial design.	#2, 3, 4

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	Part 264.97(c), (d) and (e)	Ground water wells must be cased in a manner ensuring well integrity, and sampled using methods ensuring sample/analysis integrity.	Yes/No	Existing well field and any additional wells placed at the site must be assessed.	#2, 3, 4
	Part 264.97(h)	Ground water sam[illegible]s must be collected and analyzed at a frequency that allows for valid statistical analysis.	Yes/No	Applicable to ground water sampling at the site.	#2, 3, 4
	6 CCR 1007, Part 2, Sections 2.4, 1-2.4.5	Design facility to prevent long term adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No	Part 2 of the State solid waste regs contains siting and design criteria for hazardous waste disposal sites built after July 1, 1981.	#2, 3, 4
Closure of HWMF:					
Closing in place (capping)	6 CCR 1007-2, Part 2, Section 2.3.7	Design runoff control system with sufficient capacity to prevent adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No		#2
	6 CCR 1007-2, Part 2, Section 2.4.8	Close facility to assure prevention of long-term adverse effects.	Yes/No		#2
	6 CCR 1007 2, Part 2, Sections 2.4.9, 2.4.10	Monitor ground water, surface water, and provide quality control during construction.	Yes/No		#2
	6 CCR 1007-3, Part 264.117	Restrict post closure use of property as necess[illegible], to prevent cover damage.	Yes/No		#2
Clean Closure Removal with off-site disposal	6 CCR 1007-3, Part 264.111	General closure, as above.	Yes/No	To estimate soil volumes, containment concentrations above which cleanup will occur are set at background or the value corresponding to one excess cancer in one million cases.	#3
	5 CCR 1001 9, Section II.D.1 and 2	VOC source can emit [illegible] more than 450 lbs/hour or 3000 lbs/day of VOCs without applying reasonably available control technology (RACT).	Yes/No	Soils at COC also have VOCs in them Design to use RACT is made after a health based risk assessment using air modeling.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-3, Part 264.114	Dispose of or decon all facility equipment and structures by removing all hazardous wastes and residues.	Yes/No		#2, 3, 4
Notification	6 CCR 1007-3, Part 99	Any person who generates or transports hazardous wastes must file a notification of hazardous waste activity before beginning such activity.	Yes/No	If tank contents, containers and contaminated soils are being shipped off-site as part of closure activities.	#3, 4
Manifests	6 CCR 1007-3, Part 262, Subpart B	A manifest must be prepared by a generator before it is offered for transportation off site. The manifest must identify the facility permitted to handle the waste described thereon, and may designate an alternative facility. The manifest format must be consistent with those offered by the consignment (destination) state or generator state, respectively. Generator must sign the manifest, obtain the signature of the initial transporter, retain one copy, and give remaining copies to the initial transporter.	Yes/No	For off site transportation.	#3, 4
Pre-transport Requirements	6 CCR 1007-3, Part 262.3, .31, and .33	A generator must package the waste in accordance with PUC or DOT regulations in 40 CFR Parts 173, 178 and 179. Each package must be labeled or marked in accordance with PUC or DOT regulations in 49 CFR Part 172. For containers of 110 gallons or less, markings must comply with requirements of 40 CFR 172.304. The generator must placard, or offer placards to the initial transporter, in accordance with 49 CFR Part 172 Subpart F.	Yes/No	For off-site transportation.	#3, 4

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Transportation	6 CCR 1007-3, Part 263.11(a)	A transporter must not transport hazardous wastes without an EPA ID number.	Yes/No	For off-site transportation.	#3, 4
Clean Closure (removal with off-site disposal)	6 CCR 1007-3, Part 263.20	A transporter may not receive hazardous waste from a generator unless it is accompanied by a manifest. The transporter must sign and date the manifest, acknowledging acceptance, and must leave on copy with the generator. Upon delivery to the designated facility, the transporter must obtain the date of delivery and the signature of the owner/operator. The transporter must retain one copy of the signed manifest.	Yes/No	For off-site transportation.	#3, 4
Transportation	6 CCR 1007-3, Part 263, Subpart C	If a discharge of hazardous waste occurs during transportation, the transporter must take appropriate immediate action to protect human health and environment. The transporter must report the discharge and ultimate resolution to PUC, DOT and CDM. The transporter must clean up the discharge or take other appropriate action so that the discharge no longer presents a hazard to human health or environment.	Yes/No	For off-site transportation.	#3, 4
Clean closure (removal with treatment n tanks)	6 CCR 1007-3, Part 264.191(a)	Tanks must have sufficient shell strength, foundation strength, structural support, and for closed tanks, pressure controls to assure that they do not collapse or rupture.	Yes/No	Soils will be mixed with fixing agents or soil washing solvents in tanks.	#4

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-3, Part 264.192(a)	Wastes and other material (e.g., treatment reagents) that are incompatible with the material of construction of the tank must not be placed in the tank, unless it is protected from accelerated corrosion, erosion, or abrasion through the use of an inner liner or coating that is compatible with tank contents and that is free of leaks, cracks, holes, or other deterioration, or through alternative means of protection.	Yes/No	Applicable if incompatible wastes are placed in tanks.	
	6 CCR 1007-3, Part 264.192(b)	Overfilling must be prevented by including control methods or, for uncovered tanks, maintenance of a sufficient free-board to prevent overtipping by wave or wind action, or by precipitation.	Yes/No	Applicable if waste is placed in tanks.	
	6 CCR 1007-3, Part 264.194(a)(1-3)	Daily inspections must be conducted on overfilling control equipment, tank integrity, monitoring equipment, and the level of wastes in uncovered tanks.	Yes/No	Applicable if waste is placed in tanks.	
Clean closure (removal with treatment in tanks)	6 CCR 1007-3, Part 264.194(a)(4) and (5)	Weekly inspections must be conducted on the construction materials of above-ground tanks and of the area around them for obvious signs of tank deterioration and leakage.	Yes/No	Applicable if waste is placed in tanks.	
	6 CCR 1007-3, Part 264.341; Part 100.22(c)(3) and (4)	Analyze the waste feed.	Yes/No	Additional waste analyses will be needed during remedial design.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Clean closure (removal with incineration on-site)	Part 264.340	No further requirements, except waste analyses and closure, apply to incinerators that only burn wastes listed as hazardous solely by virtue of the characteristic or ignitability, corrosivity, or both; or the characteristic of reactivity if the wastes will not be burned when other hazardous wastes are present in the combustion zone; and if the waste analysis shows that the wastes contain none of the hazardous constituents listed in Appendix VIII which might reasonably be expected to be present.	No/No	Hazardous wastes at COC are listed for toxicity and acute toxicity, not ignitability or corrosivity alone.	
		Performance standards for incinerators:			
	6 CCR 1007-3, Part 264.343(a)(1)	- Achieve a destruction and removal efficiency of 99.99 percent for each principal organic hazardous constituent in the waste feed and,	Yes/No	Applicable if waste is incinerated.	
Clean closure (removal with incineration on-site)	6 CCR 1007-3, Part 264.343(a)(2) and Part 264.343(b)	- 99.9999 percent for F020, F021, F022, F023, F026, F027 wastes.	Yes/No	If waste is a F020, F021, F022, F023, F027,or F029 waste.	
		- Reduce hydrogen chloride emissions to 1.8 kg/hr or 1 percent of the HCl in the stack gases before entering any pollution control devices.			
	6 CCR 1007-3, Part 264.343(c) also, 5 CCR 1001-8, Section III C.1	- Emissions of particulate matter cannot exceed 0.08 grains per dry standard cubic foot when corrected for the amount of oxygen in the stack gas.	Yes/No	General capacity limitation also applies to new incineration sources.	
	6 CCR 1007-3, Part 264.345(c)	Operate within specified limits during startup and shutdown	Yes/No		

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	Part 264.345(d)	Control fugitive emissions from the combustion zone.	Yes/No		
	Part 264.374	Monitoring of various parameters during operation of the incinerator is required. These parameters include:	Yes/No		
Clean closure (removal with incineration on-site)	6 CCR 1007-3, Part 264.347(a)	- Combustion temperature.	Yes/No		
		- Waste feed rate.			
		- An indicator of combustion gas velocity.			
		- Carbon monoxide.			
		- Waste and exhaust emissions upon request.			
	Part 264.347(b)	Daily visual inspections of incinerator and associated equipment.	Yes/No		
	Part 264.347(c)	Operate with an automatic feed cutoff system; inspect weekly.	Yes/No		
	Part 264.351	At closure, all hazardous waste and residues, including ash, scrubber water, and scrubber sludge must be removed from the site.	Yes/No		
Clean closure (removal with incineration on-site)	5 CCR 1001-3, Section VIB	Sources can emit no more than 2 tons/day of sulfur dioxide.	Yes/No	Specific sources may have other limitations. Use best available control technology.	
	5 CCR 1001-3, Section IIIA	Comply with particulate limitations.	Yes/No	Functions of heat input. Applies to the operation of fuel burning equipment.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Emission of metals from incinerators		Colo. Air Quality Control Commission Regulation #8, Section 6.	TBC	The ambient air quality standard for lead is 1.5 ug/m (avg. monthly modeled standard).	
		Ambient air quality standards for State of Massachusetts. Currently used as guideline for State of Colorado.	TBC	The State has metals emissions guidelines of 0.0003 ug/m for cadmium, 0.69 ug/m chromium, and 0.18 ug/m for nickel.	
On-site disposal of treatment residues	6 CCR 1007-3, Part 260.22(a)	A demonstration must be made that the waste no longer meets any of the criteria under which it was listed as hazardous under Part 261, Subpart D.	Yes/No	If the waste is listed with code "I", the petition must demonstrate that the residues do not contain the constituent (app. 7) that caused it to be listed, using the appropriate app. 7 test method; or the waste does not meet the criterion of Part 261.11(a)(3), considering the factors in 40 CFR Parts 261.11(a)(i) through (xi).	#4
On-site disposal of treatment residues	6 CCR 1007-2, Part 2, Section 2.4.1-2.4.5	Design facility to prevent long-term adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No	Part 2 of the State solid waste regs contains siting and design criteria for hazardous waste disposal sites built after July 1, 1981. These requirements are applicable if a hazardous waste disposal site is built.	
	Part 2, Section 2.4.6	Protect the function and integrity of liner(s)	Yes/No		
	Part 2, Section 2.5.3	Isolate wastes for 1000 years.	Yes/No		
	Part 2, Section 2.4.9, 2.4.10	monitor ground water, surface water, and provide quality control during construction.	Yes/No		
On-site disposal of treatment residues	Part 2, Section 2.4.8	Close facility to assure prevention of long-term adverse effects.	Yes/No		
	Part 2, Section 2.4.7, 2.5.5	Design leachate and runoff control system to prevent adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No		

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-3, Part 264.301(a)(1)	Use liner which prevents waste migration into adjacent soil, ground water, surface water, or liner itself during the active life of the landfill, including closure. Design and construct liner to prevent failure due to pressure gradients, contact with wastes, climate, and stress of installation and daily operations. The liner must be placed on a foundation that will provide support and resistance to pressure gradients above and below the liner, to prevent failure due to settlement, compression or uplift. The liner must cover all areas likely to be in contact with waste or leachate.	Yes/No		
On-site disposal of treatment residues	6 CCR 1007-3, Part 264.301(a)(2)	Install leachate collection system above the liner that the depth of leachate on the liens does not exceed thirty centimeters (one foot). The system must be constructed of materials that are compatible with wastes and leachate in the landfill, and that have sufficient strength to prevent collapse under pressures exerted by overlying wastes, caps and equipment. The system must be designed and operated to function without clogging.	Yes/No		
	6 CCR 1007-3, Part 264.301(c)(d)(e)	Construction run-on and runoff control systems capable of handling the peak discharge of a 100-year 24 hour storm. Associated collection and holding facilities must be designed to expeditiously maintain system capacity after storms.	Yes/No		

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-3, part 264.303(a)	During construction, liners must be inspected for uniformity, damage and imperfections. Synthetic membranes must be inspected to ensure tight seams and joints and the absence of tears, punctures or blisters. Soil-based and ad-mixed caps must be inspected.	Yes/No	Substantive standards for inspection are applicable.	
On-site disposal of treatment residues	6 CCR 1007-3, Part 264.309	The exact location and dimensions including depth, of disposal cells must be shown on site maps relative to permanently surveyed benchmarks. The contents of each cell and location of each hazardous waste type must also be shown.	Yes/No		
	6 CCr Part 264.90 Subpart F	Conduct a ground water monitoring and response program, including corrective action, as required.	Yes/No		
	6 CCR Part 264.312, 264.313, 317	Comply with special requirements for ignitable, reactive, incompatible wastes, and F020, F021, F022, F023, F026, F027 wastes.	Yes/No		
	6 CCR 1007-3, Part 264.310(a)	Design and construct cover to: - Provide long-term minimization of migration of liquids through the cap. - Function with minimum maintenance. - Promote drainage and minimize erosion or abrasion of the cover. - Accommodate settling and subsidence to maintain the cover's integrity.	Yes/No		

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
		- Have a permeability less than or equal to the permeability of the bottom liner or natural subsoils present.			
On-site disposal of treatment residues	6 CCR 1007-3, Part 264.310(b)	Cap integrity must be maintained and repaired as necessary. Leak detection, leachate collection, and leachate removal systems must be operated and maintained. Surveyed benchmarks must be protected and maintained.	Yes/No		
	6 CCR 1007-2, Section 2.1.2	Disposal sites shall comply during operations with applicable rules and regulations of the water and air quality control commissions, and with local zoning laws and ordinances.	Yes/No		
	6 CCR 1007-2 Section 4.2	Ground water shall be protected from pollution by leachate. Permanent diversions shall control run-on and runoff from the 100-year event. Facility design shall address geologic hazards. Ground water monitoring wells shall be designed in accordance with applicable state engineer's rules and regulations. Sufficient amounts of cover must exist on-site or be readily available off-site. Cap design must demonstrate that two feet of cover is sufficient to establish vegetation and isolate wastes after closure. Adequate amounts of water must be available for construction	Yes/No	Compliance with these design standards is demonstrated by providing the data called for in 6 CCR 1007-2, Sections 4.3 through 4.8.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
	6 CCR 1007-2, Section 2.1	Operations shall control odors and prevent rodent and insects by being adequately covered. Nuisance conditions shall be minimized. Wastes shall be placed as densely as practicable. Disposal sites shall be adequately fenced.	Yes/No	These are minimum operating standards mandated by the statue.	
On-site disposal of treatment residues	6 CCR 1007-2, Section 2.2	During operations, run-on shall be diverted from the working area. Ground water shall be monitored regularly upgradient and downgradient of the facility. Operations shall cease when high wind warnings are verified. Hazardous wastes and sludges shall not be disposed during operations.	Yes/No	these are additional operation standards for solid waste disposal sites.	
Chemical, Physical and Biological Treatment (Soil Washing and Biological Treatment)	40 CFR 265.400	Chemical, physical or biological treatment of hazardous waste must comply with Section 265.17(b).	Yes/No	Would be applicable if biological or soil washing treatment is performed.	#4
General requirements for ignitable, reactive, or incompatible wastes	40 CFR 265.17(b)	Where specifically required by other sections, of this part, the treatment, storage, or disposal of ignitable or reactive waste, and the mixture of commingling of incompatible wastes, or incompatible wastes and materials, must be conducted so that it does not:		Would be applicable if biological or soil washing treatment is preformed.	#4
		Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health; produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions.			
Waste pile	40 CFR 264.251	Use a single liner and leachate collection system.	Yes/No	Would be applicable if waste is held in a waste pile prior to treatment.	#4

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
Transportation (Off-site)	40 CFR 107, 171-177	Regulates transportation of hazardous materials (Department of Transportation)	Yes/No		#3, 4
	November 15, 1985 Federal Register	Superfund Off site Policy	Yes/No		
Standards a\Applicable to Generators of Hazardous Wastes	40 CFR Part 262	Regulations for Transporting Hazardous Wastes: Before an owner or generator disposes of any hazardous waste, he must obtain a detailed chemical and physical analysis of a representative sample of the waste. At a minimum, this analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with Part 265 and Part 268.	Yes/No	#3, 4	
Requirements for Miscellaneous Units	52 FR 46946 (December 10, 1987) Subpart x of Part 264	A RCRA permit is not required for on-site CERCLA action; however, the requirements of the permit must b met. The Subpart x permit requirements include but is not limited to: (a) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in the ground water or subsurface environment, considering: (1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for migration through soil, liners, or other containment structures; (2) The hydrologic and geologic characteristics of the unit and surrounding	Yes/No	Applicable if waste is treated in a miscellaneous unit.	

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
		area;			
		(3) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground water;			
		(4) The quality and direction of ground-water flow;			
		(5) The proximity to and withdrawal rates of current and potential ground-water users;			
		(6) The patterns of land use in the region;			
		(7) The potential for deposition or migration of waste constituents into subsurface physical structures, and into the root zone of food chain crops and other vegetation;			

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
		(8) The potential for health risks caused by human exposure to waste constituents; and (9) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structure caused by exposure to waste constituents; (b) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water or wetlands or on the soil surface considering; (1) The volume and physical and chemical characteristics of the waste in the unit; (2) The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing migration; (3)The hydrologic characteristics of the unit and the surrounding area, including the topography of the land around the unit; (4) The patterns of precipitation in the region; (5) The quantity, quality, and direction of ground water flow; (6) The proximity of the unit to surface waters; adverse effects on human health or the environment; considering:			

TABLE 1 (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
		(7) The current and potential uses of nearby surface waters and any other water quality standards established for those surface waters;			
		(8) The existing quality of surface waters and surface soils, including other sources of contamination and their cumulative impact on surface waters and surface soils;			
		(9) The patterns of land use in the region;			
		(10) The potential for health risks caused by human exposure to waste constituents; and			
		(11) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.			
		(c) Prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering; (1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for the emission and disposal of gases, aerosols and particulates;			
		(2) The effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to the air;			

TABLE (continued)
ARARs FOR SAND CREEK OU5
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment	Applies to Alternative
State ARARs					
		(3) The operating characteristics of the unit;			
		(4) The atmospheric, meteorologic, and topographic characteristics of the unit and the surrounding area;			
		(5) The existing quality of the air, including other sources of contamination and their cumulative impact on the air;			
		(6) The potential for health risks caused by human exposure to waste constituents; and			
		(7) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.			
Colorado Air Quality Control Act	5 CCR 1001-9	Establishes regulations to control emissions of VOC's (new and existing sources).	Yes/No	Apply reasonably available control technology (RACT) in ozone non-attainment area.	#2, 3, 4
	5 CCR 1001-5, Reg. 3, Section II	File APEN including estimation of emission rates.	Yes/No	Applies to all sources including existing unless specifically exempt.	#2, 3, 4
	5 CCR 1001-5, Reg. 3, Section IV.D	Source cannot cause an exceedance in any attainment area of any NAAQS.	Yes/No		

SAND CREEK INDUSTRIAL SUPERFUND SITE
OPERABLE UNIT NO. 5
COMMERCE CITY, COLORADO
RESPONSIVENESS SUMMARY
September 1990

This community relations Responsiveness Summary for Operable Unit No. 5 (OU5) of the Sand Creek Industrial site contains the following sections:

A. Overview. The overview briefly describes the site and summarizes the public's major comments on EPA's Feasibility Study (FS) and preferred alternative for OU5.

B. Summary of Community Involvement. This section gives a history of EPA's community relations activities at the site.

C. Summary of Comments Received During Public Comment Period. This section categorizes oral and written comments received concerning the FS and EPA's preferred alternative, and provides EPA's responses to those comments.

D. Remaining Concerns. This section describes concerns about the FS and tells how EPA will address them.

E. Previous Community Relations Activities at the Site. This table lists by chronological order the community relations activities that have occurred to date.

A. OVERVIEW

The Sand Creek Industrial site is located in Commerce City, city north of Denver, Colorado. The site and surrounding area are primarily occupied by

trucking firms, petroleum and chemical supply/production companies, warehouses, and small businesses. There is a small residential population in the study area and the area adjacent to the northeast border of the site.

The site contains the following fou. nown potential source areas, all of which are now inactive: the Oriental Refinery, the Colorado Organic Chemical (COC) property, the L.C. Corporation acid pits, and the 48th and Holly Landfill. Contaminants found on the site include pesticides and herbicides, volatile organic compounds (VOCs), and arsenic. To expedite the study and cleanup of the contaminated areas, EPA has divided the Sand Creek site into six operable units. The operable units were established based on the presence of different types of contaminants or contaminated media, different source areas, and/or physical constraints. This responsiveness summary presents comments on EPA's FS and the preferred alternative for cleaning up contaminated soils in Operable Unit No. 5 (OU5), which consists of the surface soils contaminated with pesticides and metals found in the vicinity of the adjacent Colorado Organic Chemical plant property (COC), the Gallagher property (former Oriental Refinery), and the Colorado and Eastern Railroad property.

Comments were received from the City of Commerce City, the original owner of the COC property, a Trust set up by the owner, the State of Colorado and a small number of individuals present at the public meeting. The majority of the comments were focused on the issues of permanency of the cleanup and any land use restrictions.

B. SUMMARY OF COMMUNITY INVOLVEMENT

Community relations activities for the Sand Creek Industrial site began in April 1985, when EPA distributed an introductory fact sheet to residents, businesses, and agencies in the area. The fact sheet described the site and explained their Superfund process, with emphasis on the RI/FS. Following the distribution of the fact sheet, EPA attended a public meeting organized by Citizens Against Contamination, a local group concerned about the site, and compiled a list of people who owned property on the site.

EPA mailed a second fact sheet in November 1985. Written in question-and-answer format, this fact sheet provided information typically requested during investigation and cleanup of hazardous waste sites. That same month, EPA also provided a report on water contamination for a second public meeting held by the Citizens Against Contamination organization.

In January 1986, EPA contacted property owners and Commerce City officials to keep them informed of activities at the site. In the spring, EPA prepared a photo display illustrating the RI/FS process.

A Remedial Investigation report describing the extent of contamination within the COC area was released for public review in March 1988. In May 1988, EPA contacted property owners to obtain permission to sample and monitor soils on those properties.

In October 1988, EPA met with Commerce City officials to keep them informed of plans for the site. The Commerce City representatives also provided their reactions to the cleanup methods being considered.

In January 1989, the FS was completed and a remedial alternative was chosen. EPA took several measures to announce the choice and to seek comments and questions from the public. First, EPA made copies of the FS Report available to the public in the Adams County Public Library, the Colorado Department of Health, and EPA's own library in downtown Denver. At the same time, EPA mailed its third fact sheet, which described the Proposed Plan as well as four other remedial alternatives that had been evaluated. Third, EPA announced a public comment period during which people were invited to submit comments and questions. The comment period originally ran from January 13, to February 13, but at the request of some commentators, EPA extended the period to February 22. Fourth, EPA conducted a public meeting on January 31 to describe the results of the RI/FS and answer questions from the public. EPA published a press release and a public notice in each of the Commerce City newspapers, The Commerce City Sentinel and The Commerce City Beacon, announcing all of these activities.

EPA made copies of the FS Addendum report available to the public and mailed its fourth fact sheet describing the new proposed plan. The remedy selected in the new proposed plan included: excavation and off-site incineration of approximately 1,000 cubic yards (CY) of highly HOC-contaminated shallow (<5 ft) soils; vacuum extraction of the volatile organic compounds in the subsurface soils above the ground-water table; demolition and off-site disposal of the contaminated tanks and buildings; and either bioremediation or soil washing for the surface soils contaminated with HOCs with the goal of returning the site to residential use. It was proposed that excavation and off-site disposal of the contaminated surface soils be retained as a contingency remedy, since the implementation of bioremediation and/or soil washing depended upon the results of treatability studies to be performed subsequent to a Record of Decision. An absence of proven bioremediation and/or soil washing results on soils contaminated with similar compounds further warranted retention of the off-site disposal option.

EPA announced a public comment period in effect from July 19, through August 21, 1989 during which the public was invited to submit comments and questions regarding the FS Addendum and the new proposed plan. EPA conducted another public meeting on August 1, 1989, to describe the proposed plan and answer questions from the community. Press releases and public notice were again published in The Commerce City Sentinel and The Commerce City Beacon announcing all these activities.

Only the City of Commerce City responded in writing, and there was limited comment on the selected remedy during the August 1 public meeting. The primary concern of the City of Commerce City was that the COC property be remediated to residential-use standards. A Record of Decision was subsequently prepared which addressed only the highly contaminated soils. Remedial design of OU1 was initiated following ROD signature. Samples of the COC area were collected during design stages. Analytical results from that sampling period were evaluated in an endangerment assessment prepared for OU5. New action levels and soil volumes were calculated using all the OU5 data.

Remedial alternatives previously identified and screened for the COC area through the initial RI/FS (CDM, 1989) and Feasibility Study Addendum for OU1 (SAIC, 1989) were utilized in the FS for OU5. Costs of selected alternatives were revised based on the refined soil volume information. A proposed plan and FS for OU5 were released to the community for public comment in July 1990.

C. SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

Comments raised during the public comment period on the FS and proposed plan are summarized below. The comment period was held from July 27 to August 27, 1990. The comments are categorized by relevant topics.

Remedial Alternative Preferences

Each of the commentors on the FS and proposed plan expressed a preference for specific alternatives.

Comment 1. The City of Commerce City feels that Alternative No. 4, on-site soil washing with off-site disposal of residuals, would be an acceptable cleanup alternative if specific concerns are addressed. The city's concerns included implementing an air monitoring and dust supervision program during remediation, a restriction of access during remediation and a notification plan for the city should any threat to public health and safety occur.

EPA Response: EPA's policy is that applicable and/or relevant and appropriate Federal and State laws be applied to Superfund remedies to ensure adequate protection of public health, welfare and the environment. In this case, specific laws regarding air emissions and particulates will apply during remediation activities. The requirements outlined on these laws will be met. The ARARs are delineated in Appendix B of the Record of Decision. Additionally, site access will be restricted to those involved with the remediation effort.

Comment 2. The City feels that alternative #3 off-site disposal would not assure a permanent solution to the hazards at the site due to EPA's inclusion of "institutional controls" in the proposed plan.

EPA Response: EPA believes that institutional controls will not alter the City's planned use of the area. EPA intends to return the site to industrial use based on the City's Comprehensive Plan for 1985 to 2010 and the historical use of the area. Implementation of land use restrictions will require the cooperative efforts of State, County, and City official to be successful.

Comment 3. Comments submitted by Holland & Hart on behalf of its client First Interstate Bank, trustee for the Philip C. Mozer Trust indicate that they believe capping is the more appropriate remedial alternative for the soils at the COC site. Holland & Hart believe that capping would be a permanent remedy, is cost effective and protective of the environment and human health. Holland & Hart do not believe the information presented in the FS on the soil washing alternative is sufficient to allow full development and evaluation of the treatment technology, to support remedial design, and to reduce the cost and performance uncertainties for this treatment alternative to acceptable levels.

EPA Response: EPA believes that in spite of the significant uncertainties associated with soil washing, it is the best alternative given the preference for treatment under CERCLA and the permanency of the remedy. EPA believes that capping is not acceptable because it does not reduce toxicity, mobility, or volume of the waste, and is not a permanent remedy. EPA plans to further determine the effectiveness, implementability and cost associated with soil washing through on-site pilot testing. Should the pilot test indicate that soil washing would not be appropriate for full scale remediation of the site, the alternative for off-site disposal will be implemented. Holland & Hart did not comment on the off-site disposal alternative.

Comment 4. Holland & Hart believe that costs associated with capping are too high and question the need for run-off controls.

EPA Response: EPA has included long-term maintenance and operation costs to the capping alternative since it would likely fail without proper operation and maintenance. A drainage system of some type is necessary for run-off even in a semi-arid environment.

Technical Questions/Concerns Regarding Remedial Alternatives

Comment 5. Some technical comments regarding the actual risks posed by the contamination of the site were made during the public meeting by a few individuals. Mr. Philip Mozer read a prepared speech concerning site risk. The speech is included in the appendix to this Responsiveness Summary along with the other comment letters.

EPA Response: EPA conducted a health risk assessment following the methodology of the EPA Risk Assessment Guidance. This methodology has been used on CERCLA sites nationwide. The methodology takes into account the toxicity of the contaminants, the exposure frequency and duration, the pathways of exposure and the potential exposure receptors. A risk level is then calculated to determine an acceptable contamination range for an overall site risk of 10^{-4} to 10^{-6}. The exposure scenarios which Mr. Mozer questioned are further explained in the risk assessment as to their relevancy in the risk calculations. Since the comments raised were of a general nature and discuss issues created in the endangerment assessment, the commentor will be will be directed to that document.

Comment 6. A question was raised about the use of bio-remediation as a viable alternative.

EPA Response: EPA has conducted a preliminary study on the use of bio remediation. It became apparent through this effort that the technology was not developed to a point of implementation in a treatability study or remedial

action. Further discussion of EPA's efforts to evaluate bio remediation can be found in the OU5 FS, pg 3-2.

D. REMAINING CONCERNS

Comment 7. Mr. David Busby, the Mayor of Commerce City commented on future land use and who would be liable for the property in the future.

EPA Response: According to CERCLA, for as long as the site is on the NPL and possibly longer, the liability is open.

Comment 8. Mr. Reis from the Sierra Club asked about a determination as to the extent of ground water contamination.

EPA Response: EPA indicated that the groundwater contamination problem has not yet been fully investigated and will be on the agenda for next year.

Comment 9. Mayor Busby also asked about pesticide migration in groundwater and dust contact during remediation.

EPA Response: There has not been evidence of a significant amount of groundwater contamination from the pesticides at the COC property. The pesticides are not very mobile through the soil and tend to adsorb to the soil particles. The greater threat is from direct contact with the soil. Concerning dust control during remediation, EPA will implement dust control measures which meet State requirements.

E. COMMUNITY RELATIONS ACTIVITIES

- April 1985 - EPA mailed an introductory fact sheet about the site to residents, businesses, agencies, and others (including PRPs) on the mailing list.

- August 27, 1985 - EPA met with PRPs.

- September 1985 - EPA participated in a public meeting organized by Citizens Against Contamination.

- October 1985 - EPA developed a comprehensive list of property owners' names and addresses.

- November 1985 - EPA mailed another fact sheet providing answers to questions typically asked during investigation and cleanup of hazardous waste sites.

- November 1985 - EPA provided information on water contamination for a public meeting organized by Citizens Against Contamination.

- January 1986 - EPA contacted property owners to inform them of site activities. EPA also contacted public officials.

- April 1986 - EPA prepared photos for use in a display illustrating the RI/FS process.

- February 1987 - EPA updated its list of property owners.

- April 1987 - EPA surveyed residents about water use habits.

- November 1987 - EPA contacted residents and businesses to identify and check the status of methane venting systems near the site.

- May 1988 - EPA requested and received access permission for soil sampling on certain properties.

- October 24, 1988 - EPA made a presentation to Commerce City officials to inform them of progress and plans at the site, and to obtain their reactions to the potential remedial alternatives developed during the Feasibility Study (FS).

- January 6, 1989 - EPA mailed a third fact sheet describing the Proposed Plan for OU1. Also on the same date, EPA made the FS for OU1 available to the public at the information repositories listed in the Proposed Plan.

- January 1989 - EPA issued notice of a public comment period on the FS and Proposed Plan.

- January 31, 1989 - EPA held a public meeting at Commerce City Hall to describe the results of the RI/FS and to respond to questions and comments. Approximately 16 people attended, not including EPA or contractor personnel.

- January-February 1989 - EPA extended its public comment period on the Proposed Plan from January 13-February 13 to January 13-February 22, as requested by some PRPs.

- March-August 1989 - EPA re-evaluated alternatives and issued an Addendum to the FS. A new Proposed Plan was issued in July 1989. The public comment period extended through mid-August. A public meeting was held August 1, 1989.

- A Record of Decision was prepared in September 1989 which addressed highly contaminated soil, VOC's, and structures.

- An FS and proposed plan for OU5 was prepared and released for public comment in July 1990. A public meeting was held August 9, 1990. The public comment period extended through August 27, 1990.

CITY OF COMMERCE CITY
COLORADO
people & industry together

Office of the
Mayor

August 16, 1990

Mr. Brian Pinkowski
Remedial Project Manager
U.S. Environmental Protection Agency
999-18th Street
Denver, Colorado 80202

Re: Commerce City's Comments on EPA's Proposed Remediation Plan for Operational Unit 5 at Sand Creek Superfund Site

The City has reviewed the preferred remedial proposal by EPA for "cleaning up" Operable Unit 5 at the Sand Creek Superfund site and provide the following comments for your review:

1. The City feels that Alternative No. 4, EPA's preferred plan of On-Site Soil Washing with Off-Site Disposal of Residuals, would be an acceptable and viable cleanup alternative, if the following areas/concerns are addressed:

   a. A reliable and effective air monitoring program should be instituted on the site to ensure that surrounding areas/populace are not exposed to hazardous materials as a result of the remediation process.

   b. An effective dust suppression program should be developed and implemented to ensure that the surrounding area and populace is protected from fugitive emissions.

   c. The operable unit should be fenced off to restrict access during remedial activities.

   d. The City should be immediately notified of any threat to public health and safety which occurs or may develop during the course of remediation of the unit.

The City also has reviewed EPA's proposal to implement Alternative No. 3 (Off-Site Landfill Disposal and "Institutional Controls") if pilot tests reveal that soil washing is ineffective. The City has the

following reservations/comments concerning the implementation of Alternative No. 3:

1. The City feels that essentially, the plan would not assure a permanent solution to the hazards at the site, as indicated by the EPA's inclusion of "institutional controls" in the plan. Why would any type of controls be necessary if the remediation truly was a permanent solution? It is felt that "institutional controls" are not in keeping with SARA's intent to arrive at permanent solutions to Superfund sites.

2. The City believes that "institutional controls" carry with them the stigma of possible future health risks and continuing legal and economic problems.

3. EPA should re-evaluate/investigate other remedial methods (such as vitrification, off-site incineration, or bioremediation) to effect a cleanup of the site. It is believed that through the use of these or other types of treatment technologies, a feasible cleanup plan can be developed, eliminating the need for restricted "institutional controls."

As Mayor of Commerce City, I would like to take the opportunity to thank you and your organization for past and future efforts to successfully remedy the contaminated soils at the Sand Creek site. Please feel free to contact me or the City Manager, Steve Crowell, if you need additional information.

Sincerely,

David R.D. Busby
Mayor

cc: Jane O. Russo
Community Relations Coordinator

SAIC

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August 31, 1990

VIA HAND DELIVERY

Mr. Brian Pinkowski
Remedial Project Manager
U.S. Environmental Protection Agency
999 Eighteenth Street
Suite 500
Denver, Colorado 80202

Re: Sand Creek Industrial Superfund Site
Comments on Feasibility Study and Proposed Plan,
Operable Unit No. 5, Colorado Organic Chemical Soils

Dear Mr. Pinkowski:

These comments on the Feasibility Study and Proposed Plan for operable unit no. 5 at the Sand Creek Industrial Superfund Site are submitted by Holland & Hart on behalf of its client First Interstate Bank, trustee for the Philip C. Mozer Trust. This letter discusses our general comments regarding the Feasibility Study and Proposed Plan for operable unit no. 5 and is not intended to address all of our concerns related to these documents. Many of the comments we made related to the Draft Feasibility Study for operable unit no. 1 are equally applicable to operable unit no. 5 and are incorporated by reference into these comments. A copy of our comments on operable unit no. 1 dated February 13, 1989 are attached for your convenience.

As with operable unit no. 1, we believe capping is the more appropriate remedial alternative for the soils at the Colorado Organic Chemical ("COC") site, which includes soils within operable unit no. 5. EPA recognizes in the operable unit no. 5 Feasibility Study ("FS") that soil contamination is limited to a depth of 3 to 5 feet and "the contaminants of interest have relatively high adsorption potential and consequently will tend to strongly adhere to soil

particles." FS, page 2-7. EPA's own evaluation of the ability of the capping alternative to reduce toxicity, mobility or volume states:

> A cap reduces the mobility of the contaminated media and significantly reduces the risks of dermal contact, inhalation and incidental ingestion of soil particles. Capping also reduces the potential for leaching of soil contaminants into the ground water by providing an impermeable layer over the contaminated soil, which prevents surface water from infiltrating below the cap. FS, page 4-6.

These soils contain low concentrations of the constituents of concern and the constituents are fairly immobile, conditions which are favorable to a capping remedy.

Further, EPA has identified the potential for exposure through skin contact or the ingestion of the soil as the greatest risks posed by these soils. Capping clearly eliminates both of these potential exposure pathways in a more cost effective manner. Therefore, a cap would be protective of not only the environment but also of human health.

EPA has apparently not considered our previous comments related to implementation of a capping alternative. A cap is a permanent remedy and maintenance need not be as continuous, time-consuming or expensive as implied by the FS report. The costs associated with placement of a cap have been overestimated by requiring extension of the cap horizontally fifty feet around all of the edges, incorporating a drainage layer which is not necessary due to our semi-arid environment, and requiring annual operating costs of $70,000. Consequently, EPA has failed to realistically evaluate the viability of a capping remedial action.

Of significant concern to the Trust is EPA's selection of alternative 4, on-site soil washing, as the preferred remedial alternative. There is no justification or basis in the FS report for selecting this alternative. One of the reasons operable unit no. 5 was established was to further evaluate the soil washing alternative that had been considered in the operable unit no. 1 Feasibility Study report. That report identified certain objectives that

would be evaluated in a treatability study which included providing sufficient data to allow full development and evaluation of the treatment technology, to support remedial design, and to reduce the cost and performance uncertainties for this treatment alternative to acceptable levels. Operable unit no. 5 has failed to accomplish that task; the results of the soil washing treatability tests and the information provided in the FS simply do not indicate that soil washing is a viable alternative. In fact, "final results have not been tabulated" and EPA has made "no quantitative determination of effectiveness" of the soil washing treatability study. FS, page 3-6. In spite of the significant uncertainties, soil washing was still selected by EPA as the preferred alternative.

Further, it is not possible to evaluate the cost estimates presented in the FS due to the limited documentation and information. It appears there is some inconsistency in the costs; in particular, some of the costs for capping appear to be inflated while costs for the soil washing alternative may be underestimated. The FS report states costs for soil washing are "highly speculative" (FS, page 4-21), which makes it extremely difficult to determine if soil washing is a cost effective alternative, a determination required under the Superfund Amendments and Reauthorization Act ("SARA"). In addition, EPA exposes its bias against capping when it states that capping could be "effective in containing the contaminated soil indefinitely" (FS, page 4-8) but then concludes in Section 5 of the FS that capping is not a permanent remedy. These factors result in an incorrect determination that the soil washing alternative is cost effective because its advantages outweigh its "slightly" higher costs when compared to alternative no. 2, capping.

There is also limited information regarding implementation of the capping alternative. The explanation is simply that soils are to be excavated and relocated "on-site". We object to the placement of any contaminated soils from other locations on COC property, if that is EPA's intent.

Capping is the more cost effective and protective remedial alternative and should be the alternative implemented at the COC site. Capping meets the requirements of SARA, is more cost effective, and is protective of human health and the environment. Further, the soil washing alternative selected by EPA is simply not supported by the

FS, is inappropriately evaluated in the FS and should not be implemented at this site.

Please call me if you have any questions regarding these comments.

Sincerely,

Cynthia S. Leap

Cynthia S. Leap
for Holland & Hart

cc: William Clemmens, Esq.
Mr. Hal Wofford
Susan E. Brown, Esq.
Mr. John Corkle
Paul D. Phillips, Esq.

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February 13, 1989

BY HAND DELIVERY

Mr. Tony Medrano
Remedial Project Manager
EPA Region VIII
999 18th Street
Suite 500
Denver, Colorado 80202-2405

Re: Comments on Feasibility Study,
Operable Unit No. 1,
Colorado Organic Chemical Soils
Sand Creek Industrial Site
Commerce City, Colorado

Dear Mr. Medrano:

Holland & Hart submits the following comments on behalf of its client First Interstate Bank, trustee for the Phillip C. Moser Trust. We are providing these general comments on the draft Feasibility Study for Operable Unit No. 1 which includes the Colorado Organic Chemical ("COC") site. We have focused our comments on the preferred remedial alternative selected by EPA, and therefore our comments are not intended to address detailed concerns related to the draft Feasibility Study.

It is our understanding, based on conversations with you, that Alternative Number 4 (off-site incineration and disposal at a Subtitle C landfill) was the preferred alternative presented by EPA at the public meeting on January 31, 1989. We object to the selection of Alternative Number 4 and recommend Alternative Number 2 (capping) because it is more consistent with the Superfund Amendments and Reauthorization Act ("SARA") requirements, and is equally protective of human health and the environment. The draft Feasibility Study recognizes that capping is effective and reliable, can be easily implemented and is a common remedial alternative at other Superfund sites. Capping is particularly effective where the substances are immobile, as are pesticides and inorganic arsenic, which have been identified at the COC property as the constituents of concern.

The technology and alternative evaluations performed by EPA in the draft Feasibility Study endorse the capping remedial alternative because it has been implemented successfully at a number of other hazardous waste sites (including Superfund sites), provides an immediate and highly effective remedy, is easily constructed with minimal disturbance to the soil and results in a significantly reduced risk of exposure to workers and the public during implementation. Capping is also the most cost-effective alternative, meets the Applicable and Relevant or Appropriate Requirements ("ARARs") and can provide permanent remediation.

Because the constituents of concern are extremely immobile there is little potential for any impact to ground water quality. The executive summary states that the risk assessment regarding ground water found the minimum travel time for any of the contaminants to reach ground water is over 2,000 years. This number was calculated without factoring in a cap, which would significantly reduce the travel times by preventing surface water from infiltrating below the cap. To select Alternative Number 4 as the preferred alternative because it eliminates the possibility of ground water contamination places undue emphasis on the potential for ground water contamination. Test results confirm that the pesticides and arsenic have not migrated to either the shallow or the deep aquifers.

There are few, if any, disadvantages to capping. One disadvantage identified by EPA is the potential restriction to future land use due to disturbance of the cap. However, capping does not restrict all land uses. For example, foundations for buildings could easily be constructed on pads of fill on top of the cap. The only use restrictions that would be necessary is to prevent excavation of the cap. Another disadvantage identified by the draft Feasibility Study is the possible settlement and subsidence of the cap materials. Settlement and subsidence are only of concern when a cap is placed over compressible and unconsolidated materials. This is not the situation at the CCC property, where the cap would be placed over native soils which would eliminate the potential for significant settling. Erosion can be avoided by grading, planting native vegetation and installing run-off and run-on controls.

Further, any concern regarding the horizontal migration of water in the vadose zone below the cap could be remedied by keying in the edges of the cap (including the geomembrane) to a depth of five feet around the contaminated zone. This method is more cost effective than extending the cap fifty feet around the edges.

Alternative Number 4 is an inadequate and inappropriate remedy because it does not meet SARA requirements. Only 1% to 3% of the contaminated soils would actually be incinerated under this alternative. The remaining 97% to 99% of the contaminated soils would be sent off-site without treatment. Alternative Number 4 is also three times the cost of Alternative Number 2 and allows workers and the public to be exposed to potentially harmful contaminants during excavation, transportation and redisposal. Clearly, Alternative Number 4 does not satisfy the SARA requirements for reduction of toxicity, mobility or volume, long-term effectiveness and permanence, implementability and cost-effectiveness.

EPA assumes certain materials, including soils, buildings, foundations and tanks are "hazardous waste" without any basis for such a determination. Because it is assumed that the buildings, foundations and tanks are "hazardous waste," EPA proposes demolishing the structures and disposing the materials in a Subtitle C landfill. The trustee strongly objects to the demolition of any buildings, foundations, tanks or other structures. EPA has not identified any need or provided any justification to remove the structures and such additional costs are unwarranted. We do not believe the buildings, foundations and tanks are "hazardous waste;" to the contrary, they are usable structures having economic value.

EPA has selected a Subtitle C disposal facility (hazardous waste facility) for disposal of all buildings, foundations and tanks that are demolished instead of a Subtitle D disposal facility (solid waste disposal), in spite of the $190 difference in cost per cubic yard. This cost difference is rationalized by EPA based on savings in time and ease of implementation. The time saved by Subtitle C disposal is four days; costs are three to four times greater. It is incomprehensible how EPA could justify such an excessive expenditure of money in order to save four days. EPA assumes the waste would have to be delisted but does not explain why these wastes are considered "listed."

Another reason EPA advances in the draft Feasibility Study for disposal at a Subtitle C facility is the reluctance of Subtitle D facilities to accept waste from Superfund sites. The draft Feasibility Study does not suggest that EPA has contacted or even attempted to contact any Subtitle D facility to inquire as to whether they are willing to accept the wastes associated with this operable unit. The decision to use a Subtitle C disposal facility is totally unfounded. In addition, EPA anticipates disposing of all materials and equipment used at the site

as hazardous wastes when materials and equipment used at Superfund sites are routinely decontaminated and reused.

While we advocate implementation of Alternative Number 2, we object to the placement of contaminated soils from other locations on COC property. Specifically, we strongly object to the proposal to place 5,000 cubic yards from Subunit 1B on COC property. We do not believe EPA has the authority to require the trustee to permit the disposal of hazardous substances on its property.

In conclusion, Alternative Number 2, capping, meets the requirements of SARA, is more cost-effective, is protective of human health and the environment, and (with the qualifications noted above) is the remedy that should be implemented at the COC site.

Please feel free to call if you have any questions.

Sincerely,

Cynthia S. Leap

Cynthia S. Leap
for HOLLAND & HART

CSL:slp
cc: Hal R. Wofford
Paul D. Phillips, Esq.
Phillip C. Mozer
Susan McIntosh, Esq.

STATE OF COLORADO

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Roy Romer
Governor

Thomas M. Vernon
Executive Director

August 20, 1990

Mr. Brian Pinkowski
Environmental Protection Agency - 8HWM-SR
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Re: Sand Creek Feasibility Study for OU-5

Dear Brian:

I have reviewed the Feasibility Study for OU-5 and have the following comments.

Page 2-5, 2.1.4. The proposed cleanup levels of all the contaminants of concern need to be included in the FS. The level should be listed for both industrial and residential uses. A discussion is also needed detailing how the industrial vs residential senario varies and why remediation for each use entails different soil volumes.

Page 3-6. Tables are needed of removal effectiveness for both OCP's and metals. This section also needs to be updated to give projected waste material volumes after soil washing when available.

Page 4-14. The State Engineers Office has communicated that they have no ability to implement institutional control to limit well drilling in contaminated areas of ground water. Also, the SACWSD has not been consistent in requiring relenqushiment of well water rights upon application for water service. This requirement was only made in the northern area of OU-2 of Chemical Sale. Because of these problems, this paragraph needs to be revised to state that continue usage of well water may exist. However, a survey will be undertaken to determine the number of well users, if any in.

ARARS's

An appendix need to be included in this FS with the complete listing of ARARS's. I have reviewed the ARARS's that are included in the original FS by CDM. There are several air pollution regulations that were not included in these ARARS's. I am enclosing a table giving these new ARARS's.

LANDBAN. A discussion of landban requirements was included in the original FS for the site. This discussion need to updated in this FS with detail as to how this OU complies with the landban requirements.

State Acceptance

Alternative No. 1. The State finds this alternative unacceptable due to continued exposure to the public, potential contamination of surface and ground water, and the lack of usability of the site.

Alternative No. 2. The State is not in favor of this alternative because the contaminated soil will remain onsite and require long-term maintenance of the cap to ensure protection of public health and containment of the waste. The land use will be excessively restrictive.

Alternative No. 3. The State finds this alternative acceptable as it fullfills all the remedial objectives.

Alternative No. 4. This alternative is preferred by the State because if fullfills all the remedial objectives and in addition minimizes waste. As the projected cost of this alternative is speculative, the State will reevalauate this alternative as compared to alternative No. 3 when new cost figures become available.

Enviromental Epidemiology is currently reviewing the health risk assessment. I hope to have comments to you by August 30.

Please call if you need clarification on any of these issues.

Sincerely,

Candace Thompson, Project Manager
Hazardous Materials and
Waste Management Division

CT:lh:7690K

STATE OF COLORADO
SAND CREEK OU-5 ARARS
9/15/90
FS REVIEW

STATUTORY AUTHORITY	STATUTORY CITATION	REGULATION	REGULATION CITATION	DESCRIPTION OR REQUIREMENTS	COMMENTS	APPLICABLE/ RELEVANT AND APPROPRIATE/ TO BE CONSID.
Colorado Air Quality Control Act	CRS 25-7-101 TO -512	Regulation No. 7	5 CCR 1001-9	Establishes regulations to control emissions of VOC's (new and existing sources)	Apply Reasonably Available Control Technology (RACT) in ozone non-attainment area	APPLICABLE
Colorado Air Quality Control Act	CRS 25-7-101 TO -512	Regulation 1, Stationary Emissions Source	5 CCR 1001-3, Reg 1, Sec. II.A.1	Comply with opacity limitations	<20 % opacity emitted, specific sources may have other limitations	APPLICABLE
Colorado Air Quality Control Act	CRS 25-7-101 TP-512	Regulation 3, Stationary Emissions Source	5 CCR 1001-5, Reg 3, Sec. II	File APEN including estimation of emissions rates	Applies to all sources including existing unless specifically exempt	APPLICABLE
Colorado Air Quality Control Act	CRS 25-7-101 TO -512	Regulation 3, Stationary Emissions Source	5 CCR 1001-5, Reg 3, Sec. IV.D	Source cannot cause an exceedance in any attainment area of any NAAQS		APPLICABLE