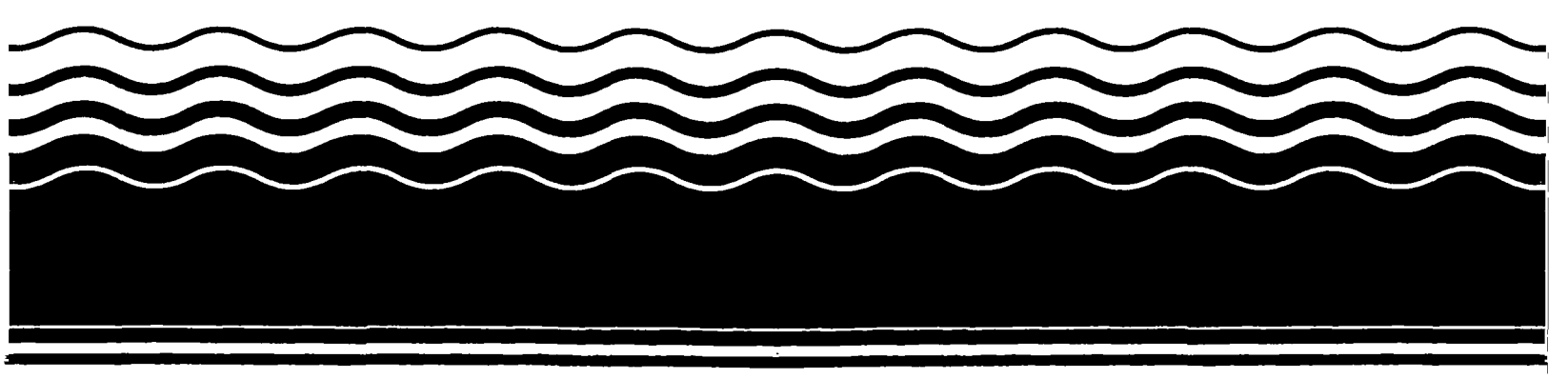
PB98-963150
EPA 541-R98-176
March 1999

EPA Superfund
Explanation of Significant Difference for the Record of Decision:

Lowry Landfill
Aurora, CO
10/24/1997



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

February 12, 1998

Subject: Responsiveness Summary for the Second Explanation of Significant Differences, Lowry Landfill Superfund Site

Dear Sir/Madam:

Please be advised that there is an error within Attachment E (Technical Evaluation of Proposed Ground-Water Treatment and Disposal Alternatives) of the above-referenced document. The mistake was recently brought to my attention by the Citizens for Lowry Landfill Environmental Action Now (CLLEAN). The evaluation table, which summarizes the rankings of the two cleanup alternatives, failed to include numerical values for State Acceptance and Community Acceptance.

This was an unintentional mistake and I take complete responsibility for the mixup. Enclosed is a copy of the table as it should have appeared in Attachment E. Copies of this errata sheet are being mailed to all recipients of the Responsiveness Summary.

The corrected ratings for State Acceptance and Community Acceptance are now consistent with the existing text on page 8 of Attachment E of the Responsiveness Summary. I believe the existing text adequately reflects the community's stated opposition to Alternative 1 and preference for Modified Alternative 2B.

If you know of anyone who may have previously received a copy of the Responsiveness Summary but did not receive the enclosed, corrected table, please either pass on a copy to them or have them contact me. If you have any additional questions, I can be reached at 1-800-227-8917 (extension 6724) or 303/312-6724.

Sincerely,

Marc E. Herman
Remedial Project Manager
Lowry Landfill Superfund Site

Enclosure

EPA Assessment Criterion	Alternative 1	Modified Alternative 2B
1. Overall Protection of Human Health & the Environment	5	5
2. Compliance with ARARs	5	5
3. Long-Term Effectiveness and Permanence	3	2
4. Reduction of TMV Through Treatment	4	3
5. Short-Term Effectiveness	3	3
6. Implementability	5	3
7. Cost	4	2
8. State Acceptance	5	4
9. Community Acceptance	1	5
Total Score	35	32

Note: 5 = completely achieves the objectives of the criterion; 1 = minimally achieves the objectives of the criterion

Responsiveness Summary for the Second Explanation of Significant Differences Lowry Landfill Superfund Site

ARCS Contract No. 68-W6-0036
EPA Work Assignment No. 016-ROBF-0808
CH2M HILL Master Project No. 139814
DCN 97-456

Volume I of II

Prepared for

U.S. Environmental Protection Agency

Prepared by

CH2M HILL

October 1997

Preface

Preface
(How to Find Your Letter)

More than 400 letters with comments were submitted to the United States Environmental Protection Agency (EPA) during the public comment period on the Lowry Landfill Superfund Site Second Explanation of Significant Differences. This Responsiveness Summary document provides responses to all of the comments and questions received in those letters and other communications during that period. This preface explains how to find a particular letter within this two-volume document.

This document is composed of the following two volumes:

Volume I

- Preface
- Executive Summary
- Comment Letters Index
- Acronyms and Abbreviations
- Responses
- References
- Glossary
- Attachments

Volume II

- Preface
- Comment Letters Index
- Copies of the original comment letters

To find a particular letter in this document, go to the Comment Letters Index that follows the Executive Summary in Volume I and this Preface in Volume II and search for the last name of the person who signed the letter. The Comment Letters Index is arranged alphabetically by the last name of the persons who signed the letters. In some cases, signatures on some of the letters were not legible. Because other copies of the form letters were available, these illegible signatures are not included in the Comment Letters Index, but copies of the form letters with the illegible signatures are included in Volume II.

The Comment Letters Index is divided into three columns. The first column is arranged alphabetically by last name. The second column provides the page number in Volumn II where a copy of the original letter the person signed can be found. The third column provides the page number in Volume I where the responses to the letter(s) the person signed can be found. In some cases, the same person sent in more than one letter. In these instances, there are multiple page numbers listed in the second and third columns.

A number of questions repeated frequent themes. The Executive Summary presents general responses to these frequently asked questions.

Some of the responses in the document refer the reader to specific sections of the Executive Summary so that the response is complete. When a response says (see Executive Summary - Sludge/Biosolids), this means the reader is referred to the section in the Executive Summary with the heading "Sludge/Biosolids." Additionally, the Executive Summary contains an overview of the Lowry Landfill Superfund Site history and a description of the Publicly Owned Treatment Works option.

Upon receipt of all of the comments at the close of the public comment period, EPA and the Colorado Department of Public Health and Environment (CDPHE) carefully reviewed and evaluated each comment. Based on this review and thoughtful consideration, EPA and CDPHE developed a response to each comment. These responses are presented in Volume I.

Executive Summary

Executive Summary
Responsiveness Summary
for the
Lowry Landfill Superfund Site
Second Explanation of Significant Differences
October 1997

Introduction

In accordance with the requirements of the **Comprehensive Environmental Response, Compensation, and Liability Act**[1] of 1980, as amended (**CERCLA**), 42 U.S.C. 9601, et seq., and the **National Oil and Hazardous Substances Pollution Contingency Plan** (**NCP**), 40 C.F.R. Part 300, et seq., this responsiveness summary presents the response of the United States Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) to public comments received on the Second **Explanation of Significant Differences (ESD)**, dated March 1997. The comments were received during the public comment period that extended from March 24 through June 30, 1997. Community members submitted comments on the proposed changes to the **Record of Decision (ROD)** for the Lowry Landfill Superfund Site (Lowry Site or Site) in Arapahoe County, Colorado.

> The purpose of this executive summary is to provide:
>
> 1. An overview of the site history and status;
> 2. A summary of the approved changes in the Second ESD; and
> 3. Responses to the issues raised most frequently in the comments.
>
> Each comment is responded to in detail within the body of the Responsiveness Summary. To conserve paper, space, and money, copies of the complete Responsiveness Summary are available at the locations listed on the last page of this executive summary.

More than 400 written comments were received on the ESD in addition to the comments received during the public meeting held on April 2, 1997. All of these comments have been responded to in the Responsiveness Summary, which consists of this Executive Summary, Volume I, which contains the responses, and Volume II, which contains copies of the original letters.

The purpose of this executive summary is to provide an overview of the site history and status, a summary of the proposed and now approved changes in the Second ESD, and address the issues that were most frequently raised in the comments. More detail on each of the topics raised in this Executive Summary can be found in the responses to comments in Volume I. Each comment is responded to in detail in the body of the complete Responsiveness Summary.

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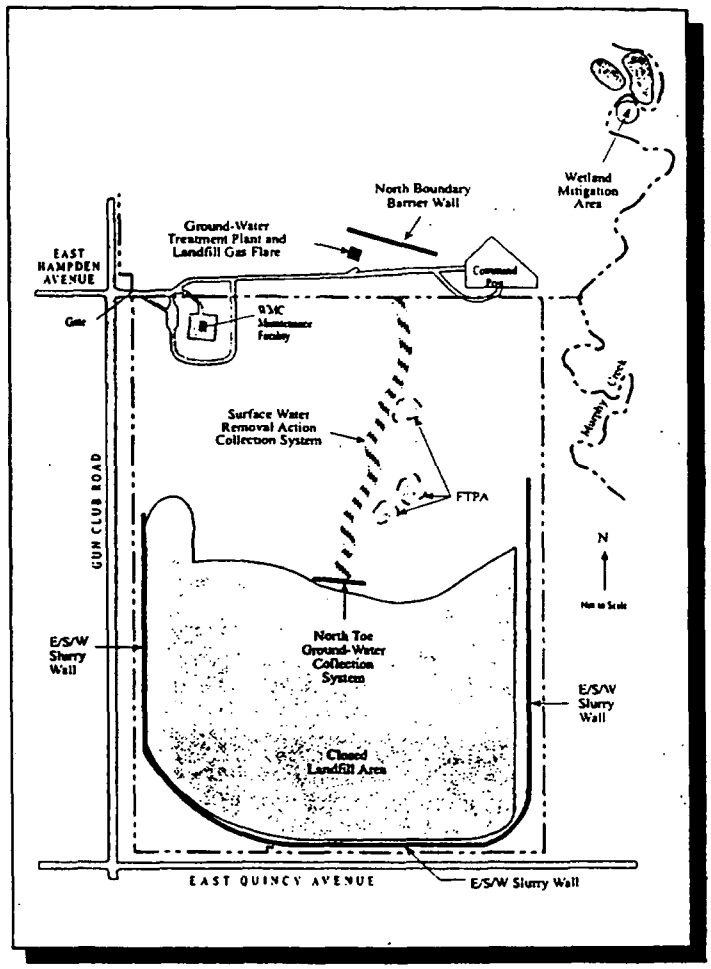
[1] Bolded terms are defined in the Glossary.

Contents

Summary of Site History and Contamination Problems

The Lowry Site is located northeast of the intersection of Quincy Avenue and Gun Club Road, approximately 15 miles east of the City and County of Denver (Denver), Colorado. In the late 1930s, Denver bought 60,000 acres of land (the Lowry Site comprises about 480 acres of this land) to attract an Army Air Corps Technical School to Denver. In 1939, the Denver City Council transferred the land to the Federal government. From about 1940 to 1962, the United States Air Force used the land as a bombing range. In 1964, the United States transferred portions of the bombing range back to Denver.



From 1966 until 1980, Denver operated a landfill at Section 6 on the Lowry Site, taking in liquid and solid household and industrial wastes. These wastes included **hazardous substances**, such as **volatile organic compounds** and **inorganics**. Organic compounds contain the element carbon. Examples of organic compounds include petroleum products, solvents, and pesticides. Volatile organic compounds are organic compounds that tend to evaporate easily. Inorganic compounds include metals (such as arsenic and selenium), chlorides, and sulfates.

Over 120 million gallons of liquid waste were disposed of at the Lowry Site, primarily using a practice known as "**co-disposal**." Some 75 unlined waste pits or trenches were dug to hold the mixed household and industrial wastes. In the southern half of the Lowry Site, the pits were filled with liquid wastes and then covered with 25 to 60 feet of household waste. The waste pits were about 15 to 30 feet deep, about 100 to 1,100 feet long, and about 50 to 150 feet wide. Over time, the liquids seeped out of the pits and mixed with the household waste and **ground water**. In the central part of the Lowry Site, the pits were filled with liquid wastes and household waste, then covered with 2 to 5 feet of soil and used tires. Over time, these liquid wastes seeped into the ground water and into

Unnamed Creek. Approximately 8 million tires were brought to the Lowry Site in the 1970s. These tires were later shredded and placed in a **monofill** onsite.

From 1969 until 1986, about 37 million gallons of **sewage sludge** were spread on 160 acres of land along the northern and eastern areas of the Lowry Site and mixed into the soils. After 1980, liquids collected in surface ponds onsite were injected in the same 160-acre area. Both the sewage sludge and the collected liquid contained hazardous substances.

The Lowry Site was placed on the National Priorities List (NPL) in September 1984. Studies performed prior to 1984 found contaminants in surface water and sediments, ground water, soils, and landfill solids. From 1984 to 1993, a series of **Remedial Investigations/Feasibility Studies** (**RI/FSs**) were conducted to find out how much and what types of contamination were at the Lowry Site. Also, the studies evaluated the potential threats to human health and the environment posed by the Site.

The main threats at the Lowry Site are posed by: landfill gas; waste-pit liquids; contaminated ground water; buried drums and their contents; and contaminated soils within the **former tire pile area (FTPA)**.

The Lowry Site ROD was issued by EPA and CDPHE on March 10, 1994, and contains the sitewide cleanup plans for the Lowry Site.

On November 18, 1994, EPA issued a Unilateral Order for **Remedial Design/Remedial Action (RD/RA** Order) to 34 Potentially Responsible Parties. The RD/RA Order directs these parties to develop a remedial design for the sitewide remedy and to perform the remedial action. Three of the parties (Denver, Waste Management of Colorado, Inc., [WMC] and Chemical Waste Management, Inc. [CWM]), referred to as **the Respondents to the RD/RA Order**, have reached agreements with 23 other parties to perform the RD and the RA on their behalf.

In August 1995, EPA and CDPHE issued the First ESD to clarify and correct some minor details of the remedy.

In March 1997, EPA and CDPHE proposed a second set of changes to the ROD, referred to as the Second ESD. These changes to the ROD resulted from new information that EPA and CDPHE received after issuing the ROD. The new information included the results of treatability studies performed by the Respondents and the potential impact of the construction of a sanitary sewerline about a half mile west of the Lowry Site.

Summary and Status of Selected Sitewide Remedy

The ROD states that contaminated ground water will be contained and collected using: the existing underground clay barrier wall and the Surface Water Removal Action collection system; underground bentonite slurry walls on the eastern, southern, and western boundaries of the Lowry Site; and a ground-water collection trench to be located at the northern boundary of the landfill mass. Contaminated ground water will be treated at the existing onsite treatment plant or an upgraded facility. Landfill gas will be contained, collected, and treated using an enclosed **flare** (a large open-flame burner housed in a four-sided metal container). The cleanup in the FTPA will address principal threats (buried drums, drum contents, and contaminated soils) through treatment and offsite disposal. Landfill solids and soils will be contained onsite. The revisions to the ROD in the Second ESD do not change the overall approach of the sitewide cleanup plans.

Description of the Second Explanation of Significant Differences (ESD)

Highlights of the differences are as follows:

1. **Former Tire Pile Area.** The ROD states that buried drums, drum contents, and contaminated soils in the FTPA will be excavated and transported *offsite* for treatment and disposal. The Second ESD requires that these contaminated materials be treated and disposed of *onsite*.

   > The approved change to the ROD is that the buried drum contents and contaminated soils in the FTPA will be treated using controlled aeration and disposed of onsite.

   As part of remedial design, EPA performed oversight of treatability tests on the contaminated materials excavated from the FTPA. These tests were used to evaluate the possibility of treating and disposing of the contaminated materials onsite. The two treatability tests were: air drying (controlled aeration); and, enhanced bioremediation (natural decay process). For the air drying test, covered stockpiles of soils/sludges were allowed to dry in a controlled manner. Air emissions data were collected and will be used to design emissions monitoring. Enhanced bioremediation is a process in which chemical-consuming bacteria are used to degrade organic compounds. For this test, soils/sludges were mixed with bacteria. Organic compound degradation was enhanced by regulating the amount of oxygen and nutrients, and the temperature.

   Based on the treatability tests, controlled aeration met the remedial action objectives for the FTPA soils. To dispose of the contaminated materials onsite, these materials will be treated, using controlled aeration, to meet requirements of the Federal Solid Waste Disposal Act and the Colorado Hazardous Waste Act.

2. **Contaminated Ground Water.** The ROD states that contaminated ground water shall be treated at either: (1) a newly-built onsite treatment plant; or (2) the existing plant, which would be upgraded.

   > The approved change to the ROD is that the water would be pretreated and then piped offsite for treatment of inorganic and remaining organic contaminants.

   The Second ESD requires that contaminated ground water be treated *onsite* to remove organics from the ground water. The approved change to the ROD is that the pretreated water would then be piped *offsite* for treatment of inorganic and remaining organic contaminants at the Metro Wastewater Reclamation District (**Metro**) facility, a **Publicly Owned Treatment Works (POTW)** and the City of Aurora Sand Creek Wastewater Reclamation Facility (also a POTW).

The POTWs will issue enforceable discharge permits to the Respondents to the RD/RA Order to control the quality of the pretreated water to be discharged to the sewer system. The permits will require that the pretreated water discharged to the POTWs meet specific chemical standards, in accordance with the **National Pretreatment Program** requirements of the **Clean Water Act of 1977, as amended** (CWA). Chemical-specific limits will be established to ensure that the pretreated ground water from the Lowry Site will:

- ❑ Comply with state water quality standards
- ❑ Achieve effluent concentration limits developed by EPA for pollutants not regulated by water quality standards
- ❑ Maintain "exceptional quality" sludge levels of pollutants in the POTWs' products
- ❑ Prevent interference with the POTWs' treatment processes
- ❑ Restrict releases of hazardous air pollutants from the POTWs' facilities
- ❑ Protect workers from adverse health and safety effects caused by the presence of toxic and reactive gases in the sewer system

In April 1996, the Respondents to the RD/RA Order evaluated options for treating contaminated ground water at the Lowry Site:

Alternative 1 (POTW option) included onsite pretreatment for organic contaminants, likely using the systems that are currently in place, followed by offsite treatment of inorganic contaminants and remaining organic contaminants at the Metro POTW. Because this option would remove water from the shallow ground-water system along Unnamed Creek, the water would have to be replaced or augmented with clean water from another source. This alternative was amended to include treatment of some of the pretreated ground water by the City of Aurora's Sand Creek Wastewater Reclamation Facility.

Modified Alternative 2B (Onsite Treatment-Reverse Osmosis/Evaporation) included: (1) onsite treatment of organic contaminants; and, (2) onsite treatment of inorganics, using a two-stage reverse osmosis, followed by evaporation and recovery of the evaporated water. Modified Alternative 2B also included offsite disposal of evaporator sludges and discharge of the recovered water to the wetlands. This alternative would also require some ground-water **augmentation** (addition of clean water from another source). It would require less augmentation than Alternative 1, but some water would be lost in the treatment process.

Alternatives 2A (Onsite Treatment-Reverse Osmosis) and 2C (Onsite Treatment-Evaporation) were evaluated and eliminated from further consideration based on the nine **NCP criteria**.

Several years ago, the POTW option was evaluated as part of the feasibility study for the shallow and deep ground-water operable units. At that time, the nearest interceptor was several miles away, and it was not practical to build a sewer line to transfer the pretreated water to the POTW. The City of Aurora recently indicated that it will allow connection of the discharge line from the Lowry Site to a newly constructed sewer line. The City of Aurora also stated that it will allow pretreated Lowry Site water to be conveyed through the sewer line to the Metro and Aurora POTWs. Metro and Aurora have indicated that they will accept pretreated Lowry Site water for final treatment, provided the water has been pretreated to meet established standards.

Pros and Cons of the Two Options

The advantages of Alternative 1 (POTW option) are that this alternative is the most technically feasible, cost-efficient, protective, and reliable option. The sewer line is already in place and the onsite treatment plant and POTWs are operational and reliable. The disadvantage of Alternative 1 is that water augmentation is required.

The advantage of Modified Alternative 2B is that less water augmentation is required. However, Modified Alternative 2B uses more complex processes that may be less reliable. In addition, evaporator sludges would be generated that would require offsite disposal and treatment.

Although both options would be effective and would comply with laws and regulations, the POTW option rates higher in terms of effectiveness because of the reliability of the POTWs and because it is more easily implemented.

Public Comments Overview

The sections that follow provide brief responses to some of the main issues raised in the public comments received on the Second ESD. The issues have been organized into the following five categories:

- Human Health, Environmental, and Biosolids Concerns
- Sewer Leakage Concerns
- Radiation Topics
- Costs - Comparison of Alternative 1 and Modified Alternative 2B
- Former Tire Pile Area (FTPA) Issues

Human Health, Environmental, and Biosolids Concerns

A number of commenters expressed concern that the pretreated ground water from the Lowry Site would contaminate the eastern Colorado environment and threaten the health of future generations by contaminating the biosolids produced at Metro's POTW.

Sending pretreated Lowry Site ground water to the Metro wastewater treatment plant will not contaminate the air, water or land in eastern Colorado. The biosolids produced by Metro will continue to meet all regulatory requirements and will not pose a threat to human health or the environment. Metro's biosolids will not be adversely affected as a result of treating Lowry Site ground water at Metro's POTW.

Metro's biosolids will not be adversely affected as a result of treating Lowry Site ground water at Metro's POTW.

The Lowry Site ground water will be treated onsite to comply with pretreatment limits set to protect human health and the environment (for both organic and inorganic contaminants) and specified in a wastewater treatment permit to be issued by Metro. The pretreated ground water will be discharged to Metro's POTW in accordance with the National Pretreatment Program, pursuant to the Clean Water Act.

Industrial discharges to Metro are allowed, with pretreatment, under the Federal Clean Water Act and regulations developed under the Colorado Water Quality Control Act. The requirements under these regulations are designed to ensure that Metro maintains the quality of its discharge and the biosolids it produces. All discharges to surface water in the State of Colorado are regulated under the Colorado Discharge Permit System (CDPS) Regulations. CDPS discharge limits for Metro's effluent are designed to protect fish, other aquatic and vegetative life, and downstream uses of the South Platte River.

The National Pretreatment Program regulates industrial waste discharges to municipal sewer systems and is applicable to every large **wastewater treatment** plant and many small wastewater treatment plants in the United States. In Colorado, the National Pretreatment Program is implemented by EPA and is the program under which Metro will issue a discharge permit to the Respondents to the RD/RA Order. This permit will control the quality of the pretreated ground water to be discharged to the sewer system, and will require that the pretreated ground-water quality be monitored before the water is discharged to the sewer system. Permit requirements protect water discharge quality and biosolids quality, as well as community and worker health and safety. The addition of pretreated Lowry Site ground water to the wastewater stream to be treated by Metro will have no measurable effect on the quality of Metro's discharge to the South Platte River.

Permit requirements protect water discharge quality, biosolids quality, and community and workers' health and safety.

"Sludge" is the solid that settles and is removed when a liquid with suspended solids passes through a settling tank. Sludge includes 80 to 90 percent water. The remaining percentage (10 to 20 percent) is a mixture of organic and inorganic solids and dissolved substances. Sludge contains nutrients such as nitrogen and phosphorus, and pathogens such as viruses and parasites. Sludge also contains cells from microorganisms that are used to treat the wastewater, organic chemicals, and inorganic chemicals (such as iron or salts). Sludge is treated before disposal. This treatment is designed to remove water, reduce the level of pathogens, stabilize volatile solids, and make the sludge less attractive to rodents, insects, and other animals. After sludge is treated, it is referred to as biosolids.

Biosolids are produced in the United States at a rate of 6,856,169 dry tons per year. Of those solids, 55 percent are land-applied. In Colorado, 78 percent of the 60,273 dry tons of biosolids generated each year are land-applied. **Land application** rates in other states range from 0 percent (Alaska) to 100 percent (Delaware, North Dakota, and Oregon). Table ES-1 shows the quantity of biosolids generated and their disposal mechanisms in the United States.

Over the past 20 years, biosolids management practices have changed significantly, moving from disposal toward more beneficial use. Beneficial use of biosolids, such as land application, is continuing to rise. In a recent poll by a trade industry magazine, 30 states indicated that beneficial use rates are expected to increase and more biosolids will be land-applied in the future.

In Colorado, land application of biosolids is regulated under the State of Colorado Biosolids Regulation and the Federal Part 503 Regulations. These regulations contain requirements and standards that have been established to protect human health and the environment. Based on 20+ years of research and analysis, the regulatory limits for land-applied biosolids have been established to be protective of public health and the environment.

Table ES-1. Biosolids Management in the United States					
EPA Region and States	**Total solids (dry tons/year)**	**Land Application**	**Surface Disposal**	**Incineration**	**Other**
Region 1 - Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island	367,430	24%	46%	30%	0%
Region 2 - New York, New Jersey	605,046	30%	14%	23%	33%
Region 3 - Pennsylvania, Maryland, Delaware, West Virginia, Virginia	1,040,206	74%	16%	10%	1%
Region 4 - Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Florida	1,050,326	57%	30%	12%	1%
Region V - Minnesota, Wisconsin, Michigan, Ohio, Indiana, Illinois	1,705,316	51%	2%	30%	17%
Region 6 - New Mexico, Texas, Oklahoma, Arkansas, Louisiana	425,203	53%	45%	2%	0%
Region 7 - Nebraska, Kansas, Iowa, Missouri	511,712	65.5%	4%	25.5%	5%
Region 8 - Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado	111,880	68%	29%	0%	3%
Region 9 - California, Nevada, Arizona, Hawaii	819,050	51%	36%	4%	7%
Region 10 - Alaska, Washington, Oregon, Idaho	220,000	89%	2%	9%	0%
TOTAL	**6,856,169**	**55%**	**19%**	**17%**	**9%**

Source: Bastian, Robert K. 1997. "Biosolids Management in the United States, A State-of-the-Nation Overview." Water Environment & Technology. Vol. 9, No. 5, Pp. 45-50.

The biosolids that are spread on Metro's land near Deer Trail, Colorado are classified under Federal and state regulations as "exceptional quality." This means that the concentrations of pollutants remaining in the biosolids are so low that the biosolids can be applied beneficially to land anywhere, even home gardens, and the biosolids are regulated as a fertilizer. Metro's biosolids are not a **hazardous waste**.

> Metro's biosolids may be applied beneficially to land anywhere, even home gardens.
>
> Metro's biosolids are <u>not</u> a hazardous waste.

Table ES-2 provides data on the concentrations of chemicals that are allowed for biosolids to be classified as "exceptional quality " under Federal and state regulations, the concentrations currently found in the Metro biosolids, the maximum allowable concentrations (based on Metro's pretreatment standards) that would be accepted from the Lowry Site, and the combined concentrations. Data in the table show that the addition of the pretreated ground water from the Lowry Site will not affect the "exceptional quality " status of the biosolids generated by Metro.

Table ES-2. Exceptional Quality Biosolids				
Parameter	**"Exceptional Quality" Biosolids (µg/g)**	**Current Metro Levels (µg/g)**	**Maximum Levels from Lowry[a] (µg/g)**	**Metro & Maximum Lowry Levels Combined (µg/g)**
Arsenic	41	1.7	0.3	2.0
Cadmium	39	6	2	8
Chromium	1200	66	3	69
Copper	1500	519	5	524
Lead	300	78	1	79
Mercury	17	2.2	0.1	2.3
Molybdenum	N/A	19	1	20
Nickel	420	31	3	34
Selenium	100	3.1	0.2	3.3
Zinc	2800	684	10	694
Gross Alpha, pCi/g	N/A	20	0.03	20
Gross Beta, pCi/g	N/A	23	0.04	23

µg/g - micrograms per gram
pCi/g - picocuries per gram
N/A - not available
[a] contribution to Metro's biosolids if the Lowry Site were to discharge at the maximum allowable concentration
Source: Metro Wastewater Reclamation District. 1997. Preliminary Proposed Self-Monitoring Requirements and Pollutants to be Limited by Permit for the Lowry Superfund Site Discharge to the City of Aurora and the Metro District.

Nevertheless, in response to community concerns, Metro will expand its environmental monitoring and community involvement activities in eastern Colorado. Metro has already begun working with the Deer Trail (Arapahoe County) and Agate (Elbert County) Soil Conservation Districts (SCDs) to develop comprehensive soil conservation practices for Metro's Deer Trail property.

In response to community concerns, Metro will expand its environmental monitoring and community involvement activities in eastern Colorado.

In addition to working with the SCDs, Metro is also working directly with the Natural Resources Conservation Service (NRCS) in developing a soil conservation program. In addition, Metro intends to fund a monitoring program that will enable independent verification of Metro's biosolids quality and the impacts of Metro's biosolids land application activities on soils, surface water, and ground water in Arapahoe and Elbert Counties. It is envisioned that Arapahoe and Elbert Counties will be the agencies in charge of this monitoring program.

Metro, in consultation with EPA and CDPHE, intends to undertake additional community involvement and monitoring activities including: working closely with community working groups or citizens' monitoring committees; incorporating community concerns and suggestions into the sampling and monitoring programs (currently under development); implementing a sampling and analysis program to establish "baseline" data for relevant areas in eastern Colorado; sending monitoring reports or other information to local libraries; arranging tours of the Metro facility and the biosolids application areas; developing and

conducting workshops on biosolids, the pretreatment program, other environmental issues near Metro's Deer Trail property, etc.; developing outreach materials (e.g., fact sheets) on appropriate topics; and implementing recommendations from the report entitled, *Field Study of Institutions, Attitudes and Opinions Impacting Acceptance of Biosolids Land Application Programs in Northeastern Colorado* (February 1994).

Sewer Leakage Concerns

Several commenters expressed the concern that the sewer pipes transporting pretreated Lowry ground water may leak or back up, causing contamination to be spread.

> The presence of pretreated Lowry ground water in the wastewater stream within the sewer systems will pose no additional risk to the public, the environment or sewer workers.

Pretreated Lowry Site ground water will be transported through sewer lines to the POTWs. Although it would be unrealistic to assume that sewer lines never break or leak, the presence of pretreated Lowry Site ground water in the wastewater stream within the sewer systems will pose no additional **risk** to the public, the environment, or sewer workers. First, concentrations of contaminants in the pretreated Lowry Site ground water will meet Metro's and Aurora's pretreatment standards. Second, these pretreatment standards for nonhousehold discharges are more protective of the environment than are the standards for raw household sewage discharges.

Radiation Topics

> The following general discussion provides introductory information on several topics related to radiation.
>
> The discussion is intended to supplement specific responses related to radiation questions in Volume I of the Responsiveness Summary, and to provide the reader with some fundamental concepts that underlie all of the responses relating to radiation and radiation exposure.

Many of the commenters expressed concern that the Lowry Site water may contain plutonium and other radionuclides.

Radiation is the energy released when a radioactive substance disintegrates. This process of energy release through disintegration is referred to as **radioactive decay**. The higher the number of disintegrations or decays during a given time period, the greater the **radioactivity** of the material.

During radioactive decay, energy is given off by the release of atomic particles (e.g., alpha or beta particles), through emission of electromagnetic energy (gamma or x-rays), or through release of both particle and electromagnetic energy. It is the energy released by radioactive materials that can cause potential health effects in humans through direct damage to sensitive biological tissues and cells.

The amount of radioactivity in a sample or substance is expressed in units of **Curies** (or fractions of a Curie). Most environmental radioactivity measurements are expressed in picocuries (pCi) . A picocurie contains one trillionth of the radioactivity in a Curie, and represents approximately two disintegrations per minute of a radioactive substance. Typically, the concentration of radioactivity in a soil or water sample is measured in units of pCi per gram (pCi/g) or pCi per liter (pCi/L). Radioactivity is present in soil naturally in concentrations ranging from a few pCi/g to tens of pCi/g. Radioactivity also occurs naturally in water with concentrations ranging from a few pCi/L to tens of pCi/L for some radionuclides (like radium and uranium) and from a few pCi/L to thousands of pCi/L for radon. Table ES-3a provides a summary of typical **background** levels for some naturally occurring radionuclides in rocks and soil, and Table ES-3b provides a similar summary for water.

Radioactivity is naturally present in soil in concentrations ranging from a few pCi/g to tens of pCi/g. Radioactivity also occurs naturally in water with concentrations ranging from a few pCi/L to tens of pCi/L for some radionuclides (like radium and uranium) and from a few to thousands of pCi/L for radon.

The amount of radioactivity in an environmental sample (soil or water) is measured through detection of the alpha and beta particles, or gamma energy released from the sample. Understanding how these particles and energy interact is important to interpreting and understanding the results from radioactive sample analyses. The simplest type of radioactive analysis is measurement of the gamma radiation released from a sample. The amount of gamma radiation can be used directly (often with minimal sample preparation) to determine the total **activity** in the sample. Because gamma radiation travels more than several feet in air, and is not easily absorbed or shielded, gamma-emitting radionuclides usually are easily detected and measured with low analytical uncertainty.

Table ES-3a. Concentrations of Naturally Occurring Radioisotopes in Rock and Soil (pCi/g)

Type of Rock or Soil	Potassium-40	Rubidium-87	Thorium-232	Uranium-238
Igneous rocks				
Basalt (crustal average)	8	0.8	0.3-0.4	0.2-0.3
Granite(crustal average)	> 30	4-5	1.5	1.1
Sedimentary rocks				
Shale sandstones	22	3	1.4	1.1
Beach sands (unconsolidated)	< 8	< 1	0.7	1.1
Carbonate rocks	2	0.2	0.2	0.7
Continental upper crust Average	23	3	1.2	1.0
Soils[a]	11	1	1.0	1.8
Soil[b]	3-19	3.5	0.2-1.4	0.2-1.4

[a]In-situ gamma spectral measurements at 200 locations by Lowder, W.M., et al. 1964. "Field Spectrometric Investigations of Envrionmental Radiation in the U.S.A." The Natural Radiation Environment. J.S. Adams and W.M. Lowder, ed., University of Chicago Press, Chicago, Illinois.

[b]Potassium, thorium, and uranium from, United Nations Scientific Committee on the Effects of Atomic Radiation. 1982. Ionizing Radiation: Sources and Biological Effects. Report to the General Assembly. Annex 1, UN82; National Council on Radiation Protection and Measurements (NCRP). 1976. Environmental Radiation in the United States. NCRP Report No. 50. December 27.

Source: EPA, 1990. Guidance for Data Usability in Risk Assessment, Interim Final. EPA/540/G-90/008. Directive: 9285.7-05. Office of Emergency and Remedial Response, Washington, DC. October.

Table ES-3b. Concentrations of Naturally Occurring Radioisotopes in Ground Water (pCi/L)				
	Radium-226	**Radium-228**	**Total Uranium**	**Radon**
Average[1]	0.87	2.0	NA	881
Median[1]	0.4	1.5	0.1-20	289
Regional Data[2]	0.133-28.5	NA	0.264-18.8[3]	NA

[1]Taken from the background information supporting proposed rulemaking for drinking water regulations for radionuclides (Federal Register, National Primary Drinking Water Standards: Radionuclides. Notice of Proposed Rulemaking. Volume 56, No. 138, Thursday, July 18, 1991)
[2]Taken from HLA. 1992. Final Remediation Investigation Report for the Shallow Groundwater and Subsurface Liquids and Deep Ground Water Operable Units, Lowry Landfill, Arapahoe County, Colorado, March 25.
[3]Regional information for uranium reported as Uranium-238
NA - Data not available

Beta particles generally travel a few inches to a few feet in air (depending on their energy), and can be absorbed or shielded by a few inches of plastic (again depending on the energy of the beta particle). Measurement of beta-particle emitting radionuclides typically requires some sample preparation to extract the radionuclide onto a thin layer so that the beta particles can be detected. This sample preparation introduces some uncertainty or error into the final result.

Radioactive materials that decay primarily by alpha particle emission (such as most types of plutonium) are the most difficult to measure because alpha particles only travel a short distance in air (an inch or less), and can be completely stopped by something as thin as a sheet of paper. The analysis process for alpha emitters typically includes a series of chemical extraction steps, with a final sample consisting of a very thin layer of material plated on a small disk. Any interferences (such as moisture or dust on the final sample disk) can cause significant errors or uncertainties in the final sample result.

Radioactive sample results typically are displayed as the sample concentration (in pCi/g or pCi/L), with an associated **minimum detectable activity (MDA)** level, and **counting errors**. A separate MDA or detection level usually is calculated for every sample result. This value represents the level that can be detected with a high degree of confidence (i.e., with a small probability of either false positive or false negative results). The counting error accounts for some of the uncertainty in a sample result caused by the statistical nature of radioactive decay. It does not include consideration of errors or uncertainties associated with the sampling event itself. This counting error term is a useful tool in determining how representative a sample result is. It is an indication of the range of radioactivity that could actually be present in the sample, given the possible errors associated with the counting process.

While the concentration of radioactivity (e.g., pCi/g) is important, the concentration alone actually says very little about the potential hazard associated with the soil and water containing the radioactivity. The **absorbed dose** is a quantity that provides an indication of the potential health effect or hazard associated with the radioactivity. The absorbed dose is expressed in **rads** (radiation adsorbed dose), and is a measure of the amount of energy deposited by radiation in an organ or tissue of interest. Absorbed dose (rads) is the quantity that is often used for studies that focus on a particular organ. An example is the recently released study on fallout from past atmospheric atomic weapons testing that focused on doses of iodine-131 to the thyroid gland in exposed individuals.

A more useful quantity for expressing potential human health impacts is **effective dose equivalent.** Effective dose equivalent is similar to adsorbed dose except that it includes consideration of the differences in biological effectiveness of different types of radiation and also considers the relative risks of cancer for different organs. Effective dose equivalent is measured in a unit called **rem (radiation equivalent man).**

As a point of reference, the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP) have established recommended limits on radiation exposure for the general public. These consensus scientific groups have recommended that public exposures from all sources except medical exposures and radon be limited to 100 millirem per year (mrem/yr). They further recommend that doses be minimized through use of the concept of as low as reasonably achievable (ALARA), and that the dose from any single site should be limited to a fraction of the 100 mrem/yr total limit.

Current proposed guidance from EPA (*EPA. 1994. Federal Radiation Protection Guidance for Exposure of the General Public. Federal Register. Vol. 59, No. 246, December 23.*), and Department of Energy (DOE) (10 CFR Part 834), (*DOE. 1993. Radiation Protection for the Public and the Environment. Notice of proposed rulemaking and public hearing. Federal Register. Vol. 58, No. 56, March 25*), and recently finalized rulemaking by the Nuclear Regulatory Commission (NRC) (*NRC. 1997. Radiological Criteria for License Termination; Final Rule. Federal Register. Vol. 62, No. 139, July 21.*) comply with the recommendation of the ICRP and NCRP by establishing a radiation exposure limit for the general public of 100 mrem/yr from all sources (except medical and radon), and stating that the dose from any single site should be a fraction of the 100 mrem/yr total limit. Recently, the NRC finalized its decommissioning rulemaking efforts, and established 25 mrem/yr as the dose limit for exposure of the public to a single decommissioned site. These regulations also require that doses be reduced to as far below the legal limit as is reasonably achievable, taking costs and benefits into account. This philosophy of ALARA usually results in further reduction of potential dose to a level on the order of a few mrem per year.

The regulations and guidance discussed previously have been developed to limit public radiation exposures to safe levels. The major health concern for limiting radiation exposures is limiting the possibility of cancer by such exposures to a negligible level. EPA requires that the risk associated with CERCLA sites be limited to a range of 10^{-6} to 10^{-4}. This risk range usually is interpreted as being between one cancer in a population of one million persons to a few cancers in a population of 10,000 persons. The dose limits discussed previously (in practice usually less than 25 mrem/yr) provide assurance that the possibility of cancer is acceptably low, particularly considering that background radiation exposures are typically several times higher than actual public exposures from a man-made source. Limiting public radiation doses to less than 25 mrem/yr generally will provide adequate assurance that the CERCLA risk criteria have been met.

The sources of the radiation that have been detected in the Lowry Site samples are most likely the same as the sources of the background radiation that can be detected in the general environment. Radiation occurs naturally in the environment, and activities such as the past atmospheric nuclear weapons tests have contributed to the background levels of radiation. The primary sources of background radiation that could impact the Lowry Site samples are:

- ❑ Cosmic radiation, which is radiation from space;
- ❑ Terrestrial sources of radiation including rocks and soil that naturally contain radioactive minerals; and
- ❑ Radioactive fallout from past atmospheric nuclear weapons testing.

Cosmic radiation contributes quantities of radionuclides such as tritium and carbon-14. These radionuclides are present in soil and water, and may have contributed to the detection of radionuclides at the Lowry Site. For example, tritium is present in the ambient environment both naturally, from cosmic radiation, and artificially, from past atmospheric nuclear weapons testing. Tritium can be an interference in the analytical procedure for plutonium-241. It is possible that natural background levels of tritium could have contributed to the positive detections of plutonium-241 at the Lowry Site.

Naturally occurring radionuclides such as uranium, thorium, and radium are present in rocks and soil in varying quantities throughout the world. In the Denver area, these radionuclides are present in soil in higher concentrations than in most areas of the United States because of the geology of the Rocky Mountain area. These radionuclides contribute to the overall radioactivity in any soil or water sample from the Lowry Site, and could contribute interferences that increase the overall error in more difficult measurements such as plutonium and americium. As an example, the naturally occurring radium-224 isotope sometimes is mis-identified as americium-241 because it emits an alpha particle that has nearly the same energy as the americium alpha particle.

> Detectable levels of plutonium have been measured in ground water from background samples in the Denver metropolitan area.
>
> While it is possible to detect plutonium in ground water and soils from background areas, this does not mean that there is a potential health threat associated with such low-level detections.

Past atmospheric testing of nuclear weapons has caused detectable amounts of man-made radionuclides such as plutonium, americium, and tritium to be dispersed in variable amounts around the world. These radionuclides are detectable in trace quantities in soil and other media, and this source may be a contributor to the sporadic detections of plutonium and americium that have been seen in Lowry Site samples.

Detectable levels of plutonium have been measured in ground water from background samples in the metropolitan Denver area. While it is possible to detect plutonium in ground water and soils from background areas, this does not mean that there is a potential health threat associated with such low-level detections. There are measurable quantities of chemicals and radionuclides other than plutonium in ground water in the Denver area, and in all other ground-water systems in the United States.

EPA has established standards for drinking water that limit the concentrations of chemical and radiological contaminants to levels that are judged to be safe for human consumption. These are called maximum contaminant levels or MCLs. For radionuclides, EPA has established a performance standard of 15 pCi/L for alpha-emitting radionuclides (excluding uranium and radon).

> Ground water leaving the Lowry Site must meet ROD performance standards or pretreatment standards for radionuclides before the water can be sent to the Metro and Aurora wastewater treatment plants.

Costs - Comparison of Alternative 1 and Modified Alternative 2B

Several of the commenters questioned the cost of the sitewide remedy and the two alternatives for ground-water treatment. The commenters expressed concern that the POTW option was selected primarily because it is the less costly option.

As part of the process for evaluating the alternatives identified in the ESD, the estimated capital costs and **operation and maintenance (O&M) costs** of the two alternatives were calculated and compared in accordance with EPA guidance. Total net present worth costs were estimated by adding capital costs to the net present worth of the annual O&M costs for a 30-year period, using an interest rate of 5 percent. The total net present worth cost for Alternative 1 (POTW option) is estimated to be $6,354,000. This includes capital costs for a lift station, piping, excavation, and construction; the sewer connection fees; design and construction management costs; O&M costs including equipment repair costs; POTW treatment fees; and water augmentation costs.

While the cost analysis showed a cost differential between onsite and offsite treatment, cost was only one of the criteria used to evaluate the two alternatives. EPA uses a total of nine criteria to evaluate the merits of Superfund remedies.

The total net present worth cost for Modified Alternative 2B is estimated to be $9,300,000. This includes capital costs for the reverse osmosis system, an iron removal system and an evaporation system; design and construction management costs; O&M costs; and water augmentation costs.

Long-term monitoring is included for both options and is projected to cost approximately the same for both options.

While the cost analysis showed a cost differential between onsite and offsite treatment, cost was only one of the criteria used to evaluate the two alternatives. EPA uses the nine NCP criteria to evaluate the merits of Superfund remedies. The first two criteria are: 1) overall protection of human health and the environment; and 2) compliance with applicable or relevant and appropriate requirements (ARARs) of other Federal and state environmental statutes. If a remedial alternative does not meet the first two criteria, it is not carried over for further analysis. If an alternative does fulfill the first two criteria, it is then reviewed against five more criteria: 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, or volume through treatment; 5) short-term effectiveness; 6) implementability; and 7) cost, including capital and O&M cost. The final two criteria, 8) State acceptance and 9) community acceptance, are evaluated following public comment.

EPA and CDPHE compared the two alternatives according to these criteria and concluded that the POTW option would achieve the best balance among the criteria. The agencies have determined that this alternative is the most technically feasible, cost-efficient, protective, and reliable option. The agencies have further determined that this alternative would achieve better long-term effectiveness, provide a more significant reduction in toxicity, mobility, and volume through treatment, be more cost effective, and be protective of human health and the environment.

The Lowry ROD indicates that the 30-year net present worth estimate, including capital and annual O&M costs, for the sitewide remedy is $93,848,000. EPA's costs to date (including contractor costs) are approximately $27 million. It is estimated that the Potentially Responsible Parties have spent between $40 million and $70 million on remedial costs (including costs reimbursed to EPA).

Former Tire Pile Area (FTPA) Issues

EPA received only a few comments on this element of the Second ESD. The comments focused on technical aspects of the design, most of which will be evaluated during preparation of the FTPA remedial design.

The March 10, 1994 Lowry Site ROD specified that "contaminated materials in the former tire pile area shall be excavated and characterized for offsite treatment and disposal." The ROD specified that "it is anticipated that the solids and soils shall be treated using stabilization before disposal, but actual treatment methods shall be determined by EPA, in consultation with CDPHE, during RD."

Because the ROD does not specifically identify a treatment technology, treatability studies and an evaluation of potential treatment options were performed by the Respondents to the RD/RA Order. The Respondents' report is entitled *Treatability Test Summary Report, Former Tire Pile Area Waste Pits* (Parsons ES, February 19, 1997). In this evaluation, the Respondents evaluated two possible remedial designs:

- Physical drying/controlled aeration
- Enhanced bioremediation

Treatability test results indicated that enhanced bioremediation would not meet the remedial, or cleanup, objectives established by EPA and CDPHE. Results of the physical drying/controlled aeration tests indicated that this process would meet the remedial objectives. Physical drying/controlled aeration will include the following elements.

- Excavating, handling, and staging of FTPA waste pit materials
- Treating FTPA waste pit materials
- Backfilling the material or disposing in an onsite disposal area

The Second ESD identified a change to the FTPA treatment and disposal to include *onsite* treatment and disposal instead of *offsite* treatment and disposal.

Locations of the Responsiveness Summary

Because of its size (several hundred pages) and in an effort to conserve paper, only the Executive Summary of the Responsiveness Summary was mailed to each commenter.

If you are interested in reviewing or copying (all or part of) the complete, multi-volume Responsiveness Summary, you can do so at any of the following locations:

EPA Superfund Records Center
999 18th Street
5th floor, North Terrace
Denver, CO 80202
303/312-6473

Aurora Public Library
14949 East Alameda Drive
Aurora, CO 80012
303/739-6600

Bennett Public Library
495 Seventh Street
Bennett, CO 80102
303/644-3303

Byers Public Library
404 East Front Street
Byers, CO 80103
303/822-9392

Deer Trail Public Library
350 Second Avenue
Deer Trail, CO 80105
303/769-4310

Strasburg Public Library
Mobile Unit on Strasburg School Lot
303/622-4268

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Acronyms and Abbreviations

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AFL-CIO	American Federation of Labor and Congress Industrial Organizations
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ASC	additional site characterization
BREACH	Bombing Range Environmental Action for Community Health
CBSGW	Colorado Basic Standard for Ground Water
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
CFR	Code of Federal Regulations
CLLEAN	Citizens for Lowry Landfill Environmental Action Now
CWM	Chemical Waste Management, Inc.
COC	chemical of concern
CSU	Colorado State University
CWA	Clean Water Act
Denver	City and County of Denver, Colorado
DIA	Denver International Airport
DOE	United States Department of Energy
DOT	Department of Transportation
ECCV	East Cherry Creek Valley Water and Sanitation District
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FESUP	Family Farmers for Environmentally Safe Use of Property
FTPA	former tire pile area
HLA	Harding Lawson Associates
H&S	Health and Safety
ICRP	International Commission on Radiological Protection
ISC3ST	Industrial Source Complex (Release 3) Short Term dispersion model
Lowry Site	Lowry Landfill Superfund Site
MCL	maximum contaminant level
MDA	minimum detectable activity
MDL	minimum detection level
Metro	Metro Wastewater Reclamation District (MWRD)
mrem	millirem, 1/1,000th rem
µg/g	micrograms per gram
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCRP	National Council on Radiation and Measurements
NESHAP	National Emission Standard for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System

NIOSH	National Institute for Occupational Safety and Health
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OCAW	Oil, Chemical & Atomic Workers International Union
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
pCi	picoCurie
pCi/g	picoCuries per gram
pCi/L	picoCuries per liter
PEMS	Pretreatment Enforcement Management System
POTW	Publicly-Owned Treatment Works
ppm	parts per million
PQL	practical quantitation limit
PRP	potentially responsible party
QNCR	Quarterly Noncompliance Report
rad	radiation absorbed dose
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RD/RA	remedial design/remedial action
rem	radiation equivalent man
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
ROD	Record of Decision
TAG	Technical Assistance Grant
TCLP	Toxic Characteristics Leaching Procedure
TMV	toxicity, mobility, and volume
TSDF	Treatment, Storage, or Disposal Facility
µg/L	micrograms per liter
USGS	United States Geological Survey
WET	whole effluent toxicity
WMC	Waste Management of Colorado, Inc.

Responses

April 2, 1997 Public Meeting Transcript
Questions and Response

During the public meeting on April 2, 1997, a number of questions were asked. This section of the responsiveness summary provides responses to those questions. The transcript of the meeting is presented in Volume II of this responsiveness summary. In the following pages, the questions are in italics and the responses are in regular text. The "T" following the question refers to the public meeting transcript, and the number refers to the page where the question can be found. In some cases, the question is taken verbatim from the transcript text. In other cases, the question is a summary of large sections of text.

A number of questions refer to similar subjects. In these cases, a reference is made in the response to the appropriate section of the executive summary, which includes the response to these subjects.

1. *Will Metro [Metro Wastewater Reclamation District] be protective of worker health and safety in the disposal of the waste from the Lowry Landfill Site?* T 30

To be protective of worker health and safety, discharge from the Lowry Landfill Superfund Site (Lowry Site or Site) must meet standards established by Metro pursuant to the **National Pretreatment Program**[1] of the Clean Water Act (1977, as amended). These standards were developed using the following guidance:

- United States Environmental Protection Agency's (EPA's) Guidance to Protect POTW [Publicly Owned Treatment Works] Workers from Toxic and Reactive Gases and Vapors (EPA, 1992b)

- American Conference of Governmental Industrial Hygienists (ACGIH) occupational guidelines that are used by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH)

Further documentation of the methods used by Metro to calculate the pretreatment standards are included in Attachment A.

2. *Do you know what will be in the waste water being discharged to Metro from the Lowry Site?* T 31

The pretreated ground water to be discharged to Metro from the Lowry Site has been analyzed. A summary of the data is attached as Table 1 (at the end of the transcript responses). A few

[1]Bolded terms are defined in the Glossary.

examples of the compounds that exceed site performance standards in the ground water *before* pretreatment are:

- 1,1-Dichloroethylene at 167 micrograms per liter (µg/L) (performance standard = 7 µg/L)
- 1,2-Dichloroethane at 139 µg/L (performance standard = 0.4 µg/L)
- Benzene at 196 µg/L (performance standard = 5 µg/L)
- Pentachlorophenol at 188 µg/L (performance standard = 1 µg/L)
- Chloride at 1,514,000 µg/L (performance standard = 250,000 µg/L)
- Iron at 6,500 µg/L (performance standard = 300 µg/L)
- Nitrate at 45,300 µg/L (performance standard = 10,000 µg/L)
- Sulfate at 720,000 µg/L (performance standard = 250,000 µg/L)

These compounds will have to be treated to pretreatment standards before the ground water can be discharged to the POTWs. Pretreatment standards give an indication of what would be allowed to be in the discharge. However, the pretreatment process selected during remedial design will determine how far below the pretreatment limits the concentrations of organic compounds will actually be. Many contaminants in the ground water to be extracted for treatment are expected to be present at concentrations below the pretreatment standards. Pretreatment to reduce the concentrations of any contaminants that exceed pretreatment standards will provide the added benefit of further reducing the concentrations of those contaminants that do not exceed pretreatment standards.

A more detailed listing of data can be found in Appendix A of the "Draft Evaluation of the POTW Treatment Option" (Parsons ES, 1996).

3. *When we produce at our oil refinery a barrel of either contaminated water or sludge, our company pays about $500, or maybe more, to take it out to Last Chance hazardous waste facility. When that same barrel goes into Metro, they can take that same barrel and go and place it across the farmlands in Deer Trail. And that is not deemed to be contaminated waste or hazardous waste?* T 32

Metro is not permitted to accept hazardous waste or sludges from industrial processes. Any discharge to Metro must meet industrial pretreatment requirements. Hazardous waste is not being distributed across farmlands in Deer Trail, Colorado. The ground water from the Lowry Site does not meet any of the characteristics of a hazardous waste (ignitability, corrosivity, reactivity, and toxicity). The Lowry Site ground water will be treated to specified pretreatment limits and then discharged to the sewer system in accordance with the National Pretreatment Program. Metro discharges to the South Platte River in accordance with requirements of the **National Pollutant Discharge Elimination System (NPDES) Program** of the Clean Water Act (1977, as amended). The addition of the Lowry Site pretreated water to Metro will not cause Metro to either exceed requirements in its discharge permit or produce biosolids that do not meet "exceptional quality" criteria.

The Metro biosolids that are spread across the land at Deer Trail, Colorado, are classified, under Federal and State regulations, as "exceptional quality," meaning the concentrations of pollutants in the biosolids are so low that the biosolids can be applied beneficially to land anywhere, even home gardens. The biosolids are not a hazardous waste.

4. *The Lowry Landfill Site background samples are located on the Buckley bombing range, which is itself a source of contamination to ground water. Does this compromise the Lowry background samples?* T 36

Background wells were identified through a careful and detailed process that included an awareness of the location of the bombing range in relation to the Lowry Site (see Comment #5 for an explanation of background). Statistical analyses were used to evaluate the analytical results from the background wells. In 1994, the Respondents to the "EPA Region 8 Administrative Order for Remedial Design/Remedial Action for the Lowry Landfill Superfund Site, Docket No. CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended] VIII-95-05" (RD/RA Order) (EPA, 1994b) installed new wells along the western and southern site boundaries. These wells are not located on the Bombing Range, have been monitored on a quarterly basis, and have shown similar background concentration results to those wells located at the southern boundary of the Lowry Site. In addition, no ordnance (e.g., bombs) were encountered during dirt-moving activities performed in connection with landfilling operations.

5. *Now, this study says that in 100 percent of the ground-water samples that were taken, there is plutonium in this landfill. And this is going to be piped into a sanitary sewer system and then to the Metro workers where they will be exposed to this contaminated ground water and then trucked out to Deer Trail where it's going to be applied onto farmland. That has not been discussed tonight.* T 37

Plutonium was not detected in 100 percent of the ground-water samples from the Lowry Site. Plutonium was detected at concentrations comparable to background concentrations in 30 of 100 ground-water samples (19 of 42 source area samples, 1 of 13 downgradient upper Dawson samples, 6 of 29 lower Dawson samples, 3 of 12 deep ground-water samples, and 1 of 4 upgradient samples) (EPA, 1993). Background concentrations are those concentrations that naturally occur in the environment or are present as a result of activities unrelated to a site. In the 30 percent of the Lowry Site ground-water samples with detectable levels of plutonium, the concentrations are so low that it is impossible to say for sure whether what is being detected is really plutonium or the result of analytical uncertainty.

Analytical uncertainty must be considered in interpretation of plutonium results, as measurement of plutonium at near-background levels is a very difficult and complicated process. Accurate results for low-level plutonium measurements require carefully working through a series of steps in a radiochemical extraction process, and eventually extracting or recovering a purified sample

that can be counted using a low-level alpha spectroscopy system. Successfully producing a purified sample is not a matter of simply following a chemistry procedure; this process requires an experienced radiochemist and is often as much an art as a science. Errors or uncertainties can be introduced into the final measurement result both by the radiochemical extraction process, and by the statistical nature of radioactive decay. Because these errors can be significant relative to the actual sample result, most analytical laboratories report an error or uncertainty term with the measurement result. This uncertainty term typically only accounts for that portion of the analytical uncertainty associated with the radioactivity counting process.

For low-level plutonium measurements, the counting uncertainty can sometimes approach or even exceed 100 percent of the sample result. As an example, a result with a reported activity of 90 picocuries per liter (pCi/L), with an uncertainty term of +/- 80 pCi/L would imply that the true sample activity lies within the range of 10 pCi/L (90 - 80) to 170 pCi/L (90 + 80). If the detection level for this procedure was greater than 10 pCi/L, then there is a chance that there is really no detectable radioactivity in the sample. This is especially true when the uncertainties associated with the complicated radiochemical extraction process (which are not included in the error term) are also considered.

It is important to point out that results like the example shown above are not ignored, but they do provide a cause for concern over whether any radioactivity is really present. When such results are reported, they must be considered questionable until additional information is obtained to support or refute the preliminary indication of the presence of radioactivity. Additional review of the data is needed (including a detailed review of the radiochemistry logs and recovery data, condition at the laboratory at the time of sample preparation and counting, and other factors that could influence the final results). Through this process, a body of evidence can be collected that should provide sufficient information for decision-making on the appropriate remedial action. This is the process that has been followed at the Lowry Site. A large body of data has been accumulated to show that radionuclides are not present in ground water under the Lowry Site in concentrations greater than those seen from background conditions (including contributions from past atmospheric weapons testing).

The source of the radiation that has been detected in the Lowry Site samples is most likely the same as the source of the background radiation that can be detected in the environment. Background radiation has a number of possible sources. These sources include atomic fallout from nuclear testing; cosmic radiation, which is radiation from space, primarily from outside of our solar system; and, geology, in Denver levels of radiation are naturally elevated as the rocks in our state contain radioactive minerals.

Radionuclides, including plutonium, will be monitored in the effluent from the Lowry Site. If radionuclides are detected at unacceptable levels, then the water will not be sent to the sewer until action is taken to ensure radionuclides are reduced to ROD performance standards or pretreatment standards.

6. *A retired highway patrolman for the State of Colorado alleged in written documents to the health department that Rocky Flats was dumping radioactive waste precisely along the same areas of Quincy Road where background levels have detected radioactive constituents. What impact does this have on the Lowry background samples?* T 38

EPA conducted field investigations that included soil sampling in the areas of alleged dumping. Results from background soil samples along Quincy Avenue show no evidence of surface or buried radioactive materials. Additionally, man-made radionuclides have not been confirmed present in ground water above background levels at the Lowry Site.

The former highway patrolman's 1977 report of alleged dumping of radioactive waste in 1960 and 1961 could not be corroborated by any other witness or by any sampling and analysis. EPA interviewed the former highway patrolman and conducted research on Rocky Flats operations to see if a connection to Rocky Flats could be established. Comprehensive review of information provided in response to the CERCLA 104(e) questionnaire indicates that no radioactive waste from Rocky Flats was disposed at the Lowry Site. Based on this body of information, the former highway patrolman's story appears to have no impact on the Lowry Site background samples.

7. *What is the source of the radiation in the Lowry samples?* T 38

The Lowry Landfill Baseline Risk Assessment, Volume 2C (EPA, 1993) concluded that the sources of the radiation that have been detected in the Lowry Site samples are most likely the same as the sources of the background radiation that can be detected in the environment. Radiation naturally occurs in the environment, and activities such as past atmospheric nuclear weapons tests have contributed to the background levels of radiation. The primary sources of background radiation that could impact Lowry Site samples are:

- Terrestrial sources of radiation, including rocks and soil that naturally contain radioactive minerals
- Cosmic radiation, which is radiation from outer space
- Radioactive fallout from past atmospheric nuclear weapons testing

Naturally-occurring radionuclides such as uranium, thorium, and radium are present in rocks and soil in varying quantities across the world. In the Denver area, these radionuclides are present in soil in higher concentrations than in most areas of the United States due to the geology of the Rocky Mountain area. These radionuclides contribute to the overall radioactivity in any soil or water sample from the Lowry Site, and could contribute interferences that increase the overall error in more difficult measurements such as plutonium and americium. As an example, the naturally occurring radium-224 isotope is sometimes misidentified as americium-241 because it emits an alpha particle with almost the same energy as the americium alpha particle.

Cosmic radiation contributes quantities of radionuclides such as tritium and carbon-14. These radionuclides are present in soil and water, and may have contributed to the detection of

radionuclides at the Lowry Site. As one example, tritium is present naturally as a result of cosmic radiation and past weapons testing. Tritium can be an interference in the analytical procedure for plutonium-241. It is possible that natural background levels of tritium could have contributed to the positive detections of plutonium-241 at the Lowry Site.

Past atmospheric testing of nuclear weapons has caused detectable amounts of man-made radionuclides such as plutonium, americium, and tritium to be dispersed in variable amounts around the world. These radionuclides are detectable in trace quantities in soil and other media, and this source may be a contributor to the sporadic detections of americium and plutonium that have been seen in Lowry samples.

8. *Why are we covering up the plutonium being in the Lowry Landfill?* T 38

EPA has never covered up the fact that plutonium may be present at low levels at the Lowry Site. This information can be found in several fact sheets, including:

- Update No. 2 (EPA, 1988b)
- Preliminary Endangerment Assessment (EPA, 1989b)
- Update No. 3 (EPA, 1990a)

Fact sheets are notices that are sent out periodically to the public and interested parties to provide information about the Lowry Site. In addition to the fact sheets, information on radionuclides detected at the Lowry Site can be found in numerous documents that are part of the Public Record, which is available at the EPA Superfund Records Center[2] and the Aurora Public Library[3]. These documents include the following:

- Preliminary Endangerment Assessment (EPA, 1989b)
- Remedial Investigation Report for Operable Unit (OUs) 1 and 6 (HLA, 1992a)
- Evaluation of the Data Quality and Occurrences of Transuranic Radionuclides in the Shallow Groundwater and Subsurface Liquids and Deep Groundwater Operable Units (HLA, 1992b)
- Remedial Investigation Report for OUs 2 and 3 (amended by EPA's comments, May 1993) (HSI/CDM, 1993)

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[2]EPA Superfund Records Center
999 18th Street
Denver, Colorado 80202
303/312-6473

[3]Aurora Public Library
14949 East Alameda Drive
Aurora, Colorado 80012
303/739-6600

- Remedial Investigation Report for OUs 4 and 5 (amended by EPA's comments, May 1993) (CDM, 1993)
- Draft Baseline Risk Assessment Sitewide Risk Issues (EPA, 1993)
- Record of Decision (ROD) for the Lowry Landfill Site (EPA, 1994a)

Due to continuing questions about plutonium, EPA has conducted more extensive review and investigation of Lowry Site conditions than is typical for most CERCLA sites. This additional review and investigation has included independent data evaluations by qualified health physicists and radiochemists, and investigation of alleged dumping activities by the Rocky Flats Plant. Far from covering up information, EPA has expended considerable resources in attempting to confirm or refute data related to plutonium at the Lowry Site. These efforts have not provided evidence to support claims that plutonium is present at the Site at concentrations greater than background levels. In addition, even though strong evidence is not available to support designating plutonium and other transuranics as contaminants of concern, these radionuclides were evaluated as part of the baseline risk assessment. The baseline risk assessment treated these radionuclides as if they were present and contaminants of concern at the Site.

The executive summary in the Draft Baseline Risk Assessment Sitewide Risk Issues (April 1993, page xii) (EPA, 1993) sums up the conclusions of the radionuclide risk: "Estimated radionuclide risks for onsite media were about the same compared to those risks expected due to exposure to naturally occurring levels of radionuclides in the Denver area. Therefore, relative to background conditions, radionuclide risk contributions do not add to the overall site-related risks."

9. *This report, by the way, was done by CH2M HILL, Metro uses CH2M HILL as a contractor to Metro. So, clearly that contractor is considered to be a reliable contractor.* T 38

CH2M HILL has worked for Metro in the past, but is currently only working on an odor control problem for Metro. CH2M HILL has no influence over the Metro Board's acceptance of the Lowry pretreated ground water for treatment at Metro. During the contracting process involving EPA and CH2M HILL, EPA evaluated CH2M HILL and found no conflict of interest.

10. *If we are going to build an underground pipeline that would go west from the landfill where we know there is a contaminated ground-water plume already, are we then going to invite the possible transmission of that contaminated ground-water plume through the pipeline channel itself to contaminate areas that are not presently contaminated?*

Of course, that ground water is common to the water supply of the East Cherry Creek Valley Water and Sanitation District, 100 percent of which is supplied by well, with some other sources, with ground water supplying tens of thousands of homes in that area. Is that a source of concern? Could that be a potential channel of the contaminated ground water to uncontaminated areas so far? T 39

The underground pipeline connecting the Lowry Site to the Aurora sewer system will be routed through an area of the Site that is not contaminated. The location was selected by drilling boreholes along the pipeline alignment. Soil samples were collected and analyzed to make sure that the selected location was not contaminated. Contamination was not detected in the area of the pipeline alignment; therefore, the pipeline will not act as a conduit for contamination to leave the Site.

11. *I was shocked to find that the workers had not been notified by the management of this proposal, and I think that is a source of concern when it comes to looking at whether or not there have been studies done of the worker health and safety. My investigation is that there has not.* T 39

The Metro Board does not specifically notify the workers when the Board votes to accept water from different sources for treatment. Metro has developed preliminary pretreatment standards for the discharge from the Lowry Site. These discharge standards include protection of workers from adverse health and safety effects and meet the requirements of the National Pretreatment Program. The standards were developed using the following guidance:

- EPA's Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors (EPA, 1992b)
- ACGIH occupational guidelines that are used by the OSHA and NIOSH

Further documentation of the methods used by Metro to calculate the pretreatment standards are included in Attachment A.

12. *Is there enough money in the fund collected from polluters to build an upgraded treatment plant?* T 40

EPA has not collected money from the polluters to build an upgraded treatment plant. Thirty-four of the largest potentially responsible parties (PRPs) were issued a unilateral administrative order (RD/RA Order) in November of 1994 (EPA, 1994b) . This legal document directs the PRPs to design and implement the sitewide remedy as described in the March 10, 1994 ROD (EPA, 1994a) . The City and County of Denver (Denver), Waste Management of Colorado, Inc. (WMC), and Chemical Waste Management, Inc. (CWM), on behalf of themselves and 24 of the other PRPs, are implementing the sitewide design and clean up in accordance with the RD/RA Order. The parties responsible for the cleanup have demonstrated financial ability to perform the cleanup, which could include building an upgraded treatment plant.

13. *That waste water from Lowry, if it were trucked on the ground to the Metro plant, would be considered a Resource Conservation and Recovery Act hazardous waste, which has much stricter regulations for that waste. At Metro, the EPA itself has indicated that if it*

were stored at Metro it would come under much more stringent requirements under RCRA. If you dump it into the sewer system under those sets of final and preregulations, it all of a sudden becomes not a hazardous waste. T 40

If the pretreated ground water from the Lowry Site was trucked to Metro, it would not be subject to more stringent requirements. The ground water from the Lowry Site does not meet any of the characteristics of a hazardous waste (ignitability, corrosivity, reactivity, and toxicity). Once the ground water is pretreated to the pretreatment limits, the water will then be regulated under the NPDES Program of the Clean Water Act (1977, as amended).

EPA and the Colorado Department of Public Health and Environment (CDPHE) do not understand what the commenter is referring to when he says " ... the EPA itself has indicated that if it were stored at Metro it would come under much more stringent requirements under RCRA."

A hazardous waste determination (see 40 CFR Part 261) must be made independent of the mode of transportation and must be made before transportation occurs. The identification of hazardous waste determines the transportation requirements.

14. *I think this proposal is inviting potential future liability in terms of the farmland out at Deer Trail.* T 41

Table ES-2 in the Executive Summary shows that the addition of contaminants from the pretreated Lowry Site ground water to Metro will not affect the "exceptional quality" status of Metro's biosolids. Because the contents of the biosolids will meet Federal and State standards, EPA does not now envision that there would be any liability relating to the farmland to which the biosolids are applied.

Biosolids are produced in the United States at a rate of 6,856,169 dry tons per year. Of those solids, 55 percent are land applied. In Colorado, 78 percent of the 60,273 dry tons per year of biosolids are land applied. Land application rates in other states range from 0 percent (Alaska) to 100 percent (Delaware, North Dakota, and Oregon).

For many years, several major urban areas have sold or given away biosolids products for use as soil conditioners, organic fertilizers or potting media (Bastian, 1997):

- Salem, Oregon (BIOGRO)
- Madison and Milwaukee, Wisconsin (AGRO-LIFE)
- Virginia Beach, Virginia (NUTRI-GREEN)

Other cities are following suit and beginning to market their biosolids products. Efforts by private companies to make and market products from biosolids are also more common now.

Over the past 20 years, biosolids management practices have changed significantly, moving from disposal toward more beneficial use. Beneficial use of biosolids such as land application is continuing to rise. When polled by BioCycle (Goldstein. 1997), 30 states indicated that beneficial use rates will increase and more biosolids will be land applied in the future.

15. *Metro has no capability of removing toxic metals. The toxic metals will end out in the sludge in Deer Trail if there is no inorganic removal process at the Metro plant.* T 41

The water that will be piped from Lowry to Metro will not contain high levels of toxic metals. Metro will monitor these metals as required in the pretreatment permits to ensure that the treatment processes at Metro are capable of handling the Lowry Site water. We assume the commenter is referring to heavy or trace metals, which are typically understood to mean the fifth line and below on the periodic table, and include mercury, arsenic, and cadmium. The water will contain high levels of chlorides and sulfates (not considered toxic metals), contaminants that will be removed or reduced at the Metro facility. The levels of metals will be below the levels required in the pretreatment permits for discharge of water to the sewer system (See Executive Summary - Human Health, Environmental, and Biosolids Concerns).

16. *Are you denying that there's plutonium, americium, tritium, strontium, cesium and cerium in the landfill?* T 45

Plutonium, americium, tritium, strontium, cesium, and cerium (types of radionuclides) have all been detected in various media at the Lowry Site, but at levels that do not pose a risk to human health or the environment. These radionuclides are present as part of the spectrum of background radionuclides that exist in the environment primarily due to past atmospheric weapons testing. They are present in soils and other media not only at the Lowry Site, but in most areas of the country at variable concentrations. The National Council on Radiation Protection and Measurements has published two reports (NCRP, 1987a; and NCRP, 1987b) that provide general information on the concentrations and doses associated with background radionuclides in the United States and Canada. Specific data on concentrations of plutonium, americium, tritium, strontium, cesium, and cerium and the Lowry Site (including background locations) can be found in the Draft Baseline Risk Assessment Sitewide Risk Issues (EPA, 1993).

17. *Are you claiming that there are measurable levels of plutonium in the ground water, in the background throughout the Denver Metropolitan area?* T 46

Detectable levels of plutonium have been measured in ground water from background samples in the Denver metropolitan area. While it is possible to detect plutonium in ground water and soils from background areas, this does not mean that there is a potential health threat associated with such low level detections. There are measurable quantities of chemicals and radionuclides other

than plutonium in ground water in the Denver area, and in all other ground-water systems in the United States.

EPA has established standards for drinking water that limit the concentrations of chemical and radiological contaminants in drinking water to levels that are safe for human consumption. These are called maximum contaminant levels or MCLs. For radionuclides, EPA has established a performance standard of 15 pCi/L for alpha-emitting radionuclides (excluding uranium and radon). The ROD (EPA, 1994a) also establishes performance standards for beta and photon emitters americium-241, cesium-134, lead-210, plutonium-238,-239, and -240, potassium-40, radium-226 and -228, strontium-90, thorium-228, -230, and -232, tritium, and uranium-234, -235, and -238. These are the performance standards that must be met before water can be sent from the Lowry Site to Metro's POTW.

18. *One particle of plutonium can cause cancer.* T 47

It is mathematically impossible to either confirm or refute such a statement since the process of cancer initiation is not understood sufficiently well at the molecular level to determine exactly what specific event starts a cancer cell growing. It is misleading to state that one particle of plutonium can cause cancer and that has not been confirmed in any scientific studies. Based on our current understanding of biological repair mechanisms, it is also highly unlikely. What we do know is that radiation can cause cancer at high doses and dose rates. Because plutonium is a radioactive substance, it is considered a human carcinogen. We know from the many studies of human populations exposed to high levels of radiation that there is an increased chance of getting cancer as radiation dose is increased. However, there is no evidence to support an assertion that one particle of plutonium can cause cancer, or that per millirem (mrem) of dose, plutonium is a more potent carcinogen than any other radionuclide (Health Physics Society, 1995).

Radioactive materials are capable of causing health effects (including cancer) because they emit energy in the form of radiation. It is this radiation that actually causes cell or tissue damage and helps to initiate a cancer. Cancer may occur after sufficient energy (dose) from radiation has been received by a tissue or organ to cause events such as unrepaired DNA strand breaks or formation of oxidizing agents that cause additional cellular damage. Under certain conditions, these events may lead to initiation of a tumor. The amount of dose is the critical point in assessing whether or not a health effect (cancer or other) is likely to occur. This is true for all radioactive materials, including plutonium.

We are all exposed to radiation every day of our lives. On average, we receive approximately 360 millirem (mrem) per year of radiation dose in the United States. For perspective, the lowest doses in the studies that have shown a correlation between radiation exposure and cancer have been on the order of 1,000 to 20,000 mrem. Based on the results of these human and animal studies, there is continued scientific debate on whether or not there is a safe threshold level of radiation exposure. Some scientists feel that there is sufficient evidence to show that there is a level of radiation exposure below which no health effects occur. Until such theories are proven,

current regulatory limits are based on the assumption that there is an increase in risk for every increase in dose, no matter how small. Rulemaking efforts are designed to limit increased risk to levels that typically range from one additional cancer in a population of one million people (10^{-6}), to a few cancers in a population of 10,000 people (10^{-4}).

19. *We understand that Lowry Landfill is part of the Lowry bombing range. Do you also understand that Lowry Landfill was built on top of a former chemical warfare testing area?* T 49

The Lowry Landfill Superfund Site was once part of the Lowry Bombing Range. The Lowry Site was not part of a former chemical warfare testing area. A history of the Lowry Bombing Range can be found in the:

- Master Work Plan, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado (COE, 1997)

- Archives Search Report, Findings, Buckley Field, Arapahoe County, Colorado (COE, 1995)

These reports can be found at the Aurora Public Library, at the EPA Superfund Records Center, and at CDPHE.

The following statement is found in the Master Work Plan for the EE/CA (Engineering Evaluation/Cost Analysis): "Although the ASR (Archive Search Report) stated that possible CWM (Chemical Warfare Material) (including bombs and agent identification sets) was used at Former Buckley Field, a more thorough search of the historic use of CWM conducted by CEHNC (United States Army Engineering and Support Center, Huntsville) indicates that the most likely use of CWM was only in the camp 2 area (within the Lowry Training Annex)." The Lowry Training Annex is several miles from the Lowry Landfill Site (see Figure 1).

20. *Can the Metro plant effectively treat the toxic wastes as they come in and are treated and put into the Platte River? I'm concerned about whether or not, as the Platte goes up towards Deer Trail, the communities up there that are engaged in agricultural pursuits will have toxic wastes in their area. And, if so, I feel it will be a tragedy.*

What is the evidence as of this date and is the accuracy of this evidence verifiable? Where are the studies? Who has them? T 51

The pretreated Lowry Site ground water will not be toxic waste. Metro can effectively treat the pretreated Lowry Site ground water. Metro will establish pretreatment standards, pursuant to the Federal Pretreatment Program, that will require Metro to maintain compliance with its discharge permit. This means that Metro will not allow wastewater to come to its facility that is not

treatable with the existing processes, or that has chemicals at high enough concentrations to inhibit treatment (i.e., would be toxic to the activated sludge system), or that could not be adequately treated to meet discharge standards.

An evaluation of Metro's capabilities to treat pretreated Lowry Site ground water may be found in the document entitled "Evaluation of the POTW Treatment Option," (Parsons ES, 1996). In addition, the Metro POTW has been successfully treating wastewater from other industrial sources for many years. Historical records of Metro's operation are available at EPA's offices.

21. *I had a couple questions concerning the first and second ESDs [Explanation of Significant Difference] specifically referring to levels of contamination in the ground water. We were wondering how those levels were decided upon because there is significant change from first numbers and second numbers, and we didn't quite understand how those were determined.* T 51

The First ESD (August 1995) corrected several performance standards that were listed in the ROD (EPA, 1994a). These corrections include:

- If a MCL or Colorado Basic Standard for Ground Water (CBSGW) exists, then the MCL or CBSGW was used instead of a risk-based performance standard.
- If a performance standard was less than background values, then the performance standard was changed to be equal to the background value.
- If a performance standard was less than the practical quantitation limit (PQL--the limit at which a laboratory can measure a compound), then the performance standard was changed to be the PQL.
- Typographical errors and duplication of compounds were corrected.

A complete copy of the First ESD can be found in the Records Center. A complete copy of the Second ESD can be found in Attachment F.

22. *We need to consider all of the separate entities that are going to be contributing to Metro's sewage sludge.* T 52

Under the terms of its permit, Metro is responsible for evaluating all wastewater to be received for treatment. The purpose of these evaluations is to ensure that its facility is capable of treating the wastewater effectively. The National Pretreatment Program regulates industrial waste discharges to municipal sewer systems (see Executive Summary - Human Health, Environmental, and Biosolids Concerns). The Metro Board has determined that its facility is capable of treating the Lowry Site ground water, while still meeting the requirements of their

NPDES permit, which allows it to discharge treated water. Metro's operation is regulated by both EPA and CDPHE.

23. *In the draft definition of the POTW treatment option there is mention of ASARCO - the ASARCO plant that would be a part of the contributors to Metro and a part of the sewage sludge that would eventually then be going out to the people of Deer Trail.* T 52

The ASARCO site is not mentioned in the Lowry Landfill POTW treatment evaluation document. ASARCO was party to a de minimis settlement at the Lowry Site. However, we are not sure what is being referred to in this statement. A request for clarification was sent to the commenter, but a response was not received.

24. *There was a study done by CH2M HILL that found plutonium in 100 percent of the soils samples taken from ASARCO - is the facility of Metro adequate to be treating such things as plutonium that will be going out to the people of Deer Trail.* T 52

It is not clear which study is being referred to in the first part of this question. Several attempts were made to contact the commenter in order to obtain a clarification of the question. To date, the commenter has not responded to EPA's inquiries. CH2M HILL has not taken any samples from the ASARCO site in Denver.

25. *What are Metro's limits for plutonium?* T 54

26. *Shouldn't you have conclusive evidence that there isn't plutonium in there before you let this plan go through?*

T 56

Since Metro has not yet developed a standard for plutonium, Metro is evaluating the pretreatment limit for plutonium. The Lowry Site ROD (EPA, 1994a) establishes performance standards for radionuclides, including plutonium. If radionuclides are detected at unacceptable levels, the concentrations will be reduced to pretreatment standards or ROD performance standards before the water is discharged to Metro.

In response to public concerns about the possible presence of radionuclides at the Site, an additional evaluation of the radionuclide data from the Lowry Site ground-water database was performed. This evaluation is presented in Attachment C and is based on the sitewide ground-water quality database, which contains more than 2,900 records of speciated radionuclide data. In addition, this database contains another 933 records of gross alpha and gross beta data for ground water. Based on the information in this database, EPA and CDPHE believe that the Site

has been sufficiently characterized with respect to radionuclides to adequately assess the potential impacts to human health and the environment.

27. *There could be significant difference region to region in an MCL. The people in Deer Trail, that county could have a different MCL than Denver and Aurora. Is that correct?* T 61

MCLs are federal standards set by EPA under the Safe Drinking Water Act and are the standards that drinking water supplies must meet. These standards are enforced nationally and do not vary from region to region.

In addition, the CDPHE is not precluded from setting a ground-water standard that is more restrictive than the corresponding Federal MCL. Some State standards for ground water do vary based upon the classification of a particular **aquifer** or the establishment of site-specific standards. Any given State standard must be at least as protective as the corresponding federal standard.

28. *Sewer systems leak all the time. So these contaminants that are going through the sewer systems underneath Aurora on their way to the Metro treatment plant are going to leak out into the soil and eventually into the ground water. You are going to have utility workers who are going to work on these sewers. The utility workers are going to be exposed to this stuff.* T 68

There is the possibility that a sewer might break or leak over time; however, there is no additional exposure risk from the pretreated Lowry Site ground water. The concentrations of contaminants in the water being released from the Lowry Site will meet the pretreatment standards established for Metro's POTW. The POTW's pretreatment standards for nonhousehold discharges are considerably more protective of the environment than are the standards for the raw household sewage that is in the sewer. Lowry Site water will not add to the risk sewer workers already encounter simply by working around raw sewage.

29. *The Metro workers themselves who are going to have to handle this stuff that they haven't had to handle before have absolutely no protection. They are not covered by OSHA, period.* T 69

Congress has determined that State and local governments, like Metro, are not subject to OSHA regulations. While the Metro workers are not covered by OSHA, they are covered by Metro's Chemical Hygiene Plan (MWRD, 1997a). EPA has reviewed this plan and found it to be as comprehensive as a plan that would be required under OSHA.

30. *The bottom line is - what are the risks for transporting the Lowry hazardous substance through the sewer system. There is no federal regulation that says EPA or the Colorado State has to do any risk assessments for the people in Aurora or anywhere along that pipeline. All they have to do is a risk assessment on the Lowry Landfill for people who won't even live there for 10 or 20 years from now. There's no regulation that says they have to do a human health baseline risk assessment for the Metro workers, the people that are going to work with this stuff, and treat it. This is a bad idea, there is a $1 million difference between doing all the treatment on-site or pumping it through the Metro system.* T 70

The ground water from the Lowry Site does not meet any of the characteristics of a hazardous waste (ignitability, corrosivity, reactivity, and toxicity). Once the ground water is pretreated to the pretreatment limits, the water will then be regulated under the NPDES Program of the Clean Water Act (1977, as amended).

The pretreatment standards were developed to minimize the risk of transportation of wastewater through the Metro system. Pretreated ground water from the Lowry Site will pose no more, and very probably less, hazard to people in Aurora or to Metro workers than the existing sewage that is already in the system.

A risk assessment is not required for adding to the waste stream already in the sewer system when the added material meets the pretreatment standards. Metro is responsible for evaluating all of the wastewater it receives for treatment to ensure that its facility is capable of treating the wastewater effectively. The National Pretreatment Program regulates industrial waste discharges to municipal sewer systems (see Executive Summary -Human Health, Environmental, and Biosolids Concerns).

Additionally, while the Metro workers are not covered by OSHA, they are covered by Metro's Chemical Hygiene Plan (MWRD, 1997a). EPA has reviewed this plan and found it to be as comprehensive as a plan that would be required under OSHA if Metro was a private entity.

31. *Dr. Ed Demos, Division Director of Environmental Services for the Department of Environmental Health, City and County of Denver, has a room full of studies relating to the Lowry Site. Since 1980 millions of dollars have been spent studying the site. The data are available for review in his office.* T 71

The comment is noted.

32. *A commenter has reviewed the documents and was concerned that the plutonium issue is not satisfactorily addressed.* T 72

See responses to Comment #5, 6, 7, 8, 16, 17, 18, 24, 25, 26, 57, and 59.

33. *What about the studies that show that crops such as wheat and corn do take up heavy metals into the grain and the kernels of corn? What impact will the sludge shipped out to Deer Trail have on these crops?* T 72

We are not sure what studies are being referred to in this question. A request for further information was sent to the commenter, but we have not received a response. Table ES-2 shows the impact the pretreated Lowry Site waters will have on the Metro biosolids (Executive Summary - Human Health, Environmental, and Biosolids Concerns). Because the impact of the Site waters on the biosolids is so low, we expect to see no significant changes in the quality of biosolids going to Deer Trail.

34. *Are crop plants from Deer Trail where the sludge is applied going to be sold on the market, and will consumers be informed where our corn and wheat come from?* T 72

Crops from Deer Trail where biosolids are applied may be sold on the market. Biosolids from municipal wastewater treatment plants are applied to cropland across the United States and in many foreign countries. In the United States, EPA has established regulations for biosolids that are applied to croplands. The quality of the biosolids must meet specific numeric criteria to ensure protection of human health and the environment. These criteria are listed in Attachment A. Metro produces "exceptional quality" biosolids as defined in these regulations and meets the criteria for biosolids placement on croplands. Products made from crops that have been grown on land that received biosolids applications are not required to be marked. (See the Executive Summary - Human Health, Environmental, and Biosolids Concerns)

35. *A commenter said that he had a series of studies that show that plants do take up metals from the soil.* T 73

We are not sure what specific studies are being referred to in this question. A request for further information was sent to the commenter, but no response was received. Nevertheless, EPA and CDPHE are aware that there is evidence that plants take up metals from soil. The numerical standards for metals established in the Clean Water Act Part 503 Rule (EPA's biosolids regulations) take into consideration the uptake of metals by various crops. These standards are established conservatively to prevent unacceptable levels of metals from being taken up by crops and to prevent human exposure by more than a dozen other potential pathways.

Table ES-2 shows the impact the pretreated Lowry Site waters will have on the Metro biosolids (Executive Summary - Human Health, Environmental, and Biosolids Concerns). Since the impact of the Site waters on the biosolids is so low, no significant changes in the quality of biosolids going to Deer Trail are expected.

36. *If we have these metals being taken up into our crops, are these metals going to enter our food web?* T 73

Yes, metals taken up into crops can enter the food chain. Again, EPA has established regulations for biosolids that are applied to croplands. The quality of the biosolids must meet specific numeric criteria to ensure protection of human health and the environment. These criteria are listed in Attachment A. Metro produces "exceptional quality" biosolids as defined in these regulations and meets the criteria for biosolids placement on croplands.

37. *Sewage sludge has increased levels of heavy metals.* T 73

Sewage sludge has heavy metals in it. Whether or not these levels are "increased" when compared to background depends on the particular heavy metal. Studies done at Colorado State University (CSU) over the past 14 years show that copper and zinc concentrations in the crops can be increased when biosolids are added to the cropland. Other heavy metals studied do not cause increased concentrations in the crops. The existing standards for biosolids do provide protection for human health and the environment.

38. *The studies I see show increases in cadmium, nickel, and copper also.* T 74

We are not sure what studies are being referred to in this question. A request for further information was sent to the commenter, but we have not received a response.

39. *Are we going to be informed about where these crop plants are going to be sold if they are going to be sold in our area?* T 76

No tracking of the crop plants produced on land enhanced with biosolids is currently required. The biosolids produced by Metro have received a rating of "exceptional quality" by Federal and State regulators and the quality of the biosolids will not be impacted by the addition of pretreated Lowry Site waters (see Executive Summary - Human Health, Environmental, and Biosolids Concerns). Because the biosolids are approved under existing regulations for application to farmlands and gardens, no tracking of the crop plants is currently required, nor are there labeling or other requirements.

40. *The sewage sludge issue has been going on for over a decade. At one time they leased ground from the farmers and convinced the farmers that the sludge would be good fertilizer, now they are unable to lease any more ground so Denver is buying 50,000 acres to put sludge on. Sludge will continually be produced and the new ground will wear out and where the additional sludge will be placed. Sludge is not good fertilizer, it*

doesn't produce good crops. Therefore it's hard to even give it away to a farmer. If the sludge is put on the ground, kids and cows may eat it. T 77

Metro has never leased ground from farmers. Until Metro began acquiring the property near Deer Trail, Metro applied all but about 5 percent of its biosolids to privately owned farmland and charged farmers $3 per acre to apply the biosolids. The 5 percent that was not land applied was turned into Class A compost. Metro still applies about 40 percent of its biosolids to privately owned farmland and still charges $3 an acre. There are a number of farmers on Metro's biosolids application waiting list.

Biosolids will be produced as long as wastewater is cleaned using the technology available today and in the foreseeable future. Biosolids do not wear out the ground. On the contrary, biosolids provide organic material and nutrients the soil needs to help it produce crops, increase tilth and soil structure, and reduce or prevent erosion. Biosolids actually help rebuild soil by adding organic matter, macronutrients, and micronutrients.

Many people say that biosolids make an excellent fertilizer. Biosolids provide farmers with $60 to $160 per acre worth of fertilizer value, including a host of essential nutrients and micronutrients that are frequently not provided in commercial fertilizers. In the case of Metro's biosolids, each dry ton contains about 25 pounds of available nitrogen, smaller amounts of phosphorus and potassium, and about 1,200 pounds of organic matter. Many of eastern Colorado's soils are deficient in organic matter. Consequently, biosolids help to repair and improve the soils by adding organic material. As for crops, biosolids have been shown to increase yields and, in dryland wheat, protein content. In general, yields in good soils do not increase as dramatically as they do in poor soils, which show as much as a 100 percent increase in yield after application of biosolids.

EPA has been studying biosolids for well over 25 years. The 40 CFR Part 503 Regulations (EPA's biosolids regulations) are based on the results of extensive multimedia risk assessment. As part of the development of the 40 CFR Part 503 Regulations, EPA conducted a risk assessment that evaluated 25 pollutants and 14 pathways of exposure. One of the risk scenarios found that if a person ate biosolids-amended soil every day for 70 years, that person would have a one-in-ten-thousand chance of possibly contracting a disease. Farmers do not typically let children or cattle roam on freshly fertilized fields. Metro restricts access to its property for 30 days after application of biosolids and has posted and fenced its property to prevent public access. Even if casual contact with biosolids-amended soil were to occur, the chance of one or two such exposures causing harm is immeasurably small.

41. *There is already a lot of garbage distributed on the ground out there, what are you going to do with what is already on the ground? How are you going to undo that problem? Because intrinsically government agencies react, they don't act to prevent.* T 78

CDPHE investigated this allegation and found no evidence of "garbage distributed on the ground out there." Metro's wastewater treatment process includes screening and skimming as well as a grinding operation just prior to undigested solids entering the digester. Any material remaining in the solids at the point of grinding comes out of the grinders approximately the size of a fingernail. Nevertheless, if, in the future, it is determined that garbage has accumulated in the area as a result of Metro's operations, Metro will be required to clean it up.

The 40 CFR Part 503 Regulations (EPA's biosolids regulations) are, in fact, designed to prevent problems from occurring.

42. *How long is this site in Deer Trail going to be used? How much sludge is going to be dumped, and at what point under existing regulations will it be determined that the Deer Trail site isn't healthy? Are you going to just move to another patch in eastern Colorado, or are we finally going to come up with solutions?* T 79

Biosolids are not being "dumped" at Metro's Deer Trail site. Crops are being planted at the site and the biosolids are being applied at **agronomic rates**. Therefore, although biosolids are being land applied at the site, no dumping is occurring. The original estimate when the land was purchased was that the site would be able to be used for land application for more than 100 years. But because 40 percent of Metro's biosolids are being applied on privately owned land, the site can actually be used for land application well in excess of the planned 100 years, although it is difficult to say precisely how much longer that would be.

As for how much biosolids will be land applied, that is also difficult to say, because the amount to be applied depends on the crop that will be grown next. Assuming dryland wheat will be the dominant crop, the agronomic rate for dryland wheat is one to two dry tons per acre, and the application would take place only every other year. Also, some of the land will not have biosolids applied to it because of buffer strips, setbacks, and other erosion-control measures.

Metro monitors the soils at its applications sites before, during, and after application to ensure that none of the metals of concern are becoming concentrated in the soil and too much nitrogen and other nutrients are being applied.

Land application of biosolids is the best, most environmentally friendly solution to what society should do with the mostly organic, nutrient-rich solids that result from treating sewage at a POTW. More that 25 years of science went into the 40 CFR Part 503 Regulations (EPA's biosolids regulations) to show that land application is safe for people, animals, and the environment. Only two other "solutions" are currently available: incineration and monofilling (surface disposal). Incinerating biosolids (1) wastes a resource that has proven environmental and economic value and (2) may not be possible in areas such as Denver where there already are air quality attainment problems. Monofilling (landfilling) biosolids concentrates nutrients such as nitrates which, when properly managed, provide fertilizer value to the soil. However, when concentrated too highly, they can leach into ground water and pollute it. It should be noted that

monofilling is cost-competitive with or even less expensive than land application in many areas, but many communities have decided to land apply and reuse this resource despite the potential cost savings of monofilling.

43. *Look into a study presented in the New Scientist magazine regarding levels of cadmium in sheep livers after the sheep grazed on grass fertilized with sewage sludge.* T 79

The New Scientist magazine article (Coghlin, 1997) entitled "Lamb's Liver with Cadmium Garnish" was published on March 22, 1997. The article reported that one research effort had determined that cadmium levels were elevated in livers from lambs grazing on pasture land where biosolids are used as fertilizer in the United Kingdom. The pretreated Lowry Site ground water will not affect the "exceptional quality" standard for cadmium in the Metro biosolids (see Executive Summary - Human Health, Environmental, and Biosolids Concerns). Metro biosolids meet Federal and State standards in the United States.

44. *A 30-day extension is requested.* T 79

In response to public requests, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended over 90 days.

45. *How much have the responsible parties paid into a fund to rectify the problem at the Lowry Landfill, this includes the private settlement litigation. What is the ballpark estimate of the difference between the cost of the on-site treatment versus the off-site treatment?* T 80

EPA was not a party to the private contribution litigation taken by Denver, WMC, and CWM against other responsible parties at the Site. The court has sealed all settlement documents that describe the amount of settlement monies paid to Denver, WMC, and CWM for the Site cleanup and EPA does not have access to those documents. The estimated 30-year cost, including capital costs and annual operation and maintenance (O&M) costs for the sitewide remedy in the ROD, is $93,848,000. EPA's costs to date (including contractor costs) are approximately $27 million. It is estimated that the Responsible Parties have spent between $40 and $70 million on remedial costs (including costs reimbursed to EPA).

As a part of the Second ESD evaluation, estimated capital and O&M costs of Alternatives 1 and 2B were compared. Net present worth costs were estimated by adding the capital costs to the net present value of the annual O&M costs for 30 years, using an interest rate of 5 percent. The net present worth cost for Alternative 1 (the POTW option) is estimated at $6,354,000. This

includes capital costs for a lift station, piping, excavation and construction, the sewer connection fees, design and construction management costs, O&M costs, equipment repair costs, POTW treatment fees, and water augmentation costs.

The net present worth cost for Modified Alternative 2B was estimated at about $9,300,000. This includes capital costs for the reverse osmosis system, an iron removal system and an evaporation system, design and construction management costs, O&M costs and water augmentation costs.

46. *I see from going through the public record that there is a citizens group of residents that are near the landfill that has a technical assistance grant to evaluate Lowry issues. What is their position on this issue and are they not here tonight?*

Didn't CLLEAN recommend modified Alternative 2 (on-site treatment of inorganic and organic contaminants) over Alternative 1(the POTW option)? T 83

The Superfund law provides for **Technical Assistance Grants** (**TAG**) to be awarded to groups in communities affected by a Superfund Site. The purpose of these grants is to encourage informed public involvement in decisions at Superfund Sites. In October 1995, a TAG was awarded to the Citizens for Lowry Landfill Environmental Action Now (CLLEAN). This grant is being used to fund reviews and analyses by technical experts of the remedial design and construction at the Lowry Site.

CLLEAN's consultant, Summit Technical Services, reviewed the evaluation of potential treatment options prepared by the City and County of Denver, Waste Management of Colorado, Inc., and Chemical Waste Management, Respondents to the Administrative Order for Remedial Design/Remedial Action. The Respondents' Report is titled, Draft Evaluation of the POTW Treatment Option (Parsons ES, 1996). After reviewing this report, CLLEAN recommended modifications to Alternative 2B (onsite treatment for organics and inorganics, onsite discharge of treated water by injection into the aquifer and offsite disposal of evaporator sludge). CLLEAN proposed the following modifications to Alternative 2B:

- Two-stage reverse osmosis system for near complete recovery of the treated water to eliminate injection water augmentation;
- Recycle the steam that would be generated by the evaporator through a heat exchanger to pre-heat the incoming water stream; and
- Use the recovered water to augment the wetlands program.

CLLEAN endorsed Modified Alternative 2B and expressed concerns that the concentrations of contaminants in Lowry ground water might increase to levels above POTW influent standards. CLLEAN submitted comments on the Second ESD and these comments are included in Volume II.

Representatives from CLLEAN did not attend the public meeting held on April 2, 1997.

47. *We represent about 90,000 members across the United States. Our members work in toxic industries. It is not a subject that we are unfamiliar with. We think there are serious, serious problems with your proposal, not only problems from the vantage point of the worker, certainly problems with in the agricultural areas with the farmers.* T 84

EPA recognizes the commenters' concerns. All work performed by the Parties to the RD/RA Order (EPA, 1994b) is done under the strict oversight of EPA and CDPHE. The Parties will be required to prepare detailed remedial designs that must be reviewed and approved by EPA and CDPHE. In addition, the construction and operation activities will be conducted in accordance with rigorous quality assurance/quality control requirements and will be observed by EPA and CDPHE. The Parties will be required to develop a compliance monitoring program to assure that the remedy complies with the performance, or cleanup, standards established in the ROD (EPA, 1994a). EPA and CDPHE will make sure the proposal will comply with all Federal and State regulations to minimize impact to the agricultural community.

48. *There is an inextricable connection between how OCAW [Oil, Chemical, and Atomic Workers International Union, AFL-CIO] workers have been treated at the Metro's Reclamation District and how the public will be treated under this proposal.* T 84

There is absolutely no connection whatsoever between OCAW's relationship with Metro and EPA's efforts to be protective of human health and the environment. This includes EPA's commitment to public involvement. Labor disputes between OCAW and Metro are a separate issue that should be directed to the Department of Labor and will not be addressed in this responsiveness summary.

49. *Is Metro licensed as a hazardous waste treatment plant?* T 84

Metro is not a permitted hazardous waste treatment facility under the Resource Conservation and Recovery Act of 1976, as amended (RCRA). The POTW is regulated under the Clean Water Act (1977, as amended).

50. *Is it correct that the water leaving the Lowry Landfill is not being considered hazardous?* T 85

Yes. The ground water from the Lowry Site does not meet any of the characteristics of a hazardous waste (ignitability, corrosivity, reactivity, and toxicity). Once the ground water is pretreated to the specified limits in a pretreatment permit from Metro and discharged to the POTWs, then the water will be regulated under the NPDES Program of the Clean Water Act

(1977, as amended) (See Executive Summary - Human Health, Environmental, and Biosolids Concerns).

51. *Is there going to be a boundary wall placed around the Site?* T 85

Yes, a containment, collection, and diversion system is currently being built along the east, south, and west boundaries of the Lowry Site. This subsurface boundary system (soil/bentonite slurry wall) will extend from the ground surface and is keyed two feet into the unweathered Dawson formation, which ranges in depth from 45 to 74 feet. The purpose of the boundary wall is to prevent clean ground water from entering the Lowry Site and becoming contaminated. The boundary wall will also help prevent contaminated ground water from leaving the Site.

52. *This stuff is all mixed together in Lowry Landfill. You've got all this hazardous toxic waste and they are all together. Inorganics, organics all mixed in together. Heavy metals, chemical wastes, radioactive whatever. How can the inorganics and the organics be treated if they are all mixed up together? Do you first separate the inorganics and organics from the water on-site and then treat them? Or do you treat them all when they are all mixed? How is that effective? How can you separate the inorganics from the organics? Is that effective treatment? And, then, how are they separated if you are going to separate them? If you are not going to separate them, is it effective if they are not going to be separated?* T 87

A wastewater treatment plant is designed in segments, or process units. These process units treat wastewater using physical, chemical or biological processes. Different process units target different compounds. Some units treat inorganic compounds, while others treat organic compounds or a combination of inorganic and organic compounds.

Waters that contain both inorganic and organic contaminants can be treated effectively. A wastewater containing both inorganic and organic contaminants flows through a process unit that removes one or more target compounds. The remainder of the wastewater (and untreated contaminants) passes through the next process unit that removes one or more additional target compounds. This continues as the wastewater goes through each process unit in the treatment plant until all of the target compounds have been treated. For example, if wastewater has **semivolatile organic compounds** such as pentachlorophenol, and inorganics such as chlorides, then the pentachlorophenol could be removed in a granular organic carbon unit, while the inorganics would pass through the unit. Then a precipitation or ion exchange unit could be added to remove some inorganics.

Wastewater treatment plants are, therefore, comprised of a number of process units that are sequenced to achieve the desired degree of treatment (called a flow scheme). Unit processes that target a specific compound or group of compounds allow other nontarget compounds to pass. If nontarget compounds interfere with a unit process, then they are removed first, or a new unit

process is selected. Testing occurs during treatment at any POTW to ensure that the treatment process is producing water that meets the requirements of the discharge permit.

The Metro facility has been designed to treat wastewater from the Denver Metropolitan area. Consequently, the flow schemes employed are capable of handling a wide variety of compounds. Wastewater sent to Metro comes from private homes, businesses, and industries throughout the area. Wastewater from domestic sources (homes) may often contain a wide range of hazardous chemicals, including such common household products as laundry bleach, Drano™, Tilex™, EasyOff™, and Vanish™. Metro's POTW is capable of treating such chemicals if they are present in the waste stream.

53. *Does Metro have a proper facility to treat the inorganics left over after treatment?* T 89

Yes, Metro meets the standards of its discharge permit with regard to treating inorganics in the water and in the sludge.

54. *Is there an agreement between Denver and Metro regarding the raw sewage that was dumped into Lowry and what they were going to pay for that? Metro originally placed the sewage sludge on site and now you're going to send this waste back to Metro?*

So why did the EPA, who originally called the Metro a responsible party and called the waste from Metro hazardous, why is the EPA now condoning Metro's treatment of waste, which could appear not to be adequate since they generated hazardous waste to begin with. T 91

Metro has been designated a PRP at the Lowry Site because of surface disposal of wastewater sludge that occurred at the Lowry Site from 1969 through 1986. Approximately 160 acres along the northern and eastern boundaries of Section 6 were used for surface disposal of wastewater sludge. The sludge was applied to the surface and then incorporated into the soils. The material that was surface disposed was sludge from the treatment process and not raw sewage or biosolids.

Metro's responsibility at the Lowry Site was triggered because of the location of its sludge disposal rather than because of any inherent hazard posed by Metro's sludge. Once a problem to be addressed under CERCLA is identified at a site, then any party that generated waste containing any amount of hazardous substances is liable under CERCLA without any need to prove that the waste actually caused the need for the remedy. Metro's sludge by itself would not have required clean up at Lowry; when combined with the liquid industrial wastes containing large amounts of hazardous substances, clean up became necessary.

The treatment process used during the time period when the sludge was applied at Lowry was different than the process Metro currently uses. Additionally, the National Pretreatment Program

was not in effect prior to 1986, so the wastewater coming into the Metro facility had higher levels of contaminants than the wastewater currently accepted into the Metro facility.

EPA is recommending the POTW option because it is the most technically feasible, cost-efficient, protective, and reliable option. Pretreated ground water from the Lowry Site would contain only materials that Metro is already permitted to receive and is currently handling safely and reliably. The pretreated ground water discharged to Metro would meet stringent requirements that have been designed to assure protection of public health and the environment. The biosolids produced by Metro have been given the highest rating under Federal and State standards and are classified as "exceptional quality." The "exceptional quality" status of the biosolids produced by Metro would not be affected by the Lowry water (see Executive Summary - Human Health, Environmental, and Biosolids Concerns). These biosolids are approved for application to farmlands and home gardens. Water discharged to the South Platte River will also be required to meet all Federal and State standards. To be safe, the pretreated ground water from the Lowry Site and all discharged waters will be carefully monitored to make sure that all standards are met.

55. *Are you going to be monitoring the water coming out of Lowry?* T 92

Yes. The pretreated ground water leaving the Lowry Site will be monitored by Metro for many constituents. EPA and CDPHE will ensure that all parameters listed in Table 11-2 of the ROD are monitored. The contaminated water collected at the Lowry Site will initially be tested before entering the onsite treatment plant, will be monitored at various locations within the onsite treatment plant, and will be monitored prior to discharge to the sewer system.

56. *Is Metro going to be monitoring for chemical compounds* T 92

Metro will be monitoring for chemical compounds in its effluent as required by its permits. In addition, Metro will obtain influent information from industrial dischargers that send wastewater to the POTW.

57. *Are you going to be monitoring for plutonium?* T 92

Radionuclides, including plutonium, will be monitored in the effluent from the Lowry Site. There are performance standards in the ROD (EPA, 1994a) for gross alpha, gross beta, and a host of radionuclides. The monitoring program will initially test for gross alpha and gross beta levels. If these standards are determined to be exceeded, then speciation will be performed to evaluate which radionuclide(s) is present in the sample. Speciation is the identification of specific radionuclides contributing to the overall radioactivity within a sample.

58. *What about if the sewer backs up and the chemicals come up through people's basements and people's yards and things like that? Are you prepared for that kind of emergency?* T 92

Although it would be unrealistic to assume that sewer lines never break or leak, the presence of pretreated Lowry ground water in the wastewater stream within the sewer systems will pose no additional risk to the public or the environment. First, concentrations of contaminants in the pretreated Lowry ground water will meet Metro's pretreatment standards. Second, these pretreatment standards for nonhousehold discharges are more protective of the environment than are the standards for raw household sewage discharges. Third, pretreated Lowry ground water will not increase the risks posed to the public or the environment.

59. *Can you clarify the requirements of the discharge permit? Does the permit address the plutonium problem?* T 93

The discharge permit for the Lowry Site will include standards for gross alpha, gross beta, and specific radionuclides. Discharge permits are written to establish monitoring requirements for specific compounds at a specified frequency. The monitoring program has been established based on many factors, including the potential to exceed a standard based on historical data.

60. *Are we going to have citizen monitors there as well to monitor that everything is fair and square?* T 94

There is a TAG that has been awarded to CLLEAN for this purpose.

61. *It appears that EPA is trivializing the tiny amount of waste that's going into the sewer system and, yet, what I believe the public should understand is that this proposal is for this trickling to go on for 30 years.* T 95

At this time, it is not possible to estimate how long the pretreated Lowry Site ground water will continue to be treated at the Metro facility. Therefore, in order to evaluate the cost of the proposed treatment alternatives, EPA used a 30-year time-frame. The POTW option for treating ground water is one component of a comprehensive sitewide remedy outlined in the Lowry Site ROD (EPA, 1994a).

As specified in Section 121(C) of CERCLA, as amended by **SARA** (referred to as the Superfund Law), and Section 300.430 of the National Contingency Plan, EPA will review the sitewide remedy at least every five years after initiation of the remedial action. The purpose of the five-year review is to assure that the remedy continues to be protective of human health and the environment and that all aspects of the remedy are functioning as designed.

An additional reason for this review is to evaluate whether the cleanup standards in the ROD remain protective or whether changes to these standards may be required. EPA will continue these reviews until no hazardous substances, pollutants or contaminants remain at the Lowry Site above levels that allow for unrestricted use and unlimited exposure. The actual timeframe for treatment will depend on monitoring results.

62. *Will Lowry Landfill ground water be sent to and go into Metro for 30 years?* T 95

If selected, the POTW remedial option will be in operation for as long as there is contaminated ground water being recovered at the Lowry Site. At this time, it is not possible to predict exactly how long it will take before all the contaminated ground water at the Lowry Site is treated.

63. *Why is some of the Metro effluent information confidential?* T 96

None of the Metro effluent information is confidential. It is all available at the Water Quality Control Division of CDPHE, second floor, Building B, 4300 Cherry Creek Drive South, Denver, Colorado 80246, (303) 692-3500. For effluent (discharge) information contact Ennio Daniels at (303) 692-3604, and for a computer printout of effluent information (a monetary charge may apply for computer-generated printouts) contact Leslie Simpson at (303) 692-3611.

64. *I just want to point out that the EPA has a pathetic record of doing enforcement on NPDES permits in this region. You allowed Martin Marietta to dump rocket fuel into a public water supply for many years without a cent fined against them until people were dead. There are numerous areas at issue where the EPA has totally abandoned its requirement under law to enforce the law.* T 98

This comment refers to Martin Marietta and the Friendly Hills lawsuit. This lawsuit was brought against Martin Marietta alleging that waters from Martin Marietta were polluting the Friendly Hills water supply. The lawsuit was dismissed in 1990 because there was no link found between Martin Marietta waters and the water supplied to the homes in the Friendly Hills community.

Metro has had an exemplary record since 1990 of meeting its discharge limits and no enforcement action has been required to be taken against it.

With regard to the Lowry Site, EPA has faithfully and diligently implemented CERCLA, and has consistently demonstrated an unwavering commitment to protecting human health and the environment.

65. *OCAW requested information regarding risk analyses at the Lowry Landfill Site on November 19, 1996. Bob Hite, the [Metro] District Manager, responded that no risk*

analyses had been performed. Metro has refused to provide information about site characterization studies. If they won't respond to OCAW, they won't be straight with the public. T 102

All information regarding site characterization and risk assessments is available to the public at the EPA Superfund Records Center and the Aurora Public Library. In addition, OCAW has been provided copies of the following documents from the City and County of Denver:

- Draft Baseline Risk Assessment, Shallow Ground-Water and Subsurface Liquids and Deep Ground-Water Operable Units (EPA, 1992a)
- Baseline Risk Assessment, Landfill Solids and Landfill Gas Operable Units, Soils and Surface Water and Sediment Operable Units (EPA, 1992c)
- Draft Baseline Risk Assessment, Sitewide Risk Issues (EPA, 1993)
- CERCLA Site Discharges to POTWs, Guidance Manual (EPA, 1990b)
- Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors (EPA, 1992b)

66. *The polluter amnesty law in Colorado allows for secrecy regarding pollution.* T 103

The polluter amnesty law in Colorado has two parts: a privilege for environmental audits; and, immunity for certain disclosure of regulatory violations. The privilege for environmental audits does not extend to reporting that is required by applicable law, regulation, permit, or order. The privilege can be lost or waived in a number of ways. The immunity is only for monetary penalties. The law does not take away the regulators' ability to issue orders, require actions or otherwise limit their authority. Criminal immunity is not available for intentional criminal acts.

67. *Metro, in 1989, had a $1 million fine for violating the Clean Water Act, which was the largest fine ever leveled against a municipal sewage district under the act. Where is the safety net margin there?* T 103

The monetary fine that was issued to Metro eight years ago was for a number of smaller violations that were wrapped into a single fine. In the last seven years, Metro has only been out of compliance once (eight minutes for a release of chlorine due to equipment malfunction). Consequently, EPA believes that Metro has a good record of compliance and is able to safely, reliably, and effectively treat wastewater.

68. *OCAW wants to see the worker protective studies. They haven't been shown to us if they exist. Everybody said they exist. However we've asked to see them, and Metro has said they don't exist.* T 103

The studies that have been done to date are available at the EPA Superfund Records Center and the Aurora Public Library. For a listing of the studies, please see the response to comment #65. In addition, the pretreatment standards established by Metro are protective of worker safety by complying with the "Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors" (EPA, 1992b).

69. *I believe that this POTW proposal is unprecedented. If this country moves toward allowing all the Superfund wastes to go into wastewater facilities because it's a loophole that allows that material to be spread across the land that otherwise would have to be disposed at a hazardous waste site under different standards, that is something you haven't addressed. It is a reality that Metro is under different, less strict, standards than private industry. Refineries, chemical plants cannot spread across the land the stuff that Metro is doing now. It's a loophole of the law.* T 104

70. *As far as we are concerned, this loophole is allowing some of the largest industrial corporations in Colorado, some of the most powerful interests in Colorado, to put their wastes in a loophole situation, and then the sludge is a solution they are going to spread across the farmlands, put it in the South Platte, expose the workers. It's a bad idea.* T 104

The POTW proposal is not unprecedented. There are at least 32 Superfund sites in the United States that send contaminated water to a POTW for treatment. Attachment B contains a table showing the site name, location, date of ROD, type of liquid sent to the POTW (i.e., ground water or leachate), contaminants of concern, and whether or not the POTW land applies its biosolids.

An EPA guidance document entitled "CERCLA Site Discharges to POTWs" (EPA, 1990b) is used when evaluating whether or not wastewater from a Superfund site may be sent to a POTW. This guidance document is intended to ensure that, when use of a POTW is considered as a possible cleanup option, each evaluation is performed in a consistent manner. In EPA Region 8 (Colorado, North Dakota, South Dakota, Wyoming, Utah, and Montana), there are several Superfund sites that discharge contaminated water to a POTW, including:

- Old Minot Landfill - Minot, North Dakota
- Utah Power and Light - Salt Lake City, Utah

Industrial discharges to POTWs, in this case to the Metro Wastewater Reclamation District, are allowed with pretreatment under the federal Clean Water Act, as amended, 33 U.S.C. Section

1251 et seq. , and regulations promulgated pursuant to the Colorado Water Quality Control Act, as amended, section 25-8-101 C.R.S., 1973, et seq. Such discharges that are in compliance with Federal and State regulations do not represent a "loophole" in the law. Regulation Number 63, Pretreatment Regulations (5 CCR 1002-63), includes strict requirements for POTWs to obtain approval for pretreatment programs. Each POTW with an approved program is required to submit annual reports including, among other requirements, an updated list of the POTW's industrial users with their compliance status and a summary of actions taken by the POTW to ensure compliance with pretreatment requirements. The requirements under these regulations allow Metro to maintain the quality of its discharge and the biosolids produced.

Metro is not under less strict discharge standards than private industry, and this proposal is not a "loophole" in the law. All discharges to surface water in the State of Colorado are regulated under Regulation 61 (5 CCR 1002-61), the Colorado Discharge Permit System Regulations. Application of biosolids is regulated under Regulation No. 64 (5 CCR 1002-64), Biosolids Regulation, and the Federal Clean Water Act (1977, as amended) Part 503 Regulations. These regulations contain requirements and standards that have been developed to protect human health and the environment. The regulatory requirements are the same for industrial discharges and POTWs alike, and do not provide special consideration or "loopholes" for any individual discharger. Metro is held to the same standards as any industry under the Colorado Discharge Permit System (CDPS). In fact, because of the size of Metro's discharge, it is required to monitor more frequently for some parameters. CDPS discharge limits for Metro's effluent are intended to be protective of the South Platte River, into which the discharge flows, and the downstream water uses. Regulatory limits for Metro's biosolids are intended to protect public health and the environment when the biosolids are applied as a soil amendment for crops.

The pretreated Lowry Site ground water to be discharged to the sewer system will not have the characteristics of a hazardous waste (ignitability, corrosivity, reactivity or toxicity). The incorporation of pretreated ground water from the Lowry Site into the wastewater stream to be treated by Metro will have no measurable effect on Metro's discharge to the South Platte River and will not affect the "exceptional quality" status of the biosolids produced by Metro.

71. *How long has waste water been disposed of in POTWs at Superfund Sites?* T 105

POTWs have been accepting wastewater from Superfund sites since before 1990. There are at least 32 Superfund sites across the country that have been identified as sending contaminated water to POTWs for treatment. The first EPA policy memorandum on this subject, entitled "Discharge of Wastewater from CERCLA Sites into POTWs" (EPA, 1986), may be found in the EPA Superfund Records Center.

An EPA guidance document, entitled "CERCLA Site Discharges to POTWs" (EPA, 1990b), is used when evaluating whether or not wastewater from a Superfund site may be sent to a POTW. This guidance document ensures that, when use of a POTW is considered as a possible cleanup option, each evaluation is performed in a consistent manner. In EPA Region 8 (Colorado, North

Dakota, South Dakota, Wyoming, Utah, and Montana), there are several Superfund sites that discharge contaminated water to a POTW, including:

- Old Minot Landfill - Minot, North Dakota
- Utah Power and Light - Salt Lake City, Utah

TABLE 1
CHARACTERIZATION OF SITE WASTEWATER
LOWRY LANDFILL SUPERFUND SITE
REMEDIAL DESIGN

Chemical [a]	Performance Standard [b] (µg/L)	PQL [c] (µg/L)	WTP Average Influent [d] (µg/L)	Early Warning [e] (µg/L)	North Toe Influent [f] (µg/L)	Total Influent [g] (µg/L)
Organics						
1,1-Dichloroethane	990.00		384.86	705.84	815.89	471.07
1,1-Dichloroethylene	7.00		179.74	322.03	117.60	167.31
1,1,1-Trichloroethane	200.00		653.28	887.78	109.23	544.47
1,1,2-Trichloroethane	3.00		4.93	38.01	46.25	13.19
1,1,2,2-Tetrachloroethane	0.089		19.94	0.83U	46.25U	25.20
1,2-Dibromo-3-Chloropropane	0.20					
1,2-Dichlorobenzene	600.00		0.50U	5.17U	107.5U	21.9U
1,2-Dichloroethane	0.40	1.00	22.22	54.25	607.89	139.55
1,2-Dichloroethylene (cis)	70.00		694.17	485.50		555.34
1,2-Dichloroethylene (trans)	100.00		1.16	1,951.16	62.67	13.46
1,2-Dichloropropane	0.56	1.00	4.05	42.83	45.50	12.93
1,2-Diphenylhydrazine	0.05				10U	2.0U
1,2,4-Trichlorobenzene	70.00			6.67U	107.5U	26.84U
1,2,4,5-Tetrachlorobenzene	2.00	10.00		10U	10U	10U
1,3-Dichlorobenzene	620.00		0.50U	5.17U	107.5U	21.9U
1,3-Dichloropropene (trans)	87.00		0.50U	0.83U	46.25U	9.65U
1,4-Dichlorobenzene	75.00		0.50U	5.17U	107.5U	21.9U
2-Butanone (MEK)	780.00		100U	15U	559.38	191.88
2-Chlorophenol	0.10			6.67U	107.25	26.79
2-Hexanone	-		50U	8.0U	102.00	60.40
2-Methylnaphthalene (total PAHs)	0.0031			10U	107.5U	29.5U
2,3,7,8-TCDD (dioxin)	0.0000002	0.20			0.00U	0.00U
2,4-D (dichlorophenoxyacetic acid)	70.00			5.5U	614.38	127.26
2,4-Dichlorophenol	21.00	50.00		6.78	145.25	34.47
2,4-Dinitrophenol	14.00	50.00		41.67U	662.5U	165.84U
2,4,5-TP (trichlorophenoxypropionic acid)	50.00			9.97	12.63	10.50
2,4,6-Trichlorophenol	2.00	50.00		6.39	108.50	26.81
4-Methyl-2-Pentanone (MIBK)	780.00		50U	6.5U	1,093.50	258.70
Acetone (2-Propanone)	1,600.00		100U	12.5U	1,183.75	316.75
Alachlor	2.00					
Aldicarb	3.00	10.00		2.15	1.0U	1.92
Aldicarb Sulfone	2.00	3.00		3.96	1.0U	15.37
Aldicarb Sulfoxide	4.00	20.00		2.75U	1.0U	2.4U
Aldrin	0.002	0.10		0.05U	0.04U	.048U
Atrazine	3.00					
Benzene	5.00		4.24	8.04	964.25	196.24

TABLE 1 (Continued)
CHARACTERIZATION OF SITE WASTEWATER
LOWRY LANDFILL SUPERFUND SITE
REMEDIAL DESIGN

Chemical [a]	Performance Standard [b] (µg/L)	PQL [c] (µg/L)	WTP Average Influent [d] (µg/L)	Early Warning [e] (µg/L)	North Toe Influent [f] (µg/L)	Total Influent [g] (µg/L)
Benzidine	0.0002	10.00		50U	840U	208U
Benzo(a)anthracene	0.10				107.5U	21.5U
Benzo(a)pyrene (PAH)	0.20				107.5U	21.5U
Benzyl alcohol	-			15U	107.5U	33.5U
Bis(2-chloroethyl)ether	0.03	10.00		8.33U	107.5U	28.16U
Bis(2-ethylhexyl)phthalate	6.10	10.00	5.00U	7.60	12.16	8.45
Bromodichloromethane (Trihalomethane)	0.30	1.00	0.50U	0.83U	46.00	9.60
Bromoform	4.00		0.50U	0.83U	47.25	9.85
Carbazole	-			10U	9.25	9.85
Carbofuran	36.00		10U	2.75U	2.50	2.70
Carbon Tetrachloride	0.30	1.00	0.50U	0.83U	46.25U	9.65U
Chlordane	0.03	1.00		0.41U	0.38U	0.40U
Chlorobenzene	100.00		0.50U	0.83U	75.75	15.55
Chloroethane (Ethyl chloride)	-		1.00U	8.56	89.63	18.73
Chloroform (Trihalomethane)	6.00		38.43	1.70	59.72	42.69
Chlorophenol	0.20					
Dalapon	200.00			10U	1.30U	8.26U
DDT Metabolite (DDE)	0.10			0.08U		0.064U
DDT (4,4' DDT)	0.10			0.08U	0.08U	0.08U
Di(2-ethylhexyl)adipate	400.00					
Di(2-ethylhexyl)phthalate	6.00	10.00				
Di-n-Octylphthlate	-		10U	8.33U	107.5U	29.5U
Dibenzofuran	-			10U	107.5U	29.5U
Dibromochloromethane (Trihalomethane)	14.00		0.50U	0.83U	46.50	9.70
Dieldrin	0.002	0.10		0.05U	0.08U	0.056U
Dinoseb	7.00			0.50U	2.5U	0.9U
Diquat	20.00					
Endothall	100.00	115.00				
Endrin	0.20			0.05U	0.05U	0.05U
Endrin Aldehyde	0.20			0.06U	0.70U	0.19U
Ethylbenzene	680.00		0.50U	0.83U	103.31	21.06
Ethylenedibromide	0.05			500U	0.03U	400U
Fluoranthene	188.00			8.33U	107.5U	28.16U
Glyphosate	700.00					
Heptachlor	0.008	0.05		0.05U	0.16	0.07
Heptachlor Epoxide	0.09			0.05U	0.04U	0.048U
Hexachlorobenzene	1.00	10.00		8.33U	107.5U	28.16U

TABLE 1 (Continued)
CHARACTERIZATION OF SITE WASTEWATER
LOWRY LANDFILL SUPERFUND SITE
REMEDIAL DESIGN

Chemical [a]	Performance Standard [b] (µg/L)	PQL [c] (µg/L)	WTP Average Influent [d] (µg/L)	Early Warning [e] (µg/L)	North Toe Influent [f] (µg/L)	Total Influent [g] (µg/L)
Hexachlorobutadiene	1.00	10.00		7.50U	107.5U	27.5U
Hexachlorocyclohexane, Alpha	0.006	0.05		0.05U	0.06	0.05
Hexachlorocyclohexane, Gamma (Lindane)	0.20			0.05U	0.24	0.09
Hexachlorocyclopentadiene	50.00			10U	107.5U	29.5U
Isophorone	1,050.00			6.67U	107.5U	26.84U
Methoxychlor	40.00			0.08U	0.38U	0.14U
Methylene Chloride (dichloromethane)	5.00		2.0U	53.20	375.94	76.79
Naphthalene	63.00			6.37	107.75	26.65
Nitrobenzene	3.50	10.00		7.33U	107.5U	27.36U
Oxamyl (Vydate)	200.00			2.80U	1.0U	2.44U
PCBs	0.005	1.00		0.41U	0.38U	0.40U
Pentachlorobenzene	6.00	10.00		10U		8.0U
Pentachlorophenol	1.00	50.00		28.33U	828.50	188.36
Phenanthrene (total PAHs)	0.0031			8.33U	107.5U	28.16U
Phenol	300.00			5.0U	2,934.13	590.83
Picloram	500.00					
Simazine	4.00					
Styrene	100.00		5.0U	1.50U	46.25U	13.25U
Tetrachloroethylene	5.00		56.54	91.95	84.23	62.08
Toluene	1,000.00		0.30U	0.83U	1,303.60	260.96
Toxaphene	0.03	5.00		0.40U	.75U	0.47U
Trichloroethylene	5.00		33.86	75.60	133.50	53.79
Vinyl Chloride	2.00		1.25	107.74	89.25	18.85
Xylenes (total)	10,000.00		0.92	1.0U	516.75	104.09
Inorganics						
Aluminum	5,000.00		46.96	28.1U	486.63	134.89
Antimony	6.00		10U	2.75	151.43	38.29
Arsenic	50.00		5U	5.78	187.28	41.46
Asbestos (fibers/l)	30,000.00					
Barium	1,000.00		28.14	544.28	3,509.82	724.48
Beryllium	4.00		1.0U	1.44	4.43	1.69
Boron	750.00				653.87	130.77
Cadmium	5.00		5.0U	4.79	12.52	6.50
Chloride	250,000.00		862,500.00	977,500.00	4,122,083.33	1,514,416.67
Chromium (as Cr VI)	50.00		200U	0.05U		160U

TABLE 1 (Continued)
CHARACTERIZATION OF SITE WASTEWATER
LOWRY LANDFILL SUPERFUND SITE
REMEDIAL DESIGN

Chemical [a]	Performance Standard [b] (µg/L)	PQL [c] (µg/L)	WTP Average Influent [d] (µg/L)	Early Warning [e] (µg/L)	North Toe Influent [f] (µg/L)	Total Influent [g] (µg/L)
Chromium (total)	50.00		5.0U	84.07	11.97	6.39
Cobalt	50.00		5.0U	24.01	29.97	9.99
Coliform (total)/ 100 ml	1.00					
Color, color units	15.00					
Copper	200.00		8.88	11.97	45.28	16.16
Corrosivity	non-corrosive					
Cyanide	200.00			20.00	26.20	21.24
Fluoride	2,000.00		0.50U	4,350.00	1,306.67	261.73
Foaming Agents	500.00					
Gross Alpha (pCi/l)	15.00		31.90	51.81	20.33	29.59
Gross Beta (pCi/l)	150.00		26.59	44.47	55.79	32.43
Iron	300.00		16.80	30,543.67	32,422.24	6,497.89
Lead	15.00		30U	23.88	13.72	26.74
Manganese	50.00		36.06	6,854.67	4,154.75	859.80
Mercury	2.00			0.11	0.38	0.16
Nickel	100.00		29.35	306.13	99.25	43.33
Nitrate as N	10,000.00		55,000.00	2,810.00	6,600.05	45,320.01
Nitrate & Nitrite as N	10,000.00			90.03	15,105.25	3,093.1
Nitrite as N	1,000.00					
pH	6.5 to 8.5		7.55	6.92	6.91	7.42
Selenium	10.00		32.47	4.20	1,008.81	227.74
Silver	50.00		4.0U	5.0U	22.33	7.67
Sulfate	250,000.00		576,000.00	1,752,500.00	1,297,291.67	720,258.33
Thallium	2.00			400U	12.77	322.55
Vanadium	100.00		3.0U	44.87	80.24	18.45
Zinc	2,000.00		110.35	102.20	56.96	99.67

[a] Compounds listed in Table 11-2 of Record of Decision (ROD), from the August 1995 Explanation of Significant Differences (ESD).

[b] ROD Table 11-2 performance standards (from ESD).

[c] PQL = Practical quantitation limit (from ESD).

[d] Average of data from sample port SP-01 at onsite water treatment plant.

[e] Average of data from early warning monitoring wells A-115, MPZ-1, and MW-EW-1.

[f] Average of data from north toe monitoring wells A-105, GW-111, GW-112, and U-712.

[g] Data calculated using average water treatment plant influent at 8 gpm, and average north toe influent at 2 gpm; early warning data were used if data were not available at SP-01.

Shading indicates concentration of total influent in exceedance of ROD performance standards.

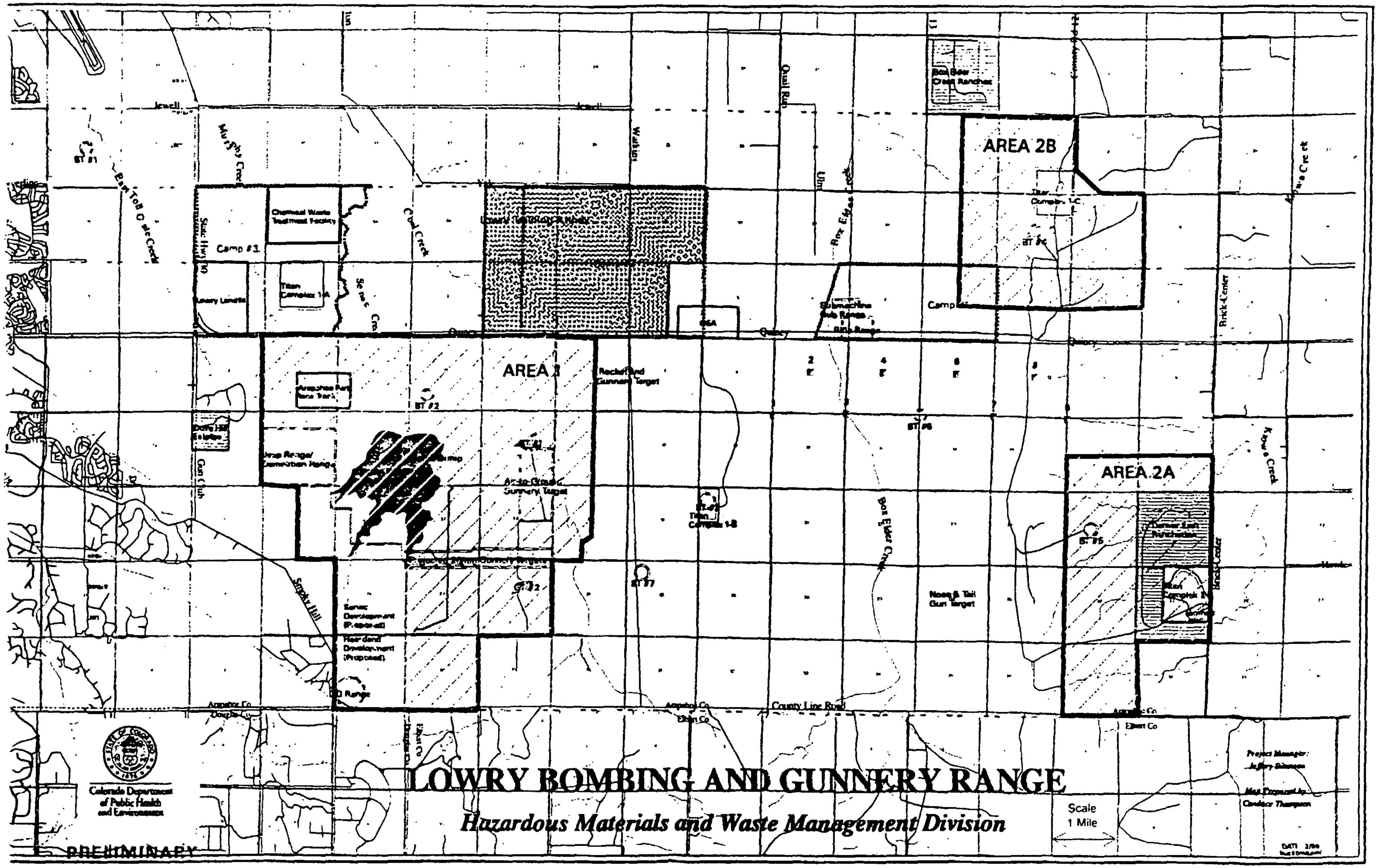
LOWRY BOMBING AND GUNNERY RANGE
Hazardous Materials and Waste Management Division
AREA 1
AREA 2A
AREA 2B
Colorado Department of Public Health and Environment
Scale
1 Mile
PRELIMINARY
County Line Road
Quincy
Jewell
Box Elder Creek
Smoky Hill

FIGURE 1

Response to Type A Letters

Commenters who signed these letters state that they do not want Lowry Landfill Superfund waste added to Metro sludge, do not want plutonium in their food, air and water, and do not want future generations contaminated by this.

The ground water from the Lowry Site would be pretreated to meet Federal and State standards. These standards are safe and designed to protect public health and the environment.

There is no evidence to indicate that plutonium was dumped at the Lowry Site. EPA has a responsibility to protect human health and the environment. Even though radionuclide contamination does not appear to be evident, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water will not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

Response to Ward Hollingsworth's Comments on the Type A Letter

This stuff not only affects us, but our livestock, deer, antelope, fish, and other wildlife. I don't know about anybody else but there (is) a good share of us that live out here that like to hunt and fish and I don't want that heritage gone forever! People depend on the land to survive so don't screw it up.

The treated sludge from Metro (called biosolids) will be analyzed to make sure it continues to meet all necessary Federal and State standards. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.) These standards are designed to protect human health and the environment, including wildlife. Based on available research, EPA and CDPHE expect to see no harmful effects on area wildlife and see no reason to expect any change in local hunting and fishing activities as a result of this proposal.

Response to Diane Lee's Comments Included on the Type A Letter

This is an outrage and I will be protesting loud and long. I refuse to have our area turned into another Love Canal. This is not wanted in our neighborhood. If there is no threat to our health, leave it in Aurora --we do not want it out here.

The proposal to send pretreated ground water from the Lowry Site to Metro is designed to clean up a Superfund site, not create a new Superfund site. The material from the Lowry Site, after pretreatment onsite and then additional treatment at Metro, will meet Federal and State standards and will pose no threat either to human health or the environment. Metro provides fertilizer to

people and organizations throughout the Denver metropolitan area for use on home gardens, parks, and golf courses. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

Response to Kent Lee's Comments Included on the Type A Letter

We have every intention of using whatever means necessary to protect our community from possible risk regardless of the government's assertion that all solid waste is safe. We don't trust you or our government to protect our interests.

As a POTW, Metro is designed and equipped to safely and reliably handle wastewater from industry, cities, and households, treating and/or removing the harmful materials present in wastewater. Biosolids, which are a byproduct of the wastewater treatment process, can be used beneficially as fertilizer. In addition to numerous government studies, industry and academic research has shown the benefits of applying biosolids as fertilizer and reducing the ever-increasing pressure on our nation's landfills. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

Response to Joseph O'Brien's Comments Included on the Type A Letter

I do not feel that sludge should be dumped on any ground as there are other alternatives though costly in monetary standards, but less costly in long-term health for ourselves and the land we ask to feed and support us.

The comment is noted. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals in the pretreated Lowry Site ground water will be lower than the concentrations in typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids land application activities.

Response to Charles Vest's Comments Included on the Type A Letter

I do not understand why the EPA would authorize adding as much as 39 parts per million of plutonium or toxic chemicals when several foreign nations allow much less, one as low as 1 part per million or less according to CNN news broadcast. I am also very concerned about the possibility of this sludge especially with this plutonium and toxic chemicals being added polluting our underground water which serves the communities of Watkins, Bennett, Strasburg, Byer, Deer Trail and Agate and also what it may do to much of northeastern Colorado and the state of Nebraska when it is channeled into the Platte River which flows through northeastern Colorado and the State of Nebraska.

Please refer to "A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule" (EPA, 1995). This EPA document discusses the differences between chemical standards in the United States and standards from other countries and describes why the differences exist (e.g., dietary reasons, differences in soil types, differences in crop types, etc.).

Before proposing the POTW option, EPA and CDPHE evaluated the available research and scientific data on this subject and concluded that pretreatment of the Lowry ground water onsite with additional treatment at Metro's POTW was the best of the available options. EPA and CDPHE believe Metro and Aurora can safely, reliably, and effectively treat the ground water to meet Federal and State standards.

As part of the Lowry Site cleanup project, EPA and CDPHE conducted detailed reviews of all information available on the wastes disposed at the Lowry Site. No plutonium or other toxic chemicals from the Lowry Site will be added to the waste stream at the Metro and Aurora POTWs. To be extra safe, EPA and CDPHE will monitor the water leaving the Lowry Site using an "early warning system." This system will alert EPA and CDPHE Site managers to unusual levels of constituents in the wastewater, allowing them to remove and/or treat these materials as necessary to continue to protect human health and the environment.

Metro and Aurora will be required to meet the standards set out in its discharge permit. This permit requires the discharge to be protective of downstream uses of the water, including those in northeastern Colorado and the State of Nebraska. Any biosolids that are applied to lands near Deer Trail will be required to continue to meet EPA's "exceptional quality" criteria, and, therefore, will not pollute underground water.

Response to John Vest's Comments Included on the Type A Letter

I received a reply letter from your office of the E.P.A. in Denver in regards to my first letter. It escapes my comprehension how the E.P.A. can ever consider such a project as this. I remember when Lowry landfill was closed down. It was

considered one of the worst toxic and radioactive contaminated sights in the Nation. Now all of a sudden the contaminated water is considered by the E.P.A. as being completely safe to send through a sewer plant instead of a toxic waste plant and the sludge dumped at Deer Trail and the water dumped into the Platte river. Which in time could and would pollute our water supply at Deer Trail as well as Byers, Strasburg and Bennett. Also the water dumped in the Platte would effect a good portion of Northeastern Colorado and Nebraska. Common sense tells me or anyone else for that matter, it should stay where its at.

Ground water from the Lowry Site will be pretreated onsite to remove contaminants in order to meet pretreatment standards before it is sent to the POTWs for further treatment. After onsite treatment, the water that will be discharged to the sewer system will not have any of the characteristics of a hazardous waste (ignitability, corrosivity, reactivity or toxicity). It will be sent to the wastewater treatment plants to remove any remaining pollutants to meet Federal and State water quality standards. These water quality standards, and the standards for biosolids application, are designed to protect public health and the environment. EPA and CDPHE regulate the POTWs to ensure that the effluent meets the water quality standards before being discharged and to ensure that biosolids meet regulatory standards before they are applied to farmland as a fertilizer. Mixing the pretreated Lowry Site ground water with the wastewater stream treated by Metro and Aurora will have no measurable effect on either Metro's discharge to the South Platte River or Aurora's discharge to Sand Creek. In addition, the "exceptional quality" status of Metro's biosolids will not be affected (sludge produced at the Aurora POTW is piped to Metro for further treatment).

Response to the Type B Letters

Commenters who signed these letters are opposed to adding Lowry Site wastewater to Metrogro sludge coming out to Elbert and Arapahoe Counties. Commenters state there is no plant that can remove the radioactive materials from the water. Commenters also state that the 30-year plan will add tons of sludge daily on wheat fields owned by Metro, and create a build-up of chemicals that will never go away. Commenters note that Metro owns land around the headwaters of the Foxhill Aquifer and above live water that recharges the Foxhill Aquifer. Commenters believe that the live water has already been contaminated by sludge-fertilized debris and note that the aquifer serves the towns of Deer Trail and Byers and hundreds of farms and ranches.

The comment is noted.

EPA and CDPHE agree that wastewater treatment plants are neither equipped nor designed to remove radioactive materials from wastewater. Therefore, EPA and CDPHE will work to ensure that no radioactive materials are sent to the wastewater treatment plants for removal. Historical records and extensive Site sampling show that no appreciable levels of radioactive materials have

been detected in Lowry Site ground water. Nevertheless, EPA and CDPHE are requiring the responsible parties to operate an "early warning system." This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

EPA and CDPHE use "30 years" for planning purposes and for cost-comparisons. At this time, it is not possible to predict exactly how long it will take before all the contaminated ground water at the Lowry Site is treated. The additional amount of biosolids resulting from the pretreated Lowry Site ground water sent to the POTWs for further treatment is quite small. The biosolids will be applied according to strict Federal and State standards. These standards are designed to make sure that biosolids are indeed, safe, for both people and the land. The biosolids currently produced and applied by Metro are of high quality. EPA and CDPHE will carefully monitor to ensure that human health and the environment continue to be protected.

Response to Harvey Crandell's Comments Included on the Type B Letter

The commenter asks, "Do you want to eat the organic foods from this sludge soil?"

Numerous studies conducted by the government, private industry, and universities show that land application of treated sewage sludge (biosolids) is safe and beneficial. Federal and State standards ensure that food is only grown on those biosolids that meet the strictest criteria. Metro's biosolids consistently receive high ratings.

Response to Clara and Harold Hanks' Comments Included on the Type B Letter

Our land that will be affected by this Lowry Landfill waste water added to Metrogro sludge is in third generation ownership and we certainly protest this addition of highly contaminated waste water being added to Metrogro sludge. We would like to see a safer environment for our children, grandchildren, and great-grandchildren.

With the addition of pretreated ground water from the Lowry Site, there will be no distinguishable change in the quality of the biosolids produced by Metro (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA and CDPHE take their responsibility to protect human health and the environment very seriously. We have carefully evaluated all the options for safely and effectively treating ground water from the Lowry Site. The current proposal is safe, reliable, and cost-effective. EPA and CDPHE believe this option will protect the health of this generation, as well as future generations.

Response to Shirley A. Pisel's Comments Included on the Type B Letter

I think it is criminal to have this foisted on us out here. It is bad enough that we have to have the sludge out here. Apparently there is no concern for people out here. We are just a lesser part of your concern.

Please see the response to Mr. and Mrs. Hanks' letter. Now, as always, EPA and CDPHE are available to meet or speak with anyone from the concerned community.

Response to Evelyn Stewart's Comments Included on the Type B Letter

Residents in this Arapahoe County area do not want this waste dumped here.

The comment is noted.

Biosolids are not considered "waste." Biosolids' application to farmland is not considered "dumping." Biosolids are applied only at a rate that will sustain crop growth, and are used as a beneficial alternative to other types of fertilizer. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

Response to the Type C Letter

After looking at a lot of information concerning whether the Metro Wastewater Reclamation District should treat the pretreated groundwater from the Lowry Landfill Superfund Site, I believe you should decide to let the Metro District do it. The Metro District treatment solution looks like it is the best solution from both an environmental and an economic point of view.

The comment is noted.

Response to Type C Letter for the Former Tire Pile Area and the Water Treatment Plant

We are submitting the following comments regarding the proposed Second ESD to the Lowry Landfill Record of Decision. We support the proposed onsite treatment and disposal of the former tire pile materials. We support the proposed POTW option. In light of the new information from recent investigations and proposed changes to the selected remedy, we believe that the remedy remains protective of

human health and the environment, complies with applicable or relevant and appropriate requirements, and is cost-effective. We support the proposed Second ESD.

The comment is noted.

Response to Adrienne Anderson's June 30, 1997 Letter

1. *The Lowry Superfund site groundwater is **mixed waste**, contaminated with both hazardous and radioactive wastes. The EPA region VIII Office, while it is fully aware of these facts, has opted to ignore them.*

The Lowry Site ground water that would be extracted and treated is not a mixed waste. To be considered a mixed waste, a waste must contain both "radioactive waste," as defined in 10 CFR 61, and "hazardous waste," as defined in 40 CFR 261. Water that will be discharged to the sanitary sewer system under the current proposal is neither radioactive nor hazardous. Data collected from ground-water monitoring wells in the area from which ground water is to be extracted show that concentrations of radionuclides are below performance standards for the Lowry Site and within measured background concentrations. Ground-water monitoring will continue to identify any changes in water quality that would necessitate modification of the treatment process.

2. *A large volume of contaminants identified at the Lowry Superfund Site have no regulatory standards set for them. While EPA Region VIII office is fully aware of these facts, it has opted to ignore them.*

There are 58 ground-water chemicals of concern identified in the ROD (EPA, 1994a). Cleanup, or performance, standards were established in the ROD based on applicable or relevant and appropriate requirements (ARARs) for the chemicals of concern as required in EPA's guidance document "CERCLA Compliance with Other Laws" (EPA, 1988a). If there was more than one standard for a particular chemical, then the lowest (most protective) standard was used as the performance standard. For the remaining chemicals of concern that did not have an established standard, other sources, such as proposed standards or guidance, were used to establish the performance standard. In addition, risk-based criteria based on calculations using carcinogenic or non-carcinogenic ingestion doses were used. There are seven chemicals of concern that do not have performance standards in the ROD. These chemicals of concern will be assessed during EPA's 5-year review and if any new regulations, guidance, or risk-based criteria are then available, performance standards will be established.

3. *The EPA Region VIII Office has failed to consider the additive, cumulative and synergistic effects of the combined load of contaminants already known to be present.*

Additive, or cumulative, risk is calculated and presented in the Lowry Site Baseline Risk Assessment documents (EPA, 1992a; EPA, 1992c; EPA, 1993). Uncertainties such as synergistic effects, which are part of the risk assessment process, are discussed in those documents. The purpose of a baseline risk assessment is to estimate potential health risks if a site is not cleaned up. Information produced in the risk assessment is used to make decisions about remediation alternatives and cleanup requirements. The risk assessment process is outlined in EPA guidance documents and publications of the National Academy of Sciences. It provides a consistent basis for documenting public health threats and evaluating risks at different sites.

More detailed information on the risk assessment process as followed for the Lowry Site can be found in:

- Baseline Risk Assessment Shallow Ground-Water and Subsurface Liquids and Deep Ground-Water Operable Units (EPA, 1992a)

- Baseline Risk Assessment Landfill Solids and Landfill Gas Operable Units, Soils and Surface Water and Sediment Operable Units (EPA, 1992c)

- Draft Baseline Risk Assessment Sitewide Risk Issues (EPA, 1993)

4. *The EPA Region VIII Office is fully aware of the fact that land on, contiguous to, and in the immediate vicinity of the Lowry Landfill site (as its boundaries have been defined by EPA Region VIII) was used as a dumping area for hazardous and/or radioactive wastes prior to the time the federal government transferred title to the City and County of Denver in 1964 for use as a municipal trash dump, yet has opted to ignore these facts of record.*

The Lowry Site is located in the southwest corner of the Bombing Range (see Figure 1). There is no evidence that the land on, contiguous to, or in the immediate vicinity of, the Lowry Site was used as a dumping area for hazardous and/or radioactive wastes prior to 1964. The history of the Lowry Site is documented in the ROD and in documents prepared as part of the investigations for the Lowry Bombing Range:

- Master Work Plan, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado (COE, 1997)

- Archives Search Report, Findings, Buckley Field, Arapahoe County, Colorado (COE, 1995)

In addition, Lowry Site remedial investigations document the fact that EPA and CDPHE were aware of the proximity of the Lowry Bombing and Gunnery Range and considered those issues during the remedy selection process. EPA and CDPHE found no evidence (records or analytical confirmation) that hazardous or radioactive wastes related to the Lowry Bombing and Gunnery Range were ever used or disposed at or near the Lowry Site. No unexploded ordnance, or any other wastes indicative of military activity, have been found at the Lowry Site.

5. *The EPA Region VIII Office is fully aware that the area surrounding the Lowry Landfill on the south and east was declared by the federal government's U.S. Army Corps of Engineers in 1995 as a "Probable Catastrophic Risk Zone," due to unexploded ordnance, napalm bomb drops by the Rocky Mountain Arsenal, reported chemical weapons testing and other hazards, yet has used this area to define "background" levels for comparison to contaminant levels inside the presently-defined boundaries for the Superfund site.*

The "Probable Catastrophic Risk Zone" referred to in the comment is located within the Lowry Bombing and Gunnery Range (Bombing Range) property, but is east of the Lowry Site (see Figure 1). The area immediately south of the Lowry Site is where many of the background samples were taken and is outside the boundaries of the Bombing Range. In any event, the catastrophic risk designation pertains to the potential for ordnance to explode and does not have any bearing on ground-water monitoring activities.

Background wells were identified through a careful and detailed process that included an awareness of the location of the bombing range in relation to the Lowry Site. Statistical analyses were used to evaluate the analytical results from the background wells. The purpose of collecting samples from these wells was to evaluate the background concentrations of naturally-occurring inorganic constituents only.

In 1994, the Respondents to the RD/RA Order installed new wells along the western and southern Lowry Site boundaries. These wells are not located on the Bombing Range, have been monitored on a quarterly basis since installation, and have shown similar background concentration results to those wells located at the southern boundary of the Lowry Site. In addition, no ordnance (e.g., bombs) were encountered during dirt-moving activities performed in connection with landfilling operations.

6. *Within the area EPA Region VIII has considered as "background" for Lowry Landfill—both within and just outside the fenceline of the site—are numerous other upgradient sources of contamination, which have been inadequately investigated or completely ignored by EPA Region VIII to date: a) former Titan Missile silos, where Martin/USAF housed nuclear warhead intercontinental ballistic missiles in the early 60's, including the 1A Titan silo immediately to the east of the Landfill; b) roads bordering the Lowry Landfill, including Gun Club Road on the east and Quincy on the*

south, where credible and corroborated eyewitnesses have reported "hundreds" of incidents of indiscriminate dumping of liquid hazardous and/or radioactive wastes by tanker trucks hauling loads to the Lowry Bombing Range and Landfill area.

EPA disagrees that the background samples were taken in areas known to have upgradient sources of contamination.

a. The closest former Titan missile site is more than 1/2 mile east of the site (not upgradient).

b. The report of a single eyewitness of indiscriminate dumping could not be corroborated nor confirmed with sampling. (See response to No. 6 in the transcript or No. 7 below.)

7. *I personally accompanied one such eye witness, retired Colorado State Highway Patrolman William H. Wilson, in February 1990 to the site of such incidents, which he had reported both at the time in the early 60's, and again the 70's and 80's, to various state and federal authorities; including the EPA; c) a former military munitions dump; e) a former military demolition range where several unexploded bombs and other debris have been found in the last year alone by federal officials; and d) other known sources of contamination at the southeastern corner of the Lowry Landfill which EPA Region VIII has completely failed, to date, to examine as contributing sources to Lowry Landfill's extensively contaminated radioactive and hazardous groundwater and other environmental media.*

EPA conducted field investigations that included soil sampling in the areas of alleged dumping. Results from background soil samples along Quincy Avenue show no evidence of surface-exposed or buried bombs or radioactive materials. EPA has no evidence that plutonium or other man-made radionuclides are present in the Site ground water above background levels.

The former highway patrolman's 1977 report of alleged dumping of materials in 1960 and 1961 could not be corroborated by any other witness or by any sampling and analysis. EPA interviewed the former highway patrolman and conducted extensive Site-related research. Based on the accumulated body of information in the Administrative Record, the former highway patrolman's story appears to have no impact on the Lowry Site project.

8. *EPA Region VIII's failure to collect adequate funds for remediation and clean-up from the Department of Defense, Department of Energy and its various contractors in the region, for military-related waste dumping in, around and near the Lowry Landfill site, and inappropriately negotiating sweetheart-deal "de minimis" settlements without local notice to potentially affected citizens, blatantly ignoring clear grounds upon which such settlements should not even been considered.*

The Respondents who are cleaning up the Site under the RD/RA Order are also paying for that cleanup.

The *de minimis* settlements are not "sweetheart deals." Before entering into any *de minimis* settlement related to the Lowry Site, EPA: a) evaluated the eligibility of each PRP within the context of qualifying criteria established in a protocols document; and b) made all proposed settlements available for public review and comment. The *de minimis* protocols document itself was made available for public review before it was finalized for use.

9. *EPA Region VIII's apparent failure, to date, to even contact or adequately consider significant "potentially liable parties" such as Dow Chemical, in its capacity as a former operator at Rocky Flats, with known and/or alleged dumping activities at and near the Lowry Bombing Range and Landfill, and possible other former Atomic Energy Commission contractor(s) and/or agent(s) acting in their behalf.*

Dow Chemical was, in fact, issued a CERCLA 104(e) information request. Dow Chemical provided EPA with a detailed response regarding waste disposal at the Lowry Site. Records indicate that, in its capacity as an operator at the Rocky Flats Plant, Dow Chemical did not arrange to have any waste disposed at the Lowry Site.

10. *EPA Region VIII's stunning and astounding attempts to distort, deny, mislead an/or fail to acknowledge key information related to all of the above, in statements made to the public, local governmental officials, the local, national and international media, and others, all of which warrants investigation by proper oversight authorities, based upon extensive review of the Administrative Record of the Lowry Landfill Superfund Site.*

The Administrative Record is the basis upon which EPA issued the March 10, 1994 ROD (EPA, 1994a) and the First and Second ESDs. Documents contained in the Administrative Record are available for public review. EPA is always willing to meet with any concerned citizen who might wish to learn more about a particular site-specific matter. Given that EPA was not provided any substantive evidence to support the above allegations, EPA can not assume responsibility for misinterpretations of information contained within the Administrative Record.

Response to E. Jordan Asnicar's June 27, 1997 Letter

Another Love Canal Tragedy? Why flush toxic residues dumped at Lowry Landfill into the public sewer?

The POTW option does not involve flushing toxic residues into the sewer. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system.

Concentrations of inorganic chemicals within the pretreated Lowry Site ground water will be lower than for typical industrial discharges.

These toxic residues contain industrial pollutants, spent rocket fuel and even some plutonium.

There is no historical or sampling evidence of plutonium or spent rocket fuel contamination at the Lowry Site. EPA has no evidence that plutonium or other man-made radionuclides are present in the Site ground water above background levels. Even though radionuclide contamination does not appear to be evident, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

Once these pollutants enter a public sewer, the corporations who used Lowry as a dump have no further responsibility or liability.

Under the Superfund law, the liability of any responsible party is not affected by the method of cleanup selected by EPA.

Response to Daniel L. Brotzman's/City Attorney, City of Englewood
March 31, 1997 Letter
and Andrew C. McMinimee's/City Manager, City of Littleton
April 2, 1997 Letter

The City supports the proposed changes to the ROD as set forth in the Explanation of Significant Differences (March 1997) and urges the adoption of those changes.

The comment is noted.

Response to Donn L. Calkins'/Gablehouse & Epel
May 12, 1997 Letter

Gablehouse & Epel represents Cummins Power, Inc., in matters relating to the Lowry Landfill Superfund Site. Cummins has reviewed the proposals put forth in the Second ESD and believes that the remedy remains protective of human health and the environment, complies with applicable or relevant and appropriate

requirements, and is cost-effective. Cummins supports the proposed changes to the ROD contained in the Second ESD.

The comment is noted.

Response to Wil Chase's/President, I-70 Corridor Chamber of Commerce
May 21, 1997 Letter

In response to the proposed "Lowry Landfill Superfund Site Second Explanation of Significant Differences for the Record of Decision" we, as community business members, landowners, and rural residents, request that the public comment period be extended 60 days from May 22, 1997 to end on July 22, 1997, so that we can review the information provided to us in the libraries. We have not had sufficient time to get access to this information, and send our comments to you on this subject.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

Response to Anne Culver's
May 20, 1997 Letter

I strongly protest your idea to allow the addition of Lowry Landfill waste to Metrogro sludge being dumped in Arapahoe and Elbert Counties. I feel this sludge will further contaminate the water supply via the Foxhill Aquifer and should not be allowed.

The comment is noted. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

Response to Frank and Patty Doyle's June 27, 1997 Letter

As concerned citizens along the I-70 corridor east of Aurora, we ask that you take into consideration the possibility of contaminated SLUDGE being distributed in our area on our farm lands. We ask that you follow OSHA regulations as we have to in our health industry and that contaminants be placed in their proper containers and taken to the proper authorities.

Metro applies biosolids as fertilizer on land owned by Metro and on land where farmers have requested and paid for the biosolids. Biosolids are produced when sludge from a municipal wastewater treatment plant is treated to meet regulatory standards. The biosolids will meet all requirements for contaminants specified in the regulations (40 CFR Part 503). It is important to note that biosolids are regulated more than any other fertilizer that is used on farmland -- many fertilizers are not regulated at all. Metro will be required to sample the biosolids to ensure that they continue to meet the requirements specified in the regulations.

OSHA regulations are followed in all instances where they are applicable. However, OSHA does not apply to municipal or State workers, including Metro workers. Metro workers are covered by Metro's health and safety program, which includes a Chemical Hygiene Plan (Metro, 1997a). EPA has reviewed the Plan and found it to be as comprehensive as that required in other industries.

By sending pretreated ground water to Metro for further treatment, the contaminants will be properly managed.

Responses to Joseph Drexler's/OCAW, Special Projects Director June 29, 1997 Letter

1. *The first document, which is attached, consists of a December 13, 1991 letter authored by John D. Faught of the Lowry Coalition of which MWRD was a member at the time the letter was written. Accompanying Mr. Faught's letter was a copy of an evaluation of radioactive wastes at the Lowry Landfill prepared by Harding Lawson Associates, and a letter written by William Wilson on the illegal dumping of radioactive waste from Rocky Flats at the Lowry Landfill. The assertions made in Mr. Faught's letter and in the documents which accompanied the letter include:*

   (1) significant quantities of man-made radionuclides from the Rocky Flats nuclear weapons facility are present at the Lowry Landfill;
   (2) there is evidence of illegal disposal of radioactive material from Rocky Flats at the Lowry Landfill;

(3) levels of Americium 241 and Plutonium 239/240 detected in wells at the Lowry Landfill are 10 to 10,000 times greater than background levels reported for Rocky Flats by EG&G;

(4) the owners and operators of Rocky Flats have significant liability for the dumping at the Lowry Landfill;

(5) any treatment alternatives will result in the generation of hazardous residuals, some of which may contain concentrated levels of radionuclides.

The assertions contained in these documents support OCAW concerns over the existence of significant and dangerous quantities of man-made radionuclides at the Lowry Landfill. Please answer in writing each of these allegations noted above. In addition, please provide copies of any and all EPA correspondence pertaining to the aforementioned letter from John Faught and all of the assertions therein. OCAW has so far been unable to locate a detailed trail of correspondence from EPA pertaining to the assertions raised in Mr. Faught's letter. We find this highly unusual since the assertions made in Mr. Faught's letter were very serious, especially coming from PRPs. Please provide copies of any and all studies conducted to specifically answer of refute the assertions made by John Faught and the Lowry Coalition.

The assertions contained in the above-referenced documents were not adequately substantiated by the Lowry Coalition (Coalition). The Harding Lawson Associates (HLA) memorandum was prepared at the request of the Coalition and was not a part of the remedial investigation process. At the time, EPA did not respond to the 1991 Faught letter because legitimate site evaluations were ongoing. Allegations presented in the 1991 Faught letter were based on an incomplete analysis that did not apply accepted data evaluation techniques. The commenter is reminded that the 1991 HLA memorandum was developed without oversight or review by the EPA and CDPHE.

Evaluations performed subsequent to 1991 have provided a clearer understanding with regard to the presence of radionuclides at Lowry. These evaluations were conducted in accordance with EPA-approved protocols and properly analyzed qualified and coded data, analytical methods, quantitation limits, temporal and spatial data relationships, as well as blank and background data.

For a further discussion of radionuclides, the commenter may wish to read the following documents:

- Remedial Investigation Report, Lowry Landfill: Shallow Ground-Water and Subsurface Liquids, and Deep Ground-Water Operable Units Remedial Investigation and Feasibility Study, Arapahoe County, Colorado, as amended (HLA, 1992a)

- Evaluation of the Data Quality and Occurrences of Transuranic Radionuclides in the Shallow Groundwater and Subsurface Liquids and Deep Groundwater Operable Units Lowry Landfill Arapahoe County, Colorado (HLA, 1992b)

- Draft Baseline Risk Assessment, Sitewide Risk Issues, Lowry Landfill, Volume 2C (EPA, 1993).

Each assertion from Mr. Faught's letter, and the documents accompanying that letter, is responded to below:

(1) There is no evidence to substantiate the claim that man-made radionuclides from the Rocky Flats nuclear weapons facility are present at the Lowry Site as a result of waste disposal activities. The Rocky Flats facility separated transuranic waste (waste with man-made radionuclides) from other industrial waste and disposed of the radioactive waste at authorized facilities in Nevada and Idaho.

(2) There is no evidence of illegal disposal of radioactive material from Rocky Flats at the Lowry Site. Despite extensive investigation of Mr. Wilson's allegations (which included collecting ground-water and soil samples and interviewing Mr. Wilson), EPA and CDPHE were unable to confirm that radioactive material from Rocky Flats was disposed at the Lowry Site.

(3) Levels of americium-241 and plutonium-239/240 were incorrectly compared to background levels reported for Rocky Flats. In an analysis performed by Doty and Associates, entitled "Response to Question 10, CERCLA 104(e) Information Request of April 23, 1992 for Lowry Landfill Superfund Site" (DOE, 1992), it is stated that "In the December 1991 report, HLA flagrantly and incorrectly ignores minimum detection levels (MDLs) and counting errors for the Lowry Landfill data when it compares water transuranic concentration ranges between the Lowry Landfill and the RFP facilities." This report goes on to state that it was inappropriate of HLA to conclude that levels of americium-241 and plutonium-239/240 detected at the Lowry Site are 10 to 10,000 times greater than background levels reported for Rocky Flats by EG&G.

(4) Liability of the owners and operators of Rocky Flats is described in a Lowry Site *de minimis* settlement, which is available for public review.

(5) Treatment residuals will neither result in the generation of hazardous residuals nor contain concentrated levels of radionuclides. EPA will require monitoring of the pretreated water to be piped to Metro using an onsite early-warning ground-water monitoring system This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

2. *Since these assertions concerning the existence of significant quantities of radioactive waste at the Lowry Landfill were made by entities who comprise the Lowry Coalition, including MWRD, and who now support the plan to treat waste from the Lowry Landfill*

at the MWRD sewage treatment plant, please explain in writing from EPA's perspective the series of events and discussions which led members of the Lowry Coalition to support the current plan to clean up the Lowry Landfill. Making knowingly false statements to federal officials is a crime under federal law. If EPA thought the assertions made in the letter from John Faught were false, did EPA attempt to bring any charges against Mr. Faught, MWRD or other entities comprising the Lowry Coalition? If EPA made no attempt to bring charges against Mr. Faught or members of the Lowry Coalition please explaining the reason for EPA's inaction.

Allegations presented in the 1991 Faught letter apparently represent the Coalition's understanding, at that time, of the nature of radioactive contamination at the Lowry Site. Since that time, existing and new information and analyses have been more thoroughly evaluated and have invalidated the Coalition's 1991 claims. The Coalition has updated its impressions accordingly. Such evidence may be found in the Lowry Site remedial investigation reports, baseline risk assessments, and the results of ongoing environmental monitoring at the Lowry Site. While EPA did not concur with the Coalition's 1991 views, it does not follow that the Coalition knowingly made false statements.

3. *The second document, attached, consists of an end log from the Lowry Landfill indicating that radioactive waste from Rocky Flats was dumped at the Lowry Landfill. The third document, also attached, consists of another end log from the Lowry Landfill indicating that highly toxic hydrazine from Martin Marietta was dumped at Rocky Flats.*

The Lowry Landfill File Review Form for Rockwell International (Rocky Flats Plant) contains a listing of all waste streams produced at the Rocky Flats Plant, but not necessarily taken to the Lowry Site for disposal. The column marked "06" is used to indicate whether or not a particular waste was sent to the Lowry Site (Lowry is located on Section 6). Evaporator salts, which are designated as radioactive, were not sent to Lowry ("N" is for no, in the "06" column).

The Rockwell International file review form and 1991 Coalition letter have been touted as evidence that radioactive material from the Rocky Flats Plant was disposed at the Lowry Site. However, waste-hauling records and the results of extensive sampling efforts show that there is no evidence that radioactive waste from Rocky Flats was disposed at the Site.

The commenter may also have misinterpreted the file review forms for Martin Marietta Aerospace (Martin). On the Martin review form, it shows that hydrazine was not disposed at the Lowry Site, and does not indicate that hydrazine was dumped at Rocky Flats.

Site records indicate that Rockwell International disposed of 55,630 gallons of paint sludge, waste oil, and solvent at the Lowry Site. None of these wastes were radioactive.

4. *As an EPA official, you have specifically denied that man-made radioactive materials from Rocky Flats were dumped at the Lowry Landfill. You have also said that no hydrazine from the Martin Marietta facility was dumped at the Lowry Landfill. Please explain in writing the discrepancy between your statements and the official end log documents from the Lowry Landfill.*

There is no discrepancy between statements made by the Lowry Site Remedial Project Manager and information contained in the Administrative Record. Please refer to the previous response for further explanation.

5. *You are undoubtedly aware that there is growing public skepticism of the plan to treat the waste from the Lowry Superfund site at facilities operated by Metro. Attached are resolutions unanimously endorsed by the executive boards of the Colorado AFL-CIO and the Denver Area Labor Federation to "oppose the current plan to treat waste from the Lowry Superfund site at MWRD facility which could result in radioactive material being spread throughout the Denver metropolitan area and in Eastern Colorado, thus endangering the health and safety of the workers and the public at large". OCAW maintains that the Lowry Landfill site has not been adequately characterized and that no one, including the EPA, knows what will be in the toxic soup to which workers and the public will be exposed.*

The pretreated ground water that will be leaving the Lowry Site for further treatment at Metro and Aurora has been adequately characterized. The existing Lowry Site ground-water database contains more than 126,780 analytical records. These records provide more than enough basis for the design and operation of a pretreatment system and for establishing pretreatment requirements. Additionally, the effluent to be piped from the onsite treatment plant will be tested to meet Metro and Aurora's pretreatment program requirements. If the pretreated ground water does not meet the pretreatment requirements, the water will not be sent offsite.

6. *OCAW is deeply concerned about the health and safety risks to MWRD workers. As you are aware, these workers are not covered by OSHA. Currently, the lab workers are not even protected by a collective bargaining agreement due to the intransigence and union busting practiced by MWRD management. Trust and confidence that MWRD District Manager Robert Hite will look after the health and safety of workers in nonexistent.*

Congress has determined that State and local governments, including Metro, are not subject to OSHA regulations. However, while the Metro workers are not covered by OSHA, they are covered by Metro's Chemical Hygiene Plan (Metro, 1997a). This plan is comparable to a plan that would be required under OSHA.

Response to Elmer Dudden's/President, Pleasant View Water and Sanitation District June 19, 1997 Letter

The Directors of the Pleasant View Water and Sanitation District fully support EPA's proposal to have the Metro District treat the Lowry site groundwater.

The comment is noted.

Response to Sharon Estell's June 28, 1997 Fax

It is dangerous enough to allow industrial waste to be spread on farmland but to allow Superfund level toxins to be spread in this manner is unthinkable. The American people are being used as guinea pigs in a scientific experiment of massive scale. The Lowry Landfill Superfund Site has contamination from plutonium, dioxin, PCBs [polychlorinated biphenyls], and other man-made radionuclides that will contaminate our food chain.

The comment is noted. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

There is no historical or sampling evidence of plutonium contamination at the Lowry Site. Current chemical analyses confirm that the pretreated Lowry Site ground water does not contain levels of radionuclides that could accumulate in the sewage sludge. Although radionuclide contamination does not currently appear to be evident, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDHPE if unacceptable levels of radionuclides appear in ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

The pretreated Lowry Site ground water received at the POTWs will be required to meet strict influent standards. In addition, the ground water from the Lowry Site that will be treated by Metro's and Aurora's POTWs will be required to meet cleanup standards in Table 11-2 of the ROD. These tables include dioxin, PCBs, and radionuclides. The pretreated Lowry Site ground

water will not adversely affect the quality of the POTWs' influent. A stringent monitoring program will be implemented to assure that the water is treated to meet State water quality standards and the requirements of the discharge permits.

Response to Patricia Farmer's July 10, 1997 Letter

On June 26, 1997, CNN Moneyline aired a report on the Lowry Landfill Superfund site and the plan to pump ground water from this site to the Metropolitan Wastewater Reclamation District for treatment. In this report, you were quoted as saying: "This is not a precedent-setting proposal. It is being done at Superfund sites around the country."

I am a Colorado citizen and former Denver resident, and have tried to keep informed of toxic cleanups in my state and others. Please send me a list of the other Superfund sites in the United States where the ground water is being treated at municipal sewage treatment plants.

There are at least 32 other sites that have been identified as sending contaminated water to a POTW for treatment. A table that lists the name of the site, location, date of ROD, type of liquid sent to the POTW (i.e., ground water, leachate, etc.), contaminants of concern, and whether or not the POTW land applies its biosolids is included in Attachment B.

Responses to Harry Hanks' May 21, 1997 Telephone Memorandum

Do heavy metals accumulate in the body? Isn't this proposal just going to transfer heavy metals from Lowry to farmland?

Yes, heavy metals can accumulate in the body. The body is capable of processing (i.e., excreting) certain levels of heavy metals. The biosolids regulations (40 CFR Part 503) consider the effects of metals on the body and establish safe levels for heavy metals in the biosolids to be used in crop fertilization. Biosolids have been studied for more than 20 years and EPA believes that the biosolids regulations are conservative.

Metro used to use DIA [Denver International Airport] property to dump sludge?

Metro participated in a reclamation project in 1996 at DIA. In addition, before the land belonged to DIA, Metro applied biosolids in the area of DIA. Metro land applies its biosolids according to the biosolids regulations (40 CFR Part 503).

Between NY and Texas, no one wants sewage sludge?

Biosolids are being used nationwide to reclaim the organic matter and nutrient value of the biosolids. Biosolids are produced in the United States at a rate of 6,856,169 dry tons per year. Of those solids, 55 percent are land applied. In Colorado, 78 percent of the 60,273 dry tons per year of biosolids produced each year are land applied. Land application rates in other states range from 0 percent (Alaska) to 100 percent (Delaware, North Dakota, and Oregon).

Response to the Leslie Hanks/Lucinda Boyd/Bombing Range Environmental Action for Community Health (B.R.E.A.C.H.) May 19, 1997 Letter

Because the citizens of the eastern plains are to be negatively impacted by this dangerous proposal, we request that the comment period be extended another 60 days beyond the current May 22, 1977 deadline.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD lasted more than 90 days.

Responses to M.A. Hanks' May 12, 1997 Letter to Phil Hegeman

1. *I feel it will be a great risk to public health and the environment to flow toxic and hazardous waste materials containing concentrations of plutonium as well as other manmade radionuclides, inorganic and organic contaminants, from the Lowry Landfill Site as indicated at the April 2, 1997 Hearing. As we are aware, the plan is to flow waste from Lowry Landfill through a pipeline which will be connected to the City of Aurora sewer line. This waste will then flow to the Public Owned Treatment Works in Denver (Metro Grow), be mixed with sewage, be treated like sewage, the residue liquids will be dumped into the South Platte River, and the sludge will be transported via trucks traveling over public roads to be spread on farmlands in Arapahoe and Elbert counties in the Deer Trail and Agate Colorado area.*

The Lowry Site ground water that will be discharged to Metro's and Aurora's POTWs will be pretreated and will not have the characteristics of a hazardous waste (ignitability, corrosivity, reactivity or toxicity). During pretreatment, contaminants will be removed to comply with Metro's and Aurora's pretreatment standards. EPA has no evidence that plutonium or other man-made radionuclides are present in the Site ground water above background levels.

Once the water reaches the POTW, it will be treated in an advanced wastewater treatment system. This system includes **primary treatment** (removal of solids by screening, skimming, and settling), **secondary treatment** (microorganisms are used to remove suspended and dissolved organics and chlorination is used to kill pathogens), and **tertiary treatment** for about half of the flow (nitrification and denitrification to remove ammonia). In addition, the solids that are recovered from the secondary treatment system are digested in an oxygen-free environment. The treated sludge, or biosolids, are safe enough to be land applied as fertilizer under 40 CFR Part 503 regulations.

2. *The amount of waste is so enormous at the Lowry Landfill Site that the Colorado Department of Public Health and Environment indicated in the April 2, 1997 Public Hearing that they had estimated it would be a 30-year process to flow ground water containing the waste materials through the pipeline and Aurora City sewer system to Metro Grow. If this type of hazardous waste flows though those sewer systems, flows down the South Platte River, and is spread on farm lands over such a great period of time it will inevitably endanger public health and the environment.*

EPA and CDPHE use a 30-year timeframe for planning purposes and for cost comparisons. It is not possible to predict exactly how long it will take before all the contaminated ground water at the Lowry Site will be treated. With regard to the addition of pretreated Lowry Site ground water to the Aurora and Metro sewer systems, there will be no adverse impacts to the quality of the South Platte River or the quality of Metro's biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). The biosolids will be applied as fertilizer according to strict Federal and State standards designed to ensure that the biosolids are safe for both people and the land. The biosolids currently produced by Metro are rated "exceptional quality." EPA and CDPHE will monitor the process to ensure that human health and the environment are protected.

3. *Such contaminants in the sewer lines would be a health risk to Aurora residents and any workers or others exposed. One example of exposure would be when sewer lines backed up in homes.*

Independent of the Lowry proposal, there is always the potential for sewer workers or home owners to be exposed to raw sewage. The presence of pretreated ground water within the sewer system will pose no additional danger. The pretreated water leaving the Lowry Site will be transported through sewer lines to the Metro and Aurora POTWs. The concentrations of contaminants in the pretreated Lowry Site ground water will meet Metro's and Aurora's pretreatment standards. Pretreatment standards for nonhousehold discharges are designed to be protective of sewer workers.

4. *These liquid residues from the waste dumped into the South Platte River would contaminate the immediate area and flow downstream contaminating water supplies for humans, livestock, and irrigated food crops.*

Treated water that would be discharged to the South Platte River will be required to meet water quality standards established in Metro's and Aurora's discharge permits. Permit levels are set to be protective of the South Platte River, including use as a drinking water supply downstream. The pretreated water from Lowry will have no measurable effect on the water discharged to the South Platte River. (See Table ES-2, Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

5. *Where the sludge would be spread on farmlands in Arapahoe and Elbert counties, there would be great risk to public health and the environment via water run-off from heavy rains and snow which would wash the contaminated dirt, carrying it to human dwellings, water supplies, livestock pastures, and food crops. There would also be great risk when wind storms, common to eastern Colorado, blow the contaminated sludge dirt and spread it by being carrying it through the air.*

In developing pollutant limits for the 40 CFR Part 503 Regulations (EPA's biosolids regulations), risk assessments were conducted to evaluate the possible impacts to human health and the environment. As part of these risk assessments, fourteen potential exposure pathways, including wind and surface water runoff, were evaluated. An exposure pathway is the means by which a person may come into contact with (be exposed to) contaminants in the environment. The regulations and standa : for biosolids, and the soil to which they are applied, are based in part on the results of these risk assessments.

Biosolids (treated sludge) from Metro are land applied as fertilizer to cropland in eastern Colorado. These biosolids meet EPA's "exceptional quality" criteria, which means the biosolids can be spread at agronomic rates, just as any other fertilizer. Metro has taken, and is taking, steps to minimize runoff and inhibit the wind from carrying the biosolids off its property. Such efforts include allowing thatch to remain when applying biosolids, farming in strips such that each 350-foot strip is farmed every other year, and providing buffer strips at the edge of fields that will filter out solids. Nevertheless, if any biosolids were to leave Metro's property, there would be no increased risk when compared to other fertilizers.

6. *There is no method to remove inorganic wastes at Metro Grow; therefore, the liquid residue dumped in the Platte River and sludge spread over farm land in Deer Trail and Agate will, indeed, be hazardous waste, but since the waste will go through the Public Owned Treatment Works, it will no longer be classified as hazardous by the EPA and CDPHE even though it will still be the same hazardous material.*

The Lowry Site ground water that will be discharged to Metro's and Aurora's POTWs will be pretreated onsite and will not have the characteristics of a hazardous waste (ignitability, corrosivity, reactivity or toxicity). During pretreatment, contaminants will be removed to comply with Metro's and Aurora's pretreatment standards. As required by the Clean Water Act (1977, as amended), water discharged from Metro must be protective of the South Platte River and to any land where biosolids are applied. The pretreated Lowry Site water will have no measurable effect on Metro's discharge to the South Platte River and will not affect the status of Metro's "exceptional quality" biosolids. (See Table ES-2, Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

7. *The EPA and CDPHE do not know (no one knows) what mixing all the toxic/hazardous substances from Lowry Landfill will chemically create and impose upon health and environment. It seems like this would be of great concern to the EPA and CDPHE.*

EPA and CDPHE are very much concerned about the effects that the Lowry Site might have on human health and the environment. To better understand the potential effects, EPA developed a comprehensive risk assessment for the ground water, surface water, soils, sediments, landfill solids, and landfill gas at the Lowry Site. This risk assessment evaluates the additive, or cumulative, risk at the Site. More detailed information on the risk assessment process as followed for the Lowry Site can be found in:

- Baseline Risk Assessment Shallow Ground-Water and Subsurface Liquids and Deep Ground-Water Operable Units (EPA, 1992a)

- Baseline Risk Assessment Landfill Solids and Landfill Gas Operable Units, Soils and Surface Water and Sediment Operable Units (EPA, 1992c)

- Draft Baseline Risk Assessment Sitewide Risk Issues (EPA, 1993)

The risk assessment is available for public review at the EPA Superfund Records Center and the Aurora Public Library.

8. *Isn't it correct that no one will be liable for the waste after it's dumped in the river and spread on the farm lands? Who will be liable for possible environmental damages and health injuries resulting from exposure to such contamination?*

Under the Superfund law, the liability of any responsible party is not affected by the method of cleanup selected by EPA. Before being sent to the Metro and Aurora POTWs, all ground water from the Lowry Site will be pretreated to meet Federal and State standards. Concentrations of chemicals in the pretreated Lowry ground water will be lower than the concentrations of chemicals entering the POTWs from local industries. The quantity of Lowry Site inorganic chemicals that may accumulate in the biosolids will not affect the "exceptional quality" status of

Metro's treated sludge, or biosolids. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.) EPA and CDPHE will monitor the quality of the pretreated Lowry water that is released to the sewer system and will evaluate Metro's ongoing biosolids land application and discharge activities.

Response to Comments in the June 30, 1997 Letter from Jack Hawkins/President of the Denver Area Labor Federation AFL-CIO

I am writing on behalf of the 88,000 members represented by my organization. On Thursday, June 26, 1997 representatives of this organization unanimously adopted a resolution that speaks to a Superfund plan being reviewed by the EPA.

The "plan" would have materials transported from the Lowry Landfill Superfund Site to the Metro Wastewater Reclamation District (MWRD) facility in Commerce City. My organization is adamantly opposed to these materials being shipped, processed, and in any way handled by MWRD.

The comment is noted.

The workers at MWRD have absolutely no protection from exposure to the known, or unknown hazardous materials. They are not covered by OSHA, or any other Federal, State, or local laws. These employees will be working 'at their own risk'.

State and local governments, including Metro, are not subject to OSHA regulations. While the Metro workers are not covered under OSHA, they are covered by Metro's Chemical Hygiene Plan (Metro, 1997a). This plan addresses such issues as emergency evacuation procedures, accident preventing and reporting, waterborne pathogens, and training, among others.

Additionally, pretreated water from the Lowry Site will not have the characteristics of a hazardous waste (ignitability, corrosivity, reactivity or toxicity), and will pose no more additional risk to sewer line workers or wastewater treatment plant workers than domestic sewage.

It is also our feeling that MWRD has not done a full disclosure to officials or residents that are downstream on the South Platte River. We feel the disclosure needs to happen from the treatment plant at 6450 York in Commerce City, CO to the confluence of the Missouri river in Omaha, NE.

Metro is required to meet the discharge limits established in its permit. Metro is required to provide "disclosure" under the following circumstances: violation of a law or discharge permit;

or requesting a change to a discharge permit. The purpose of this public comment period is to invite comments on the proposed changes to the Lowry Site ROD, which is not a change to Metro's discharge permit.

> *The MWRD facility at 6450 York Street in Commerce City, CO simply is not equipped to handle the different fissile materials that are present at the Lowry Landfill Superfund Site. Nor is the facility equipped to handle some of the most toxic non-fissile materials at the Landfill.*

The Metro facility is capable of handling all materials expected to be discharged in the pretreated ground water from the Lowry Site. Fissile materials, or radionuclides, are not expected to be present, above ROD performance standards, in the pretreated ground water. Nevertheless, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

The Metro facility has been evaluated for its ability to treat all materials in the pretreated ground water. Evaluation criteria included:

- Maintaining compliance with Metro's CDPS/NPDES discharge permit
- Maintaining compliance with State water quality standards
- Achieving risk-based effluent concentration limits developed by EPA for analytes not regulated by water quality standards
- Maintaining "clean sludge" levels of analytes in Metro's biosolids
- Preventing interference with Metro's treatment processes
- Preventing releases of significant quantities of hazardous air pollutants from Metro's facilities
- Protecting workers from adverse health and safety effects due to toxic compounds in the sewer system

> *There has also been an ongoing labor dispute between the OCAW and MWRD. The District Manager, Mr. Robert Hite, has employed the services of a regionally known union-busting firm to handle their labor relations. This dispute has lead to a level of mistrust that should cause alarm. Under these current circumstances, treatment of hazardous materials has a heightened danger level.*

Labor issues are under the jurisdiction of the Department of Labor. Any labor concerns should be directed to the Department of Labor and will not be addressed in this responsiveness summary. Pretreated ground water will meet all pretreatment standards before it is introduced

into the sewer and the water will be handled at Metro just as any other waste in the sewer is handled.

For these reasons, we demand that the EPA deny the "plan" for treatment of Lowry Landfill Superfund materials by the Metro Wastewater Reclamation District in Commerce City, CO. There are too many problems in too many areas to endanger so many people.

As has been shown in previous responses to comments, the pretreated ground water will not be harmful to residents or workers.

Responses to Draft Resolution by OCAW Local 2-477 to Colorado AFL-CIO on Labor Dispute with Metro Wastewater Reclamation District

Whereas, members of OCAW Local 2-477 employed at Metro Wastewater Reclamation District (MWRD) have been without a collective bargaining agreement for four years;

Whereas, MWRD under the direction of District Manager Robert Hite has utilized Mountain States Employers Council, the most notorious union-buster in the Rocky Mountain region, as its representative for the purpose of collective bargaining;

Whereas, the lack of a collective bargaining agreement and a grievance/arbitration procedure has forced OCAW to utilize the Colorado court system to obtain relief resulting in great legal expenses on both sides;

Whereas, MWRD has recklessly spent thousands of dollars of public money to keep OCAW members from securing a contract, and Mountain States Employers Council has made thousands of dollars from the public trough;

Whereas, union busting in the public sector to the extent practiced by MWRD and Robert Hite is almost non-existent;

Whereas, four years of conflict have destroyed any trust between OCAW and MWRD;

Labor issues are handled by the Department of Labor. Any labor concerns should be directed to the Department of Labor and will not be addressed in this responsiveness summary.

Whereas, MWRD has agreed to a plan to ship toxic waste from the Lowry Landfill Superfund site to its Commerce City facility, where workers are not protected by OSHA;

State and local governments, including Metro, are not subject to OSHA regulations. While the Metro workers are not covered by OSHA, they are covered by Metro's Chemical Hygiene Plan (Metro, 1997a). This plan addresses such issues as emergency evacuation procedures, accident preventing and reporting, waterborne pathogens, and training, among others.

Whereas MWRD never officially notified OCAW of this agreement;

Communication problems between Metro and OCAW will not be addressed in this responsiveness summary.

Whereas, there is increasing evidence that plutonium, americium and other man-made radionuclides exist at the Lowry Landfill site;

Whereas, this radioactive waste will run through the Aurora sewer system, will be processed at the MWRD sewage plant, and will be deposited into the Platte River or as sludge on farmland in Eastern Colorado;

There is no evidence that plutonium, americium or other man-made radionuclides from Rocky Flats were dumped at the Lowry Site. Nevertheless, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

Whereas, the plan by MWRD to treat the Lowry Superfund waste poses severe dangers to worker and public health and could result in an even more serious environmental disaster;

The risks associated with typical materials found in a sewer are much greater than the risks posed by pretreated ground water from the Lowry Site. Raw sewage contains such materials as chemicals (acids, proteins, amino acids, carbohydrates), pathogenic bacteria, enteric organisms (*E. Coli*), and viruses (poliovirus and Hepatitis A).

Pretreatment standards for the pretreated water coming from the Lowry Site are set at levels that are protective of worker health and safety. EPA will require monitoring of the effluent from the Lowry Site to ensure that an "environmental disaster" does not occur.

BE IT THEREFORE RESOLVED that the Colorado AFL-CIO does hereby (1) recognize that four years of union busting and denying a union contract to OCAW members at MWRD is an outrage and demand that MWRD negotiate in good faith with OCAW to obtain a contract and end the labor dispute; (2) condemn MWRD for utilizing thousands of dollars of public money to pay Mountain States Employers Council for its union busting services and demand that this union busting firm be fired immediately; (3) oppose the current plan to treat waste from the Lowry Superfund site at the MWRD facility which could result in radioactive material being spread throughout the Denver Metropolitan area and in Eastern Colorado, thus endangering the health and safety of workers and the public at large; and (4) call upon the MWRD to replace District Manger Robert Hite for his callous disregard for worker rights and the health and safety of all concerned.

(1), (2), and (4): Labor issues are handled by the Department of Labor.

(3): The POTW option will not result in radioactive material being spread throughout the Denver metropolitan area and eastern Colorado, nor will it endanger the health and safety of workers or the public at large.

BE IT FURTHER RESOLVED that the Colorado AFL-CIO will communicate this resolution forthwith to the management and board members of MWRD, the Environmental Protection Agency, the Colorado Department of Health, the Mayor of Denver, the Governor of Colorado, and members of the Colorado Congressional Delegation.

The comment is noted.

Responses to Richard S. Hillier's/Health and Safety Department, OCAW May 6, 1997 and May 15, 1997 Letters

1. *The Baseline risk assessment conducted by CH2M HILL in 1993 focused only on human health risks to future populations that may occupy the Lowry site. Additionally, the assessment provided to our office considered risks only from lead and certain radionuclides.*

   The risk assessment conducted by CH2M HILL while not adequate in scope, was more appropriate for the original ROD requiring onsite treatment of wastes. There is no doubt that the CH2M HILL risk assessment is not adequate for the proposed amendment to the ROD.

   The OCAW has not seen any risk assessments that address risks to the current populations that will be potentially exposed to the more than 130 identified hazardous substances proposed to be transported through the public sewer system. There is little

doubt that these contaminants will leak from the public sewer pipes into the soil and potentially into the groundwater beneath the City of Aurora and any other communities served by these pipes. The risk assessment does not address the effects to the aquatic life of the South Platt River and all downstream users/uses of this river which will receive the effluent of the Metro/Lowry wastewater. It does not appear that effluent limits have been established for all of the contaminants nor have any current limits been factored into the risk assessment. It does not appear that any risk assessment has been conducted to determine the effects on users and the environment from the use of Metro Gro fertilizer of the application of the Metro wastewater sludge on farm land. It is this same sludge that was deemed a hazardous waste by court ruling in 1996. It does not appear that any risk assessment has been conducted on the livestock that graze off the lands where Metro wastewater sludge has been placed. The addition of the Lowry landfill wastes to the pubic sewer system will increase both the number and concentration of contaminants in the sludge. It does not appear that any risk assessment has been conducted on the Metro treatment plant workers who will be exposed to the Lowry landfill wastes.

EPA developed a three-volume risk assessment for the Lowry Site:

- Baseline Risk Assessment, Shallow Ground-Water and Subsurface Liquids and Deep Ground-Water Operable Units (EPA, 1992a)

- Baseline Risk Assessment, Landfill Solids and Landfill Gas Operable Units, Soils and Surface Water and Sediment Operable Units (EPA, 1992c)

- Baseline Risk Assessment, Sitewide Risk Issues (EPA, 1993)

These baseline risk assessments evaluated both current and future exposure pathways for residential, recreational, and occupational scenarios. During the risk assessment evaluation, it was determined that there were limited current exposure pathways. As a result, the baseline risk assessments focused on future risk scenarios. The 1993 baseline risk assessment addressed radionuclides and lead for all environmental media. The other two baseline risk assessments addressed chemical contamination, except for lead and radionuclides, for all environmental media.

The Superfund risk assessment process evaluates potential risks posed at a site under the "no action," or baseline, scenario. This means that the assessment assumes there will be no action taken to prevent human exposure to contamination. Consequently, the results of the assessment are expected to represent the "worst case" exposure scenario. It specifically does not incorporate any cleanup plans.

The baseline risk assessments did consider a variety of exposure conditions in order to evaluate appropriate cleanup options. One such exposure scenario assumed that an onsite worker would consume contaminated ground water (waste pit liquids and shallow ground water from the source area) over the course of a 25-year work lifetime.

The risk associated with onsite worker exposure to waste pit liquids and contaminated shallow ground water, through direct ingestion, was estimated to be about 1×10^{-4} (1 in 10,000). Of the constituents contributing 99 percent of the total risk for this estimate, about 80 percent of the risk is associated with the fraction attributable to organic chemicals, which will be removed through pretreatment prior to discharge. Making a conservative, worst-case assumption that a Metro worker would consume 1 liter of the pretreated ground water on a daily basis for 25 years, the associated ingestion risk would be about 2×10^{-5} (2 in 100,000). Using reasonable safety factors, such as not drinking the water, this risk would be even lower. Assuming a Metro worker only has limited contact with the water, the resulting risk would be less than the 10^{-6} (1 in 1,000,000) risk level established by EPA. The baseline risk assessments provide a more in-depth explanation of risk and the meaning of risk levels such as 10^{-6}.

The Lowry Site ground water will be pretreated to reduce the levels of contaminants prior to discharge to the sewer system. Therefore, risk levels associated with the pretreated ground water will be much less than the risks associated with drinking waste pit liquids and untreated, contaminated shallow ground water. The baseline risk assessments conducted for the Lowry Site are more than adequate in scope and detail to provide the necessary information on which to base remedy decisions. The POTW option will achieve the following remedial action objectives:

- prevent human exposure (through ingestion, inhalation, and dermal absorption) to liquids containing contaminants in excess of the cleanup goals; and

- prevent migration of contaminants that would result in ground-water concentrations in excess of the cleanup goal.

There is no current residential exposure to ground-water contaminants at the Lowry Site. Prior to being discharged to the sewer system for treatment at the POTWs, Lowry Site ground water will be pretreated onsite to meet pretreatment requirements. These pretreatment requirements were developed in accordance with regulatory guidance to protect sewer workers, wastewater treatment workers, and the treatment processes at the POTW. Even though there is no residential exposure to raw sewage, this scenario has been anticipated by considering the skin and breathing exposure pathways for sewer workers. The pretreated water from the Lowry Site will pose no additional hazard above that already associated with raw sewage.

It is not clear to which "130 identified hazardous substances" the commenter is referring. The Baseline Risk Assessment for Deep Ground Water and Shallow Ground Water and Subsurface Liquids (OUs 1 and 6) identified 33 risk assessment **chemicals of concern** (COCs) with which to evaluate the risk from contaminated ground water. ROD Table 11-2 presents ground-water performance standards for 58 contaminants. Metro's preliminary pretreatment standards were developed for 51 contaminants, consistent with those that have been detected at the Site. For any contaminant that Metro has not developed a pretreatment standard for, the ROD performance standard shall apply.

As with any domestic and industrial wastewater, or treated effluent, the water to be discharged will retain certain chemical, physical, and biological characteristics. The risks associated with treated ground water originating from the Lowry Site and discharged to the sanitary sewer system are comparable to, or less than, risks related to typical household and industrial pretreated wastewater, which are also discharged to the sanitary sewer.

A separate risk assessment is not required because Metro operates under a discharge permit issued by CDPHE, pursuant to the CDPS Regulations, 5 CCR 1002-61. This discharge permit requires Metro to meet standards in its discharge that are protective of aquatic life and other classifications of the receiving waters in the South Platte River at, and downstream of, the discharge location. The other uses include water supply, recreational, and agricultural uses. Monitoring and reporting requirements for Metro ensure that they are in compliance with the conditions of their permit to protect aquatic life and other designated uses of the South Platte River.

As stated above, pretreatment standards have been developed for contaminants in the ground water from the Lowry Site. Again, Metro must meet the requirements of its discharge permit, which includes the limits determined by CDPHE to be necessary to protect the South Platte River, aquatic life, and designated use categories.

The commenter is referred to "A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule" (EPA, 1995), which contains detailed information on the risk assessments conducted for the Part 503 Rule regulating biosolids application. Comprehensive risk evaluations were performed in developing these regulations and regulatory limits on biosolids. The risk assessments used conservative assumptions to ensure protection of public health and the environment.

The commenter states that "this same sludge...was deemed a hazardous waste by court ruling." The court ruling did not identify Metro's sludge as a hazardous waste. The sludge taken to the Lowry Site fifteen to twenty years ago is not the same product as the biosolids that are produced today. Please see the response to Comment #3, below.

As was discussed above, the commenter is referred to the EPA Part 503 Rule risk assessments guidance document. These risk assessments addressed potential exposure pathways for livestock, as well as many other potential exposure pathways. Additionally, Metro is not applying biosolids to land where livestock graze. Metro applies biosolids to land where dryland wheat is primarily grown.

Evaluations performed to date indicate that the pretreated Lowry Site ground water will have no measurable effect on the POTWs' discharge to the receiving stream and that the "exceptional quality" status of the biosolids produced from wastewater treatment process will not be adversely affected.

Pretreatment standards are developed in accordance with regulatory guidance to protect wastewater treatment plant workers from potential exposures to contaminants. The pretreatment standards developed for the Lowry Site ground water will be subject to the review and approval of EPA and CDPHE.

In summary, the addition of pretreated Lowry Site ground water to the sanitary sewer system will not increase or exacerbate the inherent risk associated with domestic or industrial sewage. EPA believes that the risk assessments conducted for the Lowry Site have adequately addressed worker and general public exposure issues associated with the POTW Option. These assessments have used conservative estimates of potential exposure conditions (including assuming that a worker would drink untreated waste pit liquids and shallow ground water) and the results indicate that the potential risks from such exposures are within the range of risks (10^{-6} to 10^{-4}) considered acceptable by EPA. Any risks posed to workers or the public, by exposure to the pretreated Lowry Site ground water, would be much less than those risks projected for direct exposure to untreated contaminated water.

2. *Transport of Lowry hazardous substances (many of which have not been adequately characterized) through a public sewer system, under residents' homes, knowing that these pipes will leak, is irresponsible. It is especially irresponsible in light of the fact that all of the Lowry wastes can be treated onsite with no risk to the public or offsite environments. According to Parsons Engineering's cost estimates, the difference between these two options (i.e., onsite vs. offsite treatment) is $1 million over 30 years. This is an insignificant amount of money considering the potential cleanup costs associated with leaking sewer pipes and adverse effects on the river and the farm lands and the adverse publicity to all parties involved with the Metro treatment plant option.*

Onsite treatment would actually involve offsite transport, treatment, and disposal of hazardous wastes (brine sludge and spent chemicals). Therefore, offsite treatment has fewer risks. Under the POTW option, onsite pretreatment will remove contaminants down to the limitations imposed by Metro's and Aurora's pretreatment permits. This pretreatment would be performed with simple processes that pose only nominal failure risk. In addition, this pretreatment would not produce brine sludge or spent chemicals that could pose a risk to the public when transported offsite for disposal.

Effluent from the Lowry Site pretreatment facility will be tested to meet strict pretreatment standards prior to release to the sewer system. Because of these pretreatment standards, the water moving through the sewer system between the pretreatment facility and Metro and Aurora poses less of a risk to people and the environment than the raw domestic sewage normally carried in such a sewer. The water from the Lowry Site pretreatment facility would have no additional impact beyond that from normal sewage should a leak occur. In addition, because the pretreatment standards are so stringent, the pretreated Lowry Site water will have no measurable impact on the quality of water discharged by the Metro facility and will not affect the

"exceptional quality" status of the biosolids produced by the Metro facility. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.)

3. *In 1996, a Denver judge ruled against Metro by declaring that the waste sludge from the Metro plant was hazardous waste. Yet this hazardous waste sludge has been applied to farm lands and the gardens of residents. This sludge was deemed hazardous before Metro had received any additional wastes from Lowry. Is this sludge going to be somehow less hazardous now? It is hazardous now and will continue to be hazardous.*

The United States District Court for Colorado ruled that Metro's sludge contained "hazardous substances;" it did not rule that Metro's sludge was a "hazardous waste." The substances found to be hazardous were manganese, iron chloride, cadmium, chromium, copper, lead, nickel, and zinc. These substances are common metals or compounds of common elements found in Colorado soils. A hazardous waste is a waste with inherent risk that is regulated under RCRA. The sludge from Metro has not been classified as a hazardous waste. See the response to Comment #1, above.

Also, the sludge that Metro disposed of at the Lowry Site contained higher levels of pollutants than the sludge that Metro produces today. There was no industrial pretreatment program in place during the period of time that Metro took sludge to the Lowry Site. The quality of today's sludge meets the criteria for "exceptional quality" under 40 CFR Part 503 regulations. Such a regulatory classification allows Metro's biosolids to be applied as a fertilizer or soil amendment.

4. *The Lowry Landfill waste contains radionuclides above background concentrations. Based on the March 1994 Record of Decision and the 1992 final RI report the following statements are correct: 1) Americium-241 is found in the waste pits and shallow ground water in a concentration 963 times greater than regional background levels; 2) Plutonium-239 is found in the same locations in a concentration 16 times greater than regional background levels and 5 times greater in the down gradient weathered Dawson monitoring wells, and; 3) Americium-241 is found in the deep water monitoring wells at a concentration 1,963 times above regional background levels found in shallow groundwater. The CH2M HILL risk assessment employed a screening methodology to eliminate, from the risk assessment, those radionuclides not deemed to be present for statistical reasons (including detection limits and background considerations). After this screening process, the radionuclides remaining were deemed to be significant enough to be included in the assessment. These included, among others, Cesium-137, Plutonium-239, Americium-241, etc... The Metro treatment plant is not equipped to perform real-time monitoring for radioactivity. The workers have no training or proper PPE to work with such materials. The sewers are not designed to transport this type of hazardous material. If a person or the Metro equipment/facility becomes radiologically contaminated, it will go undetected. Workers risk the possibility of bringing this material home with them.*

Very few samples were analyzed for radionuclides. The few samples that were analyzed represent a very small portion of the Lowry Landfill Site. It is very possible that significant hot spots of radiological contamination have gone undetected to date. At the very least, it cannot be taken for granted that such hot spots do not exist. This is a risk that does not need to be taken.

Using information contained in the 1994 ROD (EPA, 1994a), 1992 Final RI Report (HLA, 1992a), or the Baseline Risk Assessments (EPA, 1992a; EPA, 1992c; EPA, 1993), we were unable to reproduce the data presented in this comment. It is acknowledged that there have been several samples where radionuclides (including plutonium-238, plutonium-239/240, americium-241, and plutonium-241) appear to have been detected in concentrations that exceeded background levels. The fact that a particular contaminant was detected in a particular sample on a particular day does not serve as conclusive evidence that the contaminant is present in the sample. In response to these sporadic detections of radionuclides, extensive reviews of the Lowry Site radiological data have been conducted.

These reviews included a focused evaluation of transuranic radionuclide data by HLA published after the final RI Report (HLA, 1992a). The "Evaluation of the Data Quality and Occurrences of Transuranic Radionuclides in the Shallow Groundwater and Subsurface Liquids and Deep Groundwater Operable Units" report (HLA, 1992b) assessed the available data for americium-241, plutonium-241, plutonium-238, and plutonium-239/240 for each operable unit.

This transuranic radionuclide evaluation report also included a detailed evaluation of the likely presence of transuranics for shallow and deep ground water. Many of the anomalous results that were reported in the RI (and presumably form the basis for the data reported in this comment) were included in the analyses conducted as part of the transuranic radionuclide evaluation report. Many of these data are uncertain due to high counting errors and analytical detection limits, and in several cases initially elevated results could not be reproduced after reanalysis of the original sample, or re-sampling.

As part of the transuranic radionuclide evaluation report, six operable units or systems (e.g., upgradient ground water, waste-pit liquid, etc.) were assessed for the presence of four transuranic radionuclides (americium-241, plutonium-238, plutonium-239/240, and plutonium-241). The results from this assessment were used to categorize the probability of the presence of each radionuclide in each operable unit as probable, questionable, improbable, not detected, and not analyzed. The results of the analysis showed that for the 24 possible cases (six OUs with four radionuclides each) there were 15 cases where the presence of transuranics was considered questionable, 3 cases where samples were analyzed for transuranics but not detected, 3 cases where a specific transuranic was not analyzed, two cases where the presence of transuranics was considered probable, and one case where the presence of transuranics was considered improbable. In summary, this analysis indicated that while the presence of transuranics was probable in two cases, for most cases the data were considered "questionable" or transuranic radionuclides were not detected. For the two cases where the report indicated that the presence of a radionuclide was probable (americium-241 in waste pit liquids and plutonium-239/240 in

shallow ground water in the weathered system in the source area), the report also indicates that there was only moderate duplicate agreement, and counting errors were high. In concluding, the transuranic radionuclide evaluation report states that "[t]here was no case in which the presence of transuranics was positively confirmed."

EPA and CDPHE have also found no confirmed source of man-made radioactive contamination at the Lowry Site. If a significant source of man-made radionuclides were present, one would expect to find consistent detections of radionuclides, with a strong correlation to certain areas or sources (e.g., waste pit liquids). What have been found are some sporadic detections of americium, plutonium, and other radionuclides. For numerous samples, where a detection may have occurred for a particular radionuclide in one sampling event, the next sampling event from the same location would indicate no detection for that same radionuclide. For other samples, when EPA and CDPHE requested a "recount" based upon high counting errors, the recount indicated no detection. For example, a particular analysis for plutonium-241 in well B-520 resulted in a concentration of 78 pCi/L with a counting error of +/-40 pCi/L. This means that the actual result may have been anywhere between 38 and 118 pCi/L. Because of the high degree of error, a recount was required, and the result of the recount was that plutonium-241 was not detected at a detection limit of 25 pCi/L.

In addition to reviews of the laboratory data, EPA and CDPHE have conducted detailed reviews of information available on the wastes disposed of at the Lowry Site. This evaluation concluded that no radioactive wastes were transported to the Lowry Site from Rocky Flats.

Analytical data and historical records serve as the basis upon which remedial action decisions can be made. A large body of data has been accumulated to indicate that there is good evidence that transuranics are not present above background levels in ground water at the Lowry Site.

However, it should be noted that while there is no evidence for a confirmed source of man-made radioactivity at this site, to err on the conservative side, EPA and CDPHE chose to consider americium-241 and plutonium-239/240 in the baseline risk assessment. The risk assessment included evaluation of risks under conditions where an individual would ingest water under residential conditions (drinking water) from source area wells. The reasonable maximum exposure (RME) risk to such an individual is 6×10^{-4} (6 in 10,000). Of that total risk, plutonium-239/240 and americium-241 contribute only 6 percent and 2 percent, respectively. By far the majority (85 percent) of potential risk is contributed by radionuclides that are present in soils and water naturally, including radium-226, lead-210, potassium-40, and the uranium isotopes (uranium-234, -235, and -238). Thus, even though evidence of transuranics in ground water at the Lowry Site has not been confirmed, transuranics were included in the risk assessment, and contributed negligibly to the total site risk from ground water.

In response to public concerns about the possible presence of radionuclides at the Site, an additional evaluation of the radionuclide data from the Lowry Site ground-water database was performed. This evaluation is presented in Attachment C and is based on the sitewide ground-water quality database, which contains more than 2,900 records of speciated radionuclide data.

In addition, this database contains another 933 records of gross alpha and gross beta data for ground water. Based on the information in this database, EPA and CDPHE believe that the Site has been sufficiently characterized with respect to radionuclides to adequately assess the potential impacts to human health and the environment.

Major conclusions from the assessment in Attachment C are:

- None of the following man-made radionuclides (that could have originated from Rocky Flats and been disposed of at Lowry) could be confirmed present in the ground water beneath the Lowry Site: americium-241; neptunium-239; plutonium-238; plutonium-239/240; and plutonium-241.

- No man-made radionuclides were confirmed present in the following Site wells: GW-111; GW-112; and MPZ-1. These three wells are specifically identified because they will be one of the sources of the water that will be piped to the POTW.

Finally, it should be noted that there is an onsite early warning ground-water monitoring system currently in place. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

5. *The potential escape of Lowry hazardous substances into the public/environment via the sewer system and the contamination of the Metro facility will result in a far greater cleanup effort in the future. There is, according to the Parson's engineering cost analysis, only a $1 million difference between this proposal and an onsite treatment proposal. Such a cost difference does not warrant, the increased risk to the public and Metro workers.*

Please see the responses to Comments #1 and 2 of this letter for a detailed discussion of the results of risk assessments related to potential exposures of the public and workers. As discussed in those responses, because the Lowry Site pretreated ground water received at Metro will be required to meet strict influent standards, implementation of this alternative will cause no measurable increase in risks to public health, including the health of workers, or the environment.

6. *The workers employed by Metro and who will be working with and around the Lowry hazardous substances are not protected by worker health and safety regulations such as OSHA. Further, the OCAW Metro workers are not covered by any labor contract and thus have no protection from recourse (i.e., "whistle blower protection") when bringing up H&S issues. This type of fear becomes a serious impediment to reporting H&S concerns when working with hazardous substances.*

State and local government agencies, including Metro, are not subject to OSHA regulations. However, while the Metro workers are not covered by OSHA, they are covered by Metro's Chemical Hygiene Plan (Metro, 1997a). This Plan is comparable to an OSHA plan.

Although OCAW workers at Metro are not covered by a current labor agreement, EPA will require Metro to have an approved Health and Safety program for all employees. It is EPA's understanding that Metro has a District-Wide Safety Committee, and a Laboratory Safety Committee that includes OCAW members. Under current laws, an OCAW member who is a "whistle blower" would have the same protection as any other Metro District employee.

7. *In a January 1997 letter from EPA Region VIII, EPA stated that this proposal "...is a significant change to a component of the remedy selected in the ROD, but does not fundamentally alter the overall approach intended by the remedy". The fact is the entire approach to the remedy has been altered by this proposal. Instead of onsite treatment, treatment will now be effected by a different technology offsite. Transport of the Lowry hazardous substances through the public sewer system will adversely impact the remedy if indeed this material leaks from the sewers. Additional remedies will be needed to clean-up contamination due to leakage or accidents associated with the sewer. Finally, the Metro facility and workforce are not designed to handle radioactive and carcinogenic materials.*

EPA does not consider the POTW proposal to fundamentally alter the overall approach intended by the remedy or the basic features of the remedy. The NCP, specifically 40 CFR 300.435 (c), specifies that an ESD be issued if the remedial action differs significantly from the ROD with respect to scope, performance, or cost. In cases where the differences fundamentally alter the basic features of the selected remedy with respect to scope, performance or costs, a ROD Amendment is issued. Although it is not required by the NCP, EPA opted to conduct a public meeting and invite public comments to receive feedback on the proposed changes.

Section 11.2.2 of the Lowry Site ROD describes the treatment component of the ground-water remedy. This section suggests treatment options for the contaminated ground water collected at the Lowry Site but specifies that "treatment technologies shall be evaluated further during RD"; actual selection of treatment technologies shall be subject to EPA approval in consultation with CDPHE. Because the ROD did not specifically identify a treatment technology, the Respondents to the RD/RA Order prepared an evaluation of potential treatment options entitled, "Draft Evaluation of the POTW Option" (Parsons ES, 1996). In this evaluation, the Respondents evaluated four treatment options including the POTW option. The Respondents' proposed option, the POTW option, includes pretreatment to meet Metro and Aurora's influent standards and discharge to the POTW for inorganic and additional organic treatment. The POTW option was screened out of the Feasibility Study early because of the excessive distance to the nearest interceptor and the fact that Metro did not accept ground water at the time. However, since the FS and the issuance of the ROD, the following changes have occurred:

- A new sanitary interceptor and connection line were constructed one-half mile from the Site.

- The City of Aurora has agreed to allow connection of a discharge line from the Site to the sewer line.

- The City of Aurora has a cooperative agreement with Metro to allow water to be conveyed through the discharge line to Metro's POTW.

- Metro and Aurora has agreed to accept Site water for treatment.

The Lowry Site pretreated ground water received at the POTWs will be required to meet strict influent standards. The ground water from the Lowry Site that is treated by Metro's and Aurora's POTWs will be required to meet the water cleanup, or performance, standards in Table 11-2 of the ROD. The pretreated Lowry Site ground water will not adversely affect the quality of the POTWs' influents. A compliance monitoring program will be implemented to assure that the water is treated to meet: performance standards in the ROD; State water quality standards; and the requirements of their CDPS permits.

Metro and Aurora will continue to be required to perform routine inspections and maintenance such as sewer line cleaning, television and other inspections, and to make repairs as needed. This program is designed to minimize the potential for sewer lines to leak. The pretreatment standards established for the Lowry Site ground water are more protective of human health and the environment than the standards for the raw sewage and industrial waste that the sewer lines are designed to convey.

The Metro and Aurora facilities are designed to safely treat industrial wastes and sewage. The treatment processes involve physical, chemical, and thermal processes to separate solids from water, reduce the level of pathogens, and stabilize volatiles. The pretreated Lowry Site ground water will be closely monitored for the presence of radionuclides and carcinogens using an onsite early-warning ground-water monitoring system. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

8. *If Metro is allowed to treat Lowry hazardous substances then Metro will need to be designated and designed as a Treatment, Storage and Disposal facility. Is Metro designed to be such a facility?*

As defined by RCRA, Metro does not treat, store or dispose of hazardous waste. Therefore, Metro does not need to be designated a RCRA Treatment, Storage or Disposal facility (TSDF). Metro is regulated by the Clean Water Act (1977, as amended) and discharges to Metro are covered by the pretreatment regulations of the Clean Water Act.

9. *It is not apparent that the risks to the following receptors have been evaluated as a result of this proposed modification to the ROD:*

- *Current Residents*
- *Groundwater beneath the sewer piping and Metro facility*
- *Soil beneath the sewer piping and Metro facility*
- *People who work on the sewer system*
- *People who excavate around the sewer to install TV cable, phone lines, and gas/utility lines*
- *Metro workers*
- *Downstream users*
- *Crops and livestock*

Current residents: There are no current residents at the Lowry Site, and there is only a slight chance that offsite residents will be exposed to sewer waters. Although it would be unrealistic to assume that sewer lines never break or leak, the presence of pretreated Lowry ground water in the wastewater stream within the sewer systems will pose no additional risk to the public. First, concentrations of contaminants in the pretreated Lowry ground water will meet Metro's and Aurora's pretreatment standards. Second, these pretreatment standards for nonhousehold discharges are more protective of the environment than are the standards for raw household sewage discharges.

Ground water beneath the sewer piping and Metro facility: It is true that a certain amount of sewage is lost through transmission as a result of sewer exfiltration. However, there is no additional risk attributed to the pretreated Lowry Site discharge over and above the risk inherent with the sewage itself, either from a human exposure perspective or an environmental release perspective.

Soil beneath the sewer piping and Metro facility: See previous response.

People who work on the sewer system: Individuals who work on the sewer system may face direct and repeated exposure to sewage. Domestic and industrial sewage are known to be contaminated with a variety of organic compounds, pathogenic bacteria, and disease-causing viruses. Contact with sewage can be harmful to human health. In addition, individuals who enter confined spaces associated with underground sewer lines could face exposure to dangerous levels of methane or hydrogen sulfide. There is no additional risk attributed to the pretreated Lowry Site ground water over and above the risk inherent with these typical sewer-related conditions.

People who excavate around the sewer to install TV cable, phone lines, and gas/utility lines: There is no additional risk attributed to the pretreated Lowry Site discharge over and above the risk inherent from the sewage itself, either from a human exposure perspective or an environmental release perspective. Individuals who come into direct contact with untreated

sewage in the course of the work activities are more likely to be affected by pathogenic bacteria or viruses.

Metro workers: Individuals who work at the sewage treatment facility face direct and repeated exposure to sewage. Domestic and industrial sewage is known to be contaminated with a variety of organic compounds, pathogenic bacteria, and disease-causing viruses. In addition, individuals who enter confined spaces associated with underground sewer lines could face exposure to dangerous levels of methane or hydrogen sulfide. There is no additional risk attributed to the pretreated Lowry Site discharge over and above the risk inherent with these typical sewer-related conditions.

Downstream Users/Crops and Livestock: Metro must comply with discharge standards established by the EPA and CDPHE to protect downstream water users, both human and ecological, whether the discharge from the Lowry Site is factored into the equation or not. Consequently, the pretreated Lowry Site discharge will have no effect on the ability of Metro and Aurora to remain in compliance with these standards.

10. *According to Parson's April 1996 cost estimates, this proposal would cost - $ 6.4 million while an onsite treatment option would cost - $ 7.3 million. Are all of these risks worth - $ 1 million? We would hope that even the life of one person is worth far more than $ 1 million.*

EPA used the methodology required by the NCP to evaluate the merits of the treatment options suggested by the Respondents to the RD/RA Order (See Attachment E). This analysis requires the detailed evaluation of nine criteria. The first two assessments are: 1) overall protection of human health and the environment and 2) compliancee with ARARs or other Federal and State environmental statutes. If a remedial alternative does not meet the first two criteria, it is not carried over for further analysis. If it meets the first two criteria, it is then reviewed against the next five criteria: 3) long-term effectiveness and permanence, 4) reduction of toxicity, mobility or volume through treatment, 5) short-term effectiveness, 6) implementability, and 7) cost, including capital and O&M cost. The final two criteria are modifying criteria and are evaluated following public comment periods: 8) State acceptance and 9) community acceptance.

EPA compared the two alternatives according to these criteria and concluded that the POTW option achieves the best balance among the nine criteria. EPA believes that this alternative is most protective of human health and the environment, achieves better long-term effectiveness, provides a more significant reduction in toxicity, mobility, and volume through treatment, is more implementable, and is more cost-effective.

EPA recommended the POTW option for the following reasons. Pretreated ground water from the Lowry Site will contain only materials that Metro and Aurora are already permitted to receive and are handling safely and reliably. The pretreated ground water discharged to Metro will meet requirements that have been designed to assure protection of public health and the environment.

The biosolids produced by Metro have been given the highest rating under Federal and State standards and are classified as "exceptional quality." The "exceptional quality" status of the biosolids produced by Metro will not be adversely affected by the Lowry Site water. These biosolids are approved for application to farmlands and home gardens. Water discharged to the South Platte River will also be required to meet all Federal and State standards. To be safe, the ground water from the Lowry Site and all discharged waters will be carefully monitored to make sure that all standards are met.

11. *Based on the March 25, 1992 final RI report for the shallow groundwater and subsurface liquids and deep groundwater operable units, it is apparent that the data indicates significant radiological contamination exists and at the very least the presence of this contamination cannot be excluded. The following comments are based on the information provided in this RI report:*

- *The shallow groundwater background levels established for Americium-241, Plutonium-241 and Plutonium-239/240 for the Lowry site are on the order of at least 10 to 134 times greater than regional background values previously established for the Rocky Flats site. This would indicate the probability that the Lowry background values are not true background values but actually much higher than the true values. Thus, all statements made regarding transuranic values being below Lowry background (i.e., Lowry upper gradient wells) are not necessarily true.*

- *Plutonium-241 was detected in concentrations 1.5 to 4 times higher than the artificially high Lowry upper gradient background well values. This report states that sampling for Plutonium-241 was too limited to fully assess the potential degree of contamination. Also it states that Plutonium-241 was not analyzed for in surface water. Thus, the Lowry site has not been adequately characterized for Plutonium-241.*

- *Americium-241 was detected in concentrations 100 to 1,000 times higher that regional background levels. A groundwater sample from the source area indicated Americium-241 concentrations greater than 8 times the already artificially high Lowry background level. This report indicated that proper concentrations of Americium-241 could not be determined because of problems with analytical procedures. Thus, the Lowry site has not been adequately characterized for Americium-241.*

- *Plutonium-239/240 was detected and confirmed in concentrations above both the regional and Lowry site background levels.*

- *The report states that Cs, Ce and Sr are all present in concentrations above Lowry background and their presence may be related to previous site activity. It*

would appear on the surface that the use of transuranic radionuclides was a common practice associated with this site.

Refer to the response to Comment #4, above (and Attachment C) for a detailed discussion of radiological data. As a general summary, a detailed review of the radiological data for the Lowry Site shows no conclusive evidence of a source of man-made radionuclide contamination in ground water. Some positive results have been reported for transuranic radionuclides (primarily plutonium-238, plutonium-239/240, and americium-241). These results have been carefully reviewed, and in some cases additional analyses (recounting), and supplementary sampling and analyses have been conducted.

In particular, an extensive review of the transuranic radionuclide data for the Shallow Ground-water and Subsurface Liquids and Deep Ground-Water Operable Units (OUs 1 and 6) was completed by HLA after completion of the March 25, 1992 final RI report (HLA, 1992a). The HLA transuranic radionuclide evaluation report (HLA, 1992b) included assessment of RI data, as well as additional data resulting from the recount of selected ground water and waste-pit liquids collected and analyzed for radionuclides during the Additional Site Characterization sampling events. Much of the information contained in the transuranic radionuclide evaluation report clarifies earlier discussions related to radionuclide concentrations that are contained in the RI report. In addition, EPA has conducted independent reviews of the Lowry Site radionuclide data. A more detailed discussion of the results from these reviews of the radionuclide data is presented in Attachment C. Summary responses (based on the results shown in Attachment C) are provided for each bullet under Comment 11 as follows. .

Bullet 1: Based on the results in the HLA transuranic evaluation report, a total of 13 samples from 8 upgradient wells were analyzed for plutonium-239/240. For 12 of these samples, plutonium-239/240 was not detected (with detection limits ranging from 0.1 to 0.5 pCi/L). Plutonium-239/240 was detected in one sample (from well B-520) at 0.59 pCi/L +/- 0.32 pCi/L, but subsequently was not detected at or above a reporting limit of 0.3 pCi/L, and again at or above a reporting limit of 0.2 pCi/L. These results indicate that plutonium-239/240 is not present in the upgradient wells, and thus the upgradient samples are representative of background conditions (i.e., normally one would expect results for plutonium-239/240 at a background well location to either show very low [trace] concentrations, or results less than the detection limits for most standard methods--this is what the Lowry Site samples show.)

Plutonium-241 was detected in two samples from background locations. Each of these results contained high counting errors (78 +/- 40 pCi/L and 21 +/- 15 pCi/L). Many of the other plutonium-241 results were reported with very high detection levels. Because of conflicting analytical results for plutonium-241 results at upgradient sample locations, the HLA transuranic report indicated that the presence of plutonium-241 in this system is questionable. Because the results for plutonium-241 in upgradient wells are considered questionable, they are not used as background values for comparison against Site concentrations.

Americium-241 was detected at 6 of 8 background wells at concentrations ranging between 1.3 pCi/L +/- 0.3 pCi/L and 13 pCi/L +/- 6.0 pCi/L. However, according to the HLA transuranic report, the presence of americium-241 at these locations is considered questionable due to poor duplicate sample agreement and questionable spectra. Because these background concentrations are questionable, they are not used for comparisons to Site conditions as a means of showing that americium-241 is not present onsite.

As an example, americium-241 was not screened out (dropped) as a contaminant of concern for the risk assessment on the basis of background values greater than onsite values. In fact, both americium-241 and plutonium-239/240 were considered as contaminants of concern for the risk assessment, and background concentrations were not subtracted from the exposure point concentrations in the risk calculations.

Bullet 2: Plutonium-241 is not a Site-specific contaminant of concern due to its low frequency of detection, short half-life (13.2 years), low relative risk (plutonium-241 emits a very weak beta particle that cannot penetrate skin), and the lack of evidence that plutonium-239/240 is present in significant concentrations (i.e., if plutonium-241 were present in significant concentrations, plutonium-239/240 would also be expected to be present in elevated concentrations.) EPA and CDPHE concur that plutonium-241 was not analyzed in surface water. However, since the Surface Water Removal Action was implemented (eliminating the surface water pathway), there is no need for additional surface water characterization.

Bullet 3: Americium-241 was detected in only one source area well. This one detection, 94 +/- 80 pCi/L, had an excessively high counting error, which means positive identification of americium-241 is questionable. Also, when this well was resampled, americium-241 was not detected. Therefore, it was concluded that americium-241 is not present above background levels in the source area. Fifty-two wells have been sampled for americium-241 across the Lowry Site. Based on the results from these samples, EPA and CDPHE believe that the Lowry Site has been adequately characterized for americium-241.

Bullet 4: Plutonium-239/240 was detected in 6 out of 77 samples. Counting errors associated with the 6 positive results were high, ranging from 20 percent to 88 percent, and plutonium-239/240 was detected in two performance evaluation samples and one laboratory blank. For these reasons, the presence of plutonium-239/240 is considered questionable in ground-water. Plutonium-239/240 was treated as a contaminant of concern in the Lowry Site risk assessment, but the presence of plutonium-239/240 has not been confirmed in ground-water.

Bullet 5: The elements cerium, cesium, and strontium are not transuranics and are not contaminants of concern for the site. The radionuclides cerium-141, cerium-144, cerium-139, cesium-134, cesium-136, cesium-137, and strontium-85 had detection frequencies of less than 10 percent each and were, therefore, not considered contaminants of concern for the site. Cerium-143 was not considered a contaminant of concern due to its very short half life (33 hours).

12. *Based on a preliminary review of the EPA document, CERCLA Site Discharges to POTWs, the following comments and questions are raised for your review and response.*

Based on the evaluation criteria outlined on pages ES-1&2, there is concern as to whether or not the METRO POTW meets all of the criteria. Specifically, the following criteria are called into question:

- *The discharged CERCLA wastewater must not contaminate sludge or become hazardous to employees at the POTW. The METRO sludge currently is considered a hazardous waste. This is one of the reasons METRO is a PRP at Lowry. Since pretreatment will not eliminate inorganic contaminants and only some of the organics. these CERCLA contaminants may become hazardous to the POTW employees. This is particularly important, as will be shown later, since the calculations performed to establish safe levels for worker exposures* ***are not correct.*** *Further, the METRO workers are not covered by state or federal health and safety rules. Many of the contaminants are known human carcinogens which both EPA and NIOSH and many H&S professionals believe have no safe level of exposure. The evaluation performed in accordance with the EPA document, "Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors," besides being done incorrectly, did not take into consideration synergistic health effects from multiple chemical exposures.*

- *The POTW should have a good record of NPDES permit compliance. METRO, in 1989, received a $1.1 million fine for violations of the Clean Water Act. In 1989 METRO announced it was going to discharge 25 million gallons of raw sewage into the South Platte river. This was prevented by the Adams County Commissioners. In 1982, METRO was targeted for stricter controls on the amount of ammonia, chlorine and nitrogen in its treated water. This is not a great track record.*

- *The potential for volatilization of wastewater contaminants and the potential for groundwater contamination from transport of the CERCLA wastewater needs to be evaluated. There is no argument that these contaminants will leak from the sewer pipes into the soil. They will also volatilize in sewer manholes. The leakage will reach the groundwater. There has been no written evaluation of these potentials and how they will be prevented.*

- *The CERCLA wastewater discharge into the POTW's receiving waters must meet the standards of "no toxics in toxic amounts." There has been no written evaluation as to the bioaccumulation effect in the receiving waters, especially from the inorganic contaminants and radionuclides. According to this document, an analysis of the fate of the contaminants in the wastewater is required. Dilution is not an acceptable treatment option.*

- *The POTW must be knowledgeable of and in compliance with any applicable RCRA or other environmental statute. Will METRO be considered a TSD facility?*

Responses to this comment are matched to the order in which the bullets are presented in the comment.

Bullet 1: Metro has established pretreatment limits for the pretreated Lowry Site discharge that will fully protect the quality of Metro's "exceptional quality" biosolids. Metro's sludge is not a hazardous waste. The definition of "hazardous waste" under RCRA means that the material has certain characteristics or properties that make it a hazardous waste or the material is included on a list of hazardous materials developed by EPA. The characteristics or properties that make a material hazardous are ignitability, corrosivity, reactivity, and toxicity. Listed hazardous wastes include categories of use such as wood preserving wastes or solvents.

Regarding employee hazards, Metro has established pretreatment limits to protect worker health and safety. The calculations performed to establish safe levels for worker exposures appear to be correct. If the commenter continues to believe they are incorrect, then specific comments as to the incorrect calculations should be provided.

Metro workers are not covered by Federal or State health and safety rules. However, they are covered by Metro's Chemical Hygiene Plan (Metro, 1997a). This plan is comparable to a plan that would be required under OSHA. In addition, discharge from the Lowry Site must meet standards established by Metro, pursuant to the National Pretreatment Program, to be protective of worker health and safety. These standards were developed using the following guidance:

- EPA's Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors (EPA, 1992b)

- ACGIH occupational guidelines that are used by OSHA and NIOSH

To date, all limits developed by Metro have been clearly presented as "Preliminary." There are a number of stages in the permitting process still to be undertaken; among them, a review of updated ACGIH exposure limits and consideration, as the commenter mentions, of synergistic health effects (please see response to Comment #15, below, fourth bullet).

Bullet 2. These matters are over eight years old. In the past eight years, Metro has had an excellent record of NPDES compliance. Last year Metro won EPA's National Pretreatment Program award. Metro has had only one exceedance of numerical discharge permit limits in the past six years and this exceedance was a chlorine problem caused by a chemical feed failure at the treatment plant. The exceedance lasted for eight minutes.

The most recent cited example of Metro's noncompliance dates back eight years to Metro's settling of Clean Water Act (1977, as amended) violations that actually occurred a number of

years earlier. The other examples cited, of Metro being targeted 15 years ago for ammonia, chlorine, and nitrogen, and the announcement (actually, previously authorized by both EPA and the Colorado Department of Health, but later reconsidered after Adams County opposition) of the raw sewage discharge, have nothing to do with NPDES compliance.

Bullet 3: The potential for volatilization of organic constituents in the sewer, and the corresponding risk to sewer workers, was addressed by Metro during development of pretreatment standards. Water will be pretreated on the Lowry Site as necessary to ensure that sewer workers are not threatened by volatile organic compounds. The potential for sewers to leak, and the significance of such potential leakage was addressed under the response to Comment #1, above.

Bullet 4: Metro's discharge will be required to continue to comply with all Federal and State pollutant-specific standards, which are based on the bioaccumulation effect in the receiving waters. Metro has established pretreatment limits for the Lowry Site discharge that will fully protect the maintenance of water quality standards, including the "no toxics in toxic amounts" narrative standard. Compliance with the standards will be enforced and the effluent will be tested using whole effluent toxicity (WET) testing (which has been a requirement of Metro's discharge permit for a number of years). Effluent that passes the toxicity testing is presumed by law to comply with the narrative standard.

Bullet 5: See the response to Comment #8, above.

13. *What is meant by the statement on pg. 3-1, "In addition, hazardous waste cannot simply be introduced to sewers outside the POTW property boundary, this would violate RCRA manifesting regulations."?*

The referenced statement from the EPA guidance entitled "CERCLA Site Discharges to POTWs" (EPA, 1990a) means that a hazardous waste generator cannot transport hazardous wastes offsite with the intent of dumping the waste down the first convenient manhole. Any such transport would, in fact, violate RCRA manifesting regulations by transporting hazardous waste without a manifest. Please refer to the definition of hazardous waste in the response to Comment #12, bullet 1, above.

14. *It is assumed that either METRO or the EPA had to evaluate this option in accordance with Table 41 beginning on page 4-6. Please provide the written responses to each of the 26 considerations presented in this table.*

Metro's compliance with the 26 items listed in Table 4-1, POTW Compliance Checklist, of EPA's "CERCLA Site Discharges to POTWs" (EPA, 1990a) is summarized in the following table:

Checklist Item	Response
1. Is the POTW in compliance with its NPDES permit, or has the POTW been reported in a recent Quarterly Noncompliance Report (QNCR)?	Not applicable because Metro discharges under a state permit (see question number 2) and Metro has not been reported in a recent QNCR.
2. Is the POTW in compliance with state discharge requirements?	The POTW is currently in compliance with state discharge requirements. Metro operates under a CDPS permit.
3. If the POTW disposed of the sludge on land, does it violate standards for PCBs, cadmium, and pathogens in the sludge? (Reference 40 CFR Part 257)	Not applicable because 40 CFR 257 no longer applies to sewage sludge used or disposed in accordance with 40 CFR 503. Metro meets all of the requirements specified in 40 CFR 503.
4. If the pollutants regulated by National Emission Standard for Hazardous Air Pollutants (NESHAPS) are present in the POTW's sludge, and the sludge is stored in piles, dried, and/or incinerated, do the air emissions violate the standards?	Metro does not dry or incinerate its sludge, and pile storage is indoors. Metro is currently in compliance with air emissions standards.
5. If pollutants regulated by National Ambient Air Quality Standards (NAAQS) are present in the POTW's sludge, and the sludge is stored in waste piles and/or incinerated, do the air emissions violate the standards.	See response to number 4.
6. If the sludges contain PCBs greater than 50 parts per million (ppm), are they properly disposed of?	Metro sludge does not contain PCB concentrations greater than 50 ppm. In fact, the laboratory reported 0 ppm PCBs (See Attachment A).
7. If the POTW incinerates its sludge and is subject to the provisions of 40 CFR §60, Subpart O, do the air emissions violate standards for particulate matter and/or opacity?	Metro does not incinerate its sludge.
8. If the POTW incinerates its sludge and is subject to No. 7, does it conduct the appropriate air monitoring?	See response to number 7.

Checklist Item	Response
9. If the POTW dumps its sludge into ocean waters, does it violate any prohibitions, limits, or conditions set by its permit, or does it contain any of the constituents at certain concentrations prohibited from dumping?	Metro does not dispose of its sludge in ocean waters.
10. Is the POTW sludge and/or wastewater considered a hazardous waste?	Neither Metro's sludge, nor its wastewater are hazardous waste. See the definition of hazardous waste in the response to Comment # 12, bullet 1, above.
11. If the POTW generates hazardous wastes, does it have a USEPA identification number?	Metro generates some hazardous wastes (i.e., laboratory waste), but these wastes are not disposed through its treatment plant. These wastes are not products of the wastewater treatment process. Metro's USEPA identification number is COD000111062.
12. Does the POTW properly manifest its hazardous waste?	Metro manifests its hazardous wastes in accordance with Colorado Hazardous Waste Act.
13. Are hazardous wastes packaged in the manner prescribed for the specific material in accordance with Department of Transportation (DOT) and RCRA regulations?	Metro packages its hazardous wastes in accordance with DOT and RCRA regulations.
14. Are containers holding hazardous wastes labeled with the labels prescribed for the material as specified in DOT and RCRA regulations?	Metro's hazardous waste containers are labeled as prescribed in DOT and RCRA regulations.
15. Does the POTW accumulate hazardous wastes for 90 days or less before the waste is picked up by a licensed transporter? If not, does the POTW generate less than 1,000 kilogram per month of waste, transport it more than 200 miles, or have a RCRA storage permit?	Because Metro is a small quantity generator, it is allowed by RCRA to accumulate waste for up to 180 days before it is picked up by a licenced transporter.

Checklist Item	Response
16. Does the POTW properly dispose of the sludge classified as hazardous waste?	This is not applicable because the sludge is not classified as hazardous waste. See number 10.
17. Does the POTW comply with permit requirements for sludge use and disposal (related to NPDES)?	This is not applicable because the sludge is regulated under 40 CFR Part 503. See response to number 18.
18. Does the POTW comply with permit requirements for sludge use and disposal (related to §503)?	Metro is in compliance with 40 CFR Part 503 permit requirements and state regulations governing sludge use and disposal.
19. (Compliance question to be determined upon finalization of sewage sludge technical standards.)	See response to number 18.
20. (Compliance question to be determined upon finalization of the proposed CWA sludge regulations.)	See response to number 18.
21. (Compliance question to be determined upon finalization of the proposed RCRA - Solid Waste Disposal Criteria.)	This is not applicable because Metro does not co-dispose its sludge with solid waste in municipal landfills.
22. Is the POTW violating its NPDES permit and/or sludge use or disposal requirements as a result of an indirect discharge?	Metro is not violating its CDPS permit or sludge use or disposal requirements as a result of an indirect discharge.
23. Do any industrial discharges violate categorical standards for discharges to the POTW?	Industrial discharges unrelated to the Lowry Landfill Site occasionally violate categorical standards. Metro has an EPA-approved Pretreatment Enforcement Management System (PEMS) in place to respond to such violations when they occur.
24. If required to develop a Pretreatment Program, has the POTW developed the program by the appropriate deadline?	Metro did not develop its Pretreatment Program by July 1, 1983. Pursuant to a compliance schedule issued by the State of Colorado, Metro submitted its Pretreatment Program to EPA for approval in 1986, and obtained approval that year.

Checklist Item	Response
25. Has the POTW enforced the Pretreatment Program and properly implemented procedures to ensure compliance?	Metro has enforced the Pretreatment Program and properly implemented procedures to ensure compliance.
26. If the POTW treats hazardous wastes, is it permitted under RCRA, and does it comply with the permit?	Metro does not accept hazardous wastes for treatment.

15. *Based on a preliminary review of the April 23, 1996 document, Evaluation of the POTW Treatment Option, Appendix B - Summary of Metro's Pretreatment Requirements, the column (1) Worker Health and Safety Sewer Conc. Values are not calculated or evaluated properly. Specifically, the following concerns exist:*

- *This Appendix B lists only 79 of the 176 contaminants of concern listed in the ROD. Further, none of the radionuclides are listed in this appendix and thus no worker H&S exposure limits are calculated for radionuclides.*

- *Of the 79 contaminants listed, 49 do not have any H&S exposure limits calculated. As a result of these first two listed observations it is apparent that the hazards of the constituents coming into the POTW have not been adequately characterized with respect to worker health.*

- *For most of the contaminants listed in Appendix B which have a calculated H&S exposure limit value, this value was taken directly from Table 4-2 of the EPA document, Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors. These Table 4-2 values were calculated using exposure limit values that are now out of date and inappropriate for use today. Thus, most of the H&S worker exposure limit values in this appendix are incorrect.*

- *Most important to note is that many of the chemicals which need to have H&S exposure limits established, act synergistically. It is inappropriate to simply pull these values off a table (which is what was done). Mixture exposure limit values need to be calculated for those contaminants that act synergistically or have similar effect on the same target organs. This has not been done.*

- *There are a number of problems with following the EPA document on protecting POTW workers. This document is not current with new methodologies for assessing worker risks and establishing protective limits. A copy of a methodology is attached for your consideration. The EPA document does not take into consideration non-volatile substances and metals. Also, it does not consider*

radionuclides. Overall the document is an oversimplification to a very complicated and serious issue.

The "Draft Evaluation of the POTW Treatment Option" (Parsons ES, 1996) states that all values reported for Metro's pretreatment requirements were preliminary. The intent of Appendix B was to offer evidence that Metro was in the process of evaluating pretreatment standards, and that the types of exposure scenarios listed in the Appendix B summary were being considered. Also, the values listed in the table were offered for general information only to assess the type of pretreatment that would be required.

Responses to the individual bullets listed in the comment follow:

Bullet 1: The information presented in Appendix B of the subject evaluation is preliminary, including the list of chemicals/parameters of concern. Since the draft evaluation was issued, Metro has added another 65 chemicals/parameters to the list, for a total of 144. This expanded list now contains the chemicals/parameters of concern for ground water listed in Table 7-1 of the ROD, exclusive of cobalt, manganese, and thallium, plus chemicals/parameters that have Colorado Basic Standards for Ground Water, regardless of whether or not they were detected at the Lowry Site. Cobalt, manganese, and thallium were excluded from the list because they are not volatile for worker protection, and they do not pose issues with respect to receiving stream standards, effluent quality or biosolids quality. In addition, Metro is establishing standards for radionuclides. Thus, the proposed list of chemicals/parameters of concern will protect worker health and safety. Please also see the response to Comment #1, above.

Bullet 2: Metro has subsequently calculated standards for additional chemicals, and is in the process of incorporating revised exposure limits. Please see the responses to Comment #1, above, and Bullet 4, below.

Bullet 3: Please see response to Bullet 4, below.

Bullet 4: As was stated previously, the Worker Health and Safety Based Discharge Screening Levels listed in Appendix B of the "Draft Evaluation of the POTW Treatment Option" (Parsons ES, 1996) are preliminary. The screening levels should not be considered the final version of the list of COCs that will be included in the Pretreatment Discharge Permit, nor as the final health and safety-based discharge levels. Development of a final list of contaminants and allowable discharge limits will be based on a four-step process. This process will allow a complete review of all available physical, chemical, and toxicological information for the COCs, and will allow development of pretreatment discharge levels that are protective of worker health and safety. This process involves:

Step 1. Use of EPA guidance (EPA, 1992b) to develop a preliminary list of COCs and discharge levels;

Step 2. Use of appropriate physical and chemical parameters and toxicological information to develop conservative screening criteria for those COCs not listed in the EPA guidance;

Step 3. Evaluation of: (a) the impact of exposure to multiple chemicals that affect the same target organ(s) (an additive effect), and (b) the potential for synergistic effects between specific chemicals; and,

Step 4. Development of site-specific exposure scenarios to more accurately determine potential exposure levels.

It should be noted that the "Draft Evaluation of the POTW Treatment Option" (Parsons ES, 1996) is limited to the information generated only by performing a part of Step 1 above. Each of the four steps is described in greater detail in Attachment D.

Bullet 5: The referenced EPA guidance document is accepted by the technical community and is used nationally by local, state, and federal regulatory agencies. The methodology submitted by the commenter, entitled "A Screening Method for Occupational Reproductive Health Risk," which appeared in the American Industrial Hygiene Association Journal (See Volume II, p. 586), is not an EPA-approved procedure. The EPA guidance document does not evaluate potential worker exposure to nonvolatile substances, metals or alpha- or beta-emitting radionuclides because it is assumed there would be no complete exposure pathway for these substances.

Response to Don Holstrom's/President, OCAW December 11, 1997 Letter

The purpose of this letter is to formally request that the EPA: 1) Provide a minimum 90-day Public Comment Period and provide for public meetings for potentially impacted and interested parties; and 2) Consider this process a Amendment to the Record of Decision for Lowry.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

EPA evaluated the POTW proposal and concluded that it would most appropriately be designated an ESD, instead of an amendment to the ROD, because the proposal is a significant change to a component of the remedy selected in the ROD, but does not *fundamentally* alter the overall approach intended by the remedy.

**Response to Robert W. Hite's/District Manager,
Metro Wastewater Reclamation District
April 23, 1997 Letter**

The Metro Wastewater Reclamation District's Board of Directors voted overwhelmingly on April 15 to reaffirm the District's intent to treat the pretreated Lowry Site groundwater.

The comment is noted.

**Response to John R. Jacus'/Chair, The Lowry Coalition
May 21, 1997 Letter**

I am writing on behalf of the Lowry Coalition and its members to provide you with comments supporting your agency's proposed Second Explanation of Significant Differences to the Record of Decision ("ROD") for the Lowry Landfill Superfund Site ("Lowry Site"). The Lowry Coalition's current members include Adolph Coors Company, Amax Research and Development, Inc., the City of Englewood, the City of Lakewood, the City of Littleton, Conoco, Inc., Gates Rubber Company, Metro Wastewater Reclamation District, the S. W. Shattuck Chemical Company, Inc., and Syntex Chemicals, Inc.

The comment is noted.

Response to Nina Judd's Note Attached to the Greg Campbell Article

Good Lord! You cannot seriously be considering letting that toxic sludge go out that way! Please!

After all the required treatment processes, the treated sludge (called biosolids) applied as fertilizer will not be toxic. Instead, the biosolids will contain many useful and essential nutrients required for healthy plant growth.

Before proposing this treatment method, EPA and CDPHE evaluated the available research and scientific data on this subject and concluded that pretreatment of the Lowry Site ground water onsite, with additional treatment at Metro, was the best of the available options. EPA and CDPHE believe Metro and Aurora can safely, reliably, and effectively treat the ground water to meet Federal and State standards. EPA believes that this alternative is most protective of human health and the environment, achieves better long-term effectiveness, provides a more significant reduction in toxicity, mobility, and volume through treatment, is more implementable, and is more cost-effective.

Response to Allen Konrath's/Karen Konrath's/Dean Gaudat's May 9, 1997 Letter

It has been brought to my attention that the surrounding landowners, and the residents of the nearby rural communities are concerned about the hazardous contents of the waste. It is significant that this waste includes plutonium, and other manmade radionuclides, and that no treatment process is in place to remove these radionuclides, from this waste, either at the Lowry Landfill, or at the Metro Treatment plant, before it is incorporated into the sludge. With this sludge being placed on thousands of acres of farmground owned by the Metro Wastewater Reclamation District, in eastern Arapahoe County, near Deer Trail, as well as other privately owned farmground in Washington and Weld counties, this proposal has many far reaching implications.

The distribution of any kind of hazardous waste containing plutonium, by any application, on land that is used to produce food, or where there may be widespread exposure to the people farming, and residents of the surrounding area and communities, is not acceptable.

EPA has no evidence that plutonium or other man-made radionuclides are present in the Site ground water above background levels.

The Metro facility is capable of handling all materials expected to be discharged in the pretreated ground water from the Lowry Site. The facility has been evaluated for its ability to treat all the materials in the pretreated ground water. Evaluation criteria included:

- Maintaining compliance with Metro's CDPS/NPDES discharge permit
- Maintaining compliance with State water quality standards
- Achieving risk-based effluent concentration limits developed by EPA for analytes not regulated by water quality standards
- Maintaining "clean sludge" levels of analytes in Metro's biosolids
- Preventing interference with Metro's treatment processes
- Preventing releases of significant quantities of hazardous air pollutants from Metro's facilities
- Protecting workers from adverse health and safety effects due to toxic compounds in the sewer system

The biosolids distributed by Metro will not be hazardous waste and will meet the stringent requirements set forth by EPA for "exceptional quality" biosolids. EPA performed more than 20 years of studies on biosolids' application to establish the biosolids standards. These requirements are more stringent that what is required for commercial fertilizer that is applied to farmland.

Response to Robert Legge's Letter

I am opposed to any waste contamination that will be used on farm land by Metrogro Sludge due to radioactive and chemical materials (proven) materials. It will be dangerous to drinking water and food supply from crops.

The comment is noted. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

There is no historical or sampling evidence of Site-related plutonium contamination at the Lowry Site. Although radionuclide contamination does not currently appear to be evident, there is an onsite early-warning ground-water monitoring system in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

Response to Donald F. McClary's/ North Kiowa Bijou Ground Water Management District May 16, 1997 Letter

The purpose of the letter is to communicate to EPA the vital interest of the North Kiowa Bijou Ground Water Management District and any such proposal that would import foreign water or matter in an area that may affect our groundwater and the drainage system.

The comment is noted.

Responses to the Donald F. McClary/
North Kiowa Bijou Ground Water Management District
June 23, 1997 Letter

On behalf of the North Kiowa Bijou Ground Water Management District, which is a political subdivision formed for ground water management under the statutes of the State of Colorado, I contacted you by letter of May 16, 1997, concerning the above matter and expressed the concern of the District as to the possible effect of any proposed dumping under the above project. Based upon the information presently furnished the District, this project would impact upon the quality of water within their area and jurisdiction. To this date we have not received any reply from any of the above parties involved in this matter.

The May 16, 1997 letter was responded to by Joseph Vranka of CDPHE on May 27, 1997. That letter provided the information you requested in the May 16 letter. When CDPHE was notified that you did not receive the letter from Mr. Vranka, the letter was sent again on July 8, 1997 by Joseph Vranka and again on July 10, 1997 by Marc Herman of EPA.

The District is becoming increasingly alarmed about this project and is particularly concerned in the total lack of any communication or attempt by anyone to contact them to get their input in this proposed project.

EPA placed announcements in the Denver Post and Rocky Mountain News, mailed over 1,300 fact sheets to the public, held a public meeting on April 2, 1997, and offered a 3-month public comment period during which comments could be submitted. The District's letters will be evaluated, along with all other comments received on the proposal, in this responsiveness summary.

In 1971 and as part of the investigation made by the District of the groundwater conditions under their jurisdiction, they had a hydrogeologic study of the bedrock aquifers of their district prepared by Willard Owens & Associates. Included within that study were regulation recommendations which have been adopted and followed by the District regarding the protection and preservation of the quantity and quality of waters in their jurisdiction. One of these recommendations particularly apply to the above project and reads as follows:

"The surface disposal of all waste materials, including but not limited to municipal sewage sludge, all well water, feedlot waste, nuclear by-products, and chemical by-products, shall be done only in a manner approved by the Board of District. Such disposal shall be done in a manner to prevent pollution or contamination of

the bedrock and alluvial aquifers. Such disposal areas shall be limited to non-water table areas of impermeable bedrock."

Metro has applied its biosolids as fertilizer for several years with appropriate approvals from State and local entities. Metro's land application operations are not within the jurisdiction of the North Kiowa Bijou Ground Water Management District. The biosolids meet requirements set forth in 40 CFR Part 503 for "exceptional quality" and, therefore, can be applied as fertilizer to farmland. The additional water that the Lowry Site will add to the Metro treatment plant will have no adverse impact on the "exceptional quality" status of the biosolids produced by Metro.

To my own personal knowledge, the jurisdiction and authority of the Ground Water Management District in this matter of protection of quality and quantity of waters under their jurisdiction have been tested, both in the Colorado courts and the Federal courts, who have unanimously upheld the jurisdiction and authority of the District Board in these matters.

Federal case law interpreting the Supremacy Clause of the United States Constitution has held that CERCLA and its hazardous waste cleanup objectives preempt conflicting state law (see, e.g., United States v. City and County of Denver, 100 F.3d 1509 (10th Cir. 1996)).

The District Board has been informed that the above project includes use of surface area for dumping or the waste water disposal in Township 5 South, Range 58 West of the 6th P.M., which includes (although not limited to) Sections 16, 17, 18, 20, and 21. Although this project is immediately adjacent to the boundaries of the District may also affect the ground waters of the District and be under the jurisdiction of the District Board, certainly the above sections are directly established by law, rules and regulations as subject to the jurisdiction of the North Kiowa Bijou Ground Water Management District Board.

No "dumping" or "waste water disposal" will occur under the POTW option. This option includes a permitted discharge to the Aurora/Metro Denver sanitary sewer systems of water from the Lowry Site after treatment to meet pretreatment standards developed by Metro and Aurora and approved by EPA and CDPHE. Metro currently land applies as fertilizer most of the biosolids in the area of Deer Trail and Agate. These biosolids are generated from the treatment of wastewater. The discharge of pretreated ground water from the Lowry Site to the sanitary sewer system would represent less than 0.01 percent of the daily volume treated by Metro's treatment plant and City of Aurora's wastewater treatment plant. Based upon current information and analytical data, the discharge of pretreated Lowry Site ground water to the sanitary sewer system will not cause a measurable change in the chemical composition of Metro's discharge to the South Platte River or Aurora's discharge to Sand Creek. In addition, treatment of the Lowry water at Metro's facility will not adversely affect the "exceptional quality" status of Metro's biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns).

Inasmuch as no one has seen fit, as of this date, to either contact or apply to the District Board for approval on the above project, although it certainly appears that the same would be subject to their approval and jurisdiction, the District Board has instructed me to advise each of you of their interest and claim of jurisdiction in this matter. It is sincerely hoped that this matter can be resolved short of the expense and delay of litigation regarding this entire matter. However, unless some contact is made, the District and its Board feel they may have no other alternative but to apply to the courts for relief.

Section 113(h) of CERCLA, 42 U.S.C. Section 9613(h), prohibits courts from reviewing challenges to remedial actions selected by EPA, except in certain circumstances, none of which currently exists.

Response to Dr. John Meinhold's
June 28, 1997 Fax

The Lowry Landfill Superfund Site has contamination from plutonium, dioxin, PCBs, and other manmade radionuclides(such as: americium, tritium, strontium, cerium, and cesium). Quite simply, these chemicals and radionuclides are some of the most deadly, toxic, and carcinogenic compounds known to man. What long-term studies can you cite and document to show that there will be no detrimental effects to the land, air, water, wildlife, and crops to support your cleanup procedures? What long-term epidemiological studies can you cite or document to prove that increased cancer rates, increased mortality rates, or other serious health effects will not occur?

The comment is noted. EPA has no evidence that plutonium or other man-made radionuclides are present in the Site ground water above background levels. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land farming activities.

The pretreated Lowry Site water received at the POTWs will be required to meet strict influent standards. The ground water from the Lowry Site that would be treated by Metro's and Aurora's

POTWs will be required to meet the performance standards in Table 11-2 of the ROD. These tables include dioxin, PCBs, and radionuclides. The pretreated Lowry Site ground water will not adversely affect the quality of the POTWs' influent and a stringent monitoring program will be implemented to assure that the water is treated to meet the performance standards in the ROD, State water quality standards, and the requirements of the discharge permits.

EPA has issued comprehensive requirements for the use of biosolids generated during the process of treating wastewater. These requirements are known as the Part 503 Rules (40 CFR Part 503) that was published in the Federal Register on February 19, 1993. A document entitled, "A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule" (EPA, 1995) published in September 1995, explains the scientific process used to develop pollutant limits for the use or disposal of biosolids. EPA conducted extensive studies to establish pollutant limits and management practices that protect human health and the environment from reasonable anticipated adverse effects of pollutants in biosolids. This guide includes a list of references that include numerous studies on biosolids and sludge disposal. This list is presented in Attachment G.

In addition, since 1986, EPA has issued 32 RODs across the nation that include disposal of wastewater to POTWs. The Superfund Law and the NCP mandate that EPA will review each remedy no less than every 5 years after initiation of the remedial action to assure that human health and the environment are protected. During this review, an evaluation is performed to determine whether the cleanup, or performance, standards in the ROD remain protective of human health and the environment. EPA will continue the reviews until no hazardous substances, pollutants or contaminants remain above levels that allow for unrestricted Site use and unlimited exposure. The list of sites with RODs that include discharges to POTWs is provided in Attachment B.

Response to Robert J. Miller's/Director, Environmental Health & Safety, Sundstrand Corporation May 22, 1997 Letter

On behalf of Sundstrand Corporation, we submit the following comments regarding the proposed ESD for the Lowry Landfill ROD. We support the agency's proposed ESD. Our support is based upon a review of the ESD and communications regarding the same.

The comment is noted.

Response to Ted Montgomery's
May 14, 1997 Letter

I am against putting Lowry Landfill Superfund waste water in Metrogro sludge and hauling it out for fertilizer that will get in the water we use out here in the East end of Arapahoe County.

The comment is noted. All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.) EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

Response to Arthur A. Paine's
May 14, 1997 Letter

In response to the proposed "Lowry Landfill Superfund Site Second Explanation of Significant Differences for the Record of Decision" we, as community business members, landowners, and rural residents, request that the public comment period be extended 60 days from May 22, 1997 to end on July 22, 1997, so that we can review the information provided to us in the libraries. We have not had sufficient time to get access to this information, and send our comments to you on this subject.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

Response to David A. Pampu's/Deputy Executive Director,
Denver Regional Council of Governments (DRCOG)
June 30, 1997 Letter

The proposed Publicly Owned Treatment Works Option developed by the U. S. Environmental Protection Agency for the Lowry Landfill Superfund Site has been

reviewed for consistency with the regional Clean Water Plan. The proposal is consistent with the Clean Water Plan and is protective of water quality. The 14,400 gallons of Lowry site groundwater to be potentially treated by the Metropolitan Wastewater Reclamation District will not have a measurable impact on effluent discharge quality. This option is appropriate and feasible and will allow clean-up of groundwater to begin at the site without delay.

The comment is noted.

Response to Richard Price, Jr.'s
May 11, 1997 Letter

I am writing to object to incorporating Lowry Landfill Superfund waste water into the Metrogro sludge.

The comment is noted. The POTW option does not involve integrating Lowry Site ground water into Metro sludge (biosolids). All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. The types of inorganic chemicals within the pretreated Lowry Site ground water will be no different than the inorganic chemicals that are found in pretreated wastewater from local industrial dischargers. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.) EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

Land already owned by Metrogro east and south of Deer Trail drains north into the Muddy Creek, also known as Deer Trail Creek. Muddy Creek has already had sludge-fertilized trash and dirt wash into it from the six-inch rain in 1996 that washed out the road to the Metrogro site. We want you to be aware that there is 7 miles of live water on the Muddy Creek and this is an important recharge for the Foxhill aquifer.

The Muddy runs through our property and into our reservoir which holds 3,000 acre feet of water and is 1 3/4 miles from Metrogro's north property line. Our reservoir is stocked with fish and is home to pelicans, ducks, geese, and small herons and other water birds. There have been Blue Heron on occasion and it is a migration stop for Sandhill cranes. Since all of the run-off from Metrogro south

of us runs into the Muddy and the reservoir, it has become a settling pond for fertilized sludge.

The comment is noted.

Water pumped from the chemically saturated sand below the Lowry Landfill Superfund will have particles of all 177 chemicals, including plutonium, in it. If this treated water is clean enough to put in sludge, then why can't it be used for household use?

Actually, treated water is not put in sludge, sludge is created from the treatment of water. Biosolids are then created from treatment of the sludge. (See Executive Summary - Human Health, Environmental, and Biosolids Concerns.) The pretreated ground water from the Lowry Site will be clean enough to be discharged to Metro and Aurora for further treatment and both Metro and Aurora will be able to meet discharge permit requirements, including biosolids requirements as specified in the Clean Water Act (1977, as amended). These standards protect the discharge stream (South Platte River) for particular uses, such as drinking water supplied downstream. Water used for household use must meet requirements specified in the Safe Drinking Water Act, known as MCLs. Lowry Site ground water will not be treated to MCLs. In particular, compounds such as chlorides and sulfates are naturally present in the shallow ground water and make the water not desirable for drinking.

The biosolids that are generated from the treatment of the water and sludge will continue to meet EPA's criteria for "exceptional quality" biosolids. This means that the biosolids are clean enough for household use and can be bagged and sold to households.

Contamination from Superfund sludge blown by high winds and run-off will be felt by people hundreds of miles away. The Muddy Creek runs into the Bijou and on into the Platte River. Huge dust clouds are carried miles away from the sites, and the eastern plains are known for high winds.

Metro has a water truck at the Deer Trail site and uses it for dust suppression. Although it is not ideal to allow dried biosolids to blow in the wind, if biosolids were to become windblown, it would not create a health threat. The 40 CFR Part 503 Regulations, which are designed to ensure that biosolids' application activities do not threaten human health or the environment, are based in part on the results of detailed risk assessments. Fourteen different exposure pathways, including dust inhalation from biosolids' application operations, were evaluated and the regulatory standards are based upon conservative assumptions incorporated into the assessments.

In addition, Metro's biosolids are classified as "exceptional quality," which means that contaminant levels in the biosolids are low enough to allow the biosolids to be applied in unrestricted areas such as farmland and home gardens.

Response to Bonnie L. Rader/Citizens for Lowry Landfill Environmental Action Now (CLLEAN) May 18, 1997 Letter

It is my understanding that because of these new issues there will need to be an extended comment period. CLLEAN will require more time to review the new information when it is released and then we will submit our comment.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

Response to Bonnie Rader's/Citizens for Lowry Landfill Environmental Action Now (CLLEAN) June 30 1997 Letter

Note: Throughout this response, the following terms are used interchangeably: Alternative 2, Alternative 2B, and Modified Alternative 2B. All three terms refer to the onsite treatment option involving reverse osmosis and evaporation.

Publicly Owned Treatment Works (POTW)

1. *CLLEAN's concerns regarding the POTW are not whether it will work as currently proposed by Denver (City) and Waste Management (WMI). The issue is - does this proposal offer a clean up of the contaminated water, one that will not adversely impact our natural resources or citizens living in other neighborhoods. Our position is that the proposal, without our suggested secondary treatment, is not a clean up. Rather, it is the disbursement of the contaminants to other neighborhoods. Metro Waste Water should not pay their share of the clean up with "in kind" through use of the POTW, they should pay for the secondary treatment requested by CLLEAN. The solution to pollution is not dilution.*

EPA and CDPHE share your concerns about spreading pollution and believe that the POTW option offers a cleanup of the contaminated ground water with the least impact on natural resources and other neighborhoods. All of the other proposals, including Modified Alternative 2B, generate concentrated wastes and brines that must be transported and disposed offsite. The pretreated ground water leaving the Lowry Site has low concentrations of inorganics. Additionally, the treatment technologies available for the ground water at the Metro and Aurora facilities are the best currently available.

EPA and CDPHE believe that the POTW option is the most technically feasible, cost-effective, protective, and reliable option. We believe that this alternative achieves better long-term effectiveness, provides a more significant reduction in toxicity, mobility, and volume through treatment, is more implementable, more cost-effective, and is protective of human health and the environment. Metro's role as a responsible party was not a factor in selecting the POTW option.

2. *Under the Superfund Law, the legal requirement is that any amount of contaminated/treated water that is pumped offsite through the POTW must be replaced with a new source of clean water. The only source of clean water available to us is the water that comes from our aquifers which are currently being depleted at an alarming rate. WMI and the City state that it will only take pumping a maximum of 10 gallons per minute (gpm) of "clean" water back into the site. In reality, 10 gpm equals 5.2 million gallons of water each and every year. Those citizens who utilize water from domestic wells consider this a tremendous amount of water to be taken from our supply.*

The Superfund Laws require that a remedial action comply with all ARARs. The Respondents to the RD/RA Order do not have surface water rights in the vicinity of the Site. Consequently, they may not remove water, for consumptive use, from the shallow ground-water (alluvial) aquifer. Under Colorado water law, water removed from the shallow alluvial aquifer, in hydraulic communication with surface water, must be replaced if the user does not have surface water rights. The Respondents to the RD/RA Order have agreed to implement an augmentation plan to replenish the water removed from the shallow Dawson aquifer, which is tributary to Murphy Creek surface water. Currently, the Respondents to the RD/RA Order own ground-water rights to the Dawson, Denver, Arapahoe, and Laramie Fox Hills aquifers that underlay the 3,634 acres of land owned by the Respondents to the RD/RA Order in the immediate vicinity of the Lowry Site. These ground-water rights allow the Respondents to the RD/RA Order to extract approximately 1.3 billion gallons of water per year for beneficial use. The 5.2 million gallons per year that may be required for augmentation would represent less than 1 percent of the amount potentially available.

The 5.2 million gallons of water per year also represent a small proportion of the water within the bedrock aquifers in the Denver Basin. According to Robson (1984), there is approximately 260 x 10^6 acre feet of water within the aquifers in the Denver Basin. This equates to approximately 85,000,000,000,000 gallons of water. The 5.2 million gallons that would be removed represents 0.000006 percent of the total water available.

Assuming an effective porosity of 45 percent for the Arapahoe, the Respondents estimate that the average drawdown of the Arapahoe Formation underlying their 3,634 acres will be approximately 0.02 inch per year. The additional drawdown in the Denver Basin would be less than 0.1 percent of the current drawdown in the surrounding vicinity. EPA and CDPHE will review the augmentation issue periodically to evaluate potential impacts to the aquifers from the water augmentation plan.

In addition, the Respondents to the RD/RA Order have entered into an agreement with East Cherry Creek Valley Water and Sanitation District (ECCV) to transfer some of their deep ground-water rights to ECCV in exchange for shallow ground-water rights adjacent to the Site. As part of this agreement, ECCV has agreed to supply the Respondents to the RD/RA Order with shallow ground water for augmentation purposes.

3. *The City and WMI are required, by law, to construct the wetlands that were destroyed during the time that chemicals were disposed at the Lowry Landfill. This wetlands will require a water source to keep it alive. CLLEAN has recommended that Alternative 2B, with our suggested addition of a secondary process, will provide an opportunity to clean the site while preserving the existing water sources in the area. Although the treated water would not replenish the deeper aquifers, new water sources would not need to be tapped to support the Wetlands.*

The Respondents to the RD/RA Order are required to replace wetlands that were destroyed during construction of the ground-water collection system component of the Surface Water Removal Action. The wetlands have already been constructed in an area northeast of the command post in the Murphy Creek drainage. The wetlands are receiving water from the alluvial aquifer and surface water flow. Under the POTW option, the water source for these wetlands will not change because the wetlands were constructed to be self-supporting and require no additional water sources.

4. *Alternative 1 states that the POTW is removing inorganics. This is incorrect. The inorganics are either passed through the plant and in to the Platte River, or they are dispersed into the sludge. The sludge, containing metals and bacteria, is then applied to the farm land. We concur with the citizens from the Eastern Plains who are complaining that they do not want the contaminated sludge brought into their neighborhoods. If the sludge is land applied the heavy metals will slowly accumulate (as e.g. selenium in the California irrigation water reservoirs). The organic portion of the sludge is used by bio-growth, however, the heavy metals would just accumulate and be in a form that is susceptible to exposure to the public. Passing the metals through the plant does not specifically "fix" them into an inert form.*

The POTW will remove inorganics. Wastewater treatment systems at a POTW are designed to treat wastewater. In other words, the POTW is designed to remove contaminants from the water. Organic compounds are broken down and destroyed by a combination of biological and chemical processes. Inorganic compounds are removed from wastewater and placed into the settling solids, where they pose a minimal hazard. If the treatment processes are managed effectively, the concentrations of inorganics in the biosolids are not only suitable for land application as fertilizer, but additionally supply micronutrients to soil depleted as a result of crop growth.

Assuming all of the metals within the Lowry Site ground water will settle to the solids, there will be no observed difference in the concentrations of metals in the biosolids produced by Metro. In addition, the biosolids will still comply with EPA's criteria for exceptional quality sludge and land application. The metals are required to be at concentrations that will not be harmful to crops or human health or the environment.

Metals are inert compounds. Therefore, they do not need to be "fixed" into an inert form.

5. *Treatment system costs: CLLEAN's position is that Alternative 2B, including secondary process, will cost more at the start up but, it will actually save money over the life of the process/cleanup. Long-term monitoring needed for the stated processes will escalate the costs of the cleanup.*

The estimated capital and O&M costs of the two alternatives were calculated and compared. Net present worth costs were estimated by adding the capital costs to the net present value of the annual O&M costs for 30 years, using an interest rate of 5 percent. The net present worth cost for Alternative 1 (the POTW option) is estimated at $6,354,000. This includes capital costs for a lift station, piping, excavation and construction, the sewer connection fees, design and construction management costs, O&M costs, equipment repair cost, POTW treatment fees, and water augmentation costs.

The net present worth cost for the Modified Alternative 2B was estimated at $9,300,000. This includes capital costs for the reverse osmosis system, an iron removal system, an evaporation system, design and construction management costs, O&M costs, and water augmentation costs. Long-term monitoring is included for both options and is approximately equal for both.

While the analysis showed a cost differential between onsite and offsite treatment, cost was only one of the criteria used to evaluate the treatment alternatives. EPA uses nine criteria to evaluate the merits of Superfund remedies. The first two criteria are: 1) overall protection of human health and the environment; and 2) compliance with ARARs or other Federal and State environmental statutes. If a remedial alternative does not meet the first two criteria, it is not carried over for further analysis. If an alternative meets the first two criteria, it is then reviewed against five additional criteria: 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility or volume through treatment; 5) short-term effectiveness; 6) implementability; and 7) cost, including capital and O&M cost. The final two criteria are: 8) State acceptance; and 9) community acceptance.

EPA and CDPHE compared the two alternatives according to these criteria and concluded that Alternative 1 achieves the best balance between the nine criteria. EPA and CDPHE are recommending the POTW option because it is the most technically feasible, cost efficient, protective, and reliable option. This alternative achieves better long-term effectiveness, provides a more significant reduction in toxicity, mobility, and volume through treatment, is more implementable, is more cost-effective, and is protective of human health and the environment.

Alternative 1 was selected over Modified Alternative 2B because there are risks associated with offsite transport and disposal of brine sludge and spent chemicals. The POTW option uses simpler treatment processes that are less likely to fail than those in Modified Alternative 2B and the Metro facility has safeguards that guarantee a more consistent effluent.

6. *CLLEAN does not support the claim made by citizens from the Eastern Plains that the crops will be contaminated by plutonium in the resultant sludge from the POTW. The evidence just does not exist. CLLEAN continues to be very vigilant regarding the plutonium and/or radionuclide issue.*

EPA agrees that there is no evidence that crops will be contaminated by plutonium in the sludge or biosolids that result from the pretreated Lowry Site water. Although radionuclide contamination does not currently appear to be evident, there is an onsite early-warning ground-water monitoring system currently in operation. This system has been designed to alert EPA and CDPHE if unacceptable levels of radionuclides appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

7. *CLLEAN supports the Oil, Chemical, and Atomic Workers in their concerns that chemicals will travel through the POTW. The onsite treatment systems, as suggested by WMI and the City, will only treat the chemicals to minimal standards, thus sending chemical resides and heavy metals to the POTW. Further, as the contaminated waters are treated, the amount of water should decrease, the concentration of chemicals will increase. At that point in time, the POTW can not legally receive the liquids.*

The pretreated ground water leaving the Lowry Site will be tested to meet Metro's and Aurora's influent requirements, which will be protective of worker health and safety. In addition, EPA and CDPHE will require Metro to have an approved health and safety program for all employees who may be in contact with the water.

It has not yet been confirmed that the concentrations of chemical residues and heavy metals in the Lowry Site ground water will increase over time. Historical data from the onsite treatment plant suggest that these concentrations may actually decline. The quality of the ground water will be closely monitored as part of the ongoing performance monitoring programs. EPA and CDPHE will require changes to process operations or equipment to assure continued compliance with the performance standards in the ROD and Metro's and Aurora's influent standards.

Treatment of Waste Pit Material Former Tire Pile Area (FTPA)

1. *It is disconcerting to note that the models that have been utilized to determine the treatment of the chemical contamination at the Lowry Landfill Superfund site describe a*

normal household garbage landfill. These models are erroneous and can not possibly reflect the very real problems that exist at the Lowry Landfill Superfund site. Please revise the models to reflect the true picture before any final decisions for cleanup are finalized.

The air model used for the FTPA emissions modeling is the Industrial Source Complex (Release 3) Short Term (ISC3ST) dispersion model. As the name implies, this model simulates industrial sources, not municipal solid waste landfills. Site-specific data from the FTPA were input into the model to evaluate emissions from the excavation and the treatment of soils.

2. *It is not yet clear how the old tire pile pits will be opened and the onsite controlled aeration will be accomplished. It is of the upper most importance to CLLEAN that neither of these activities move forward with out the prior construction of a bubble over the pits as they are opened to prevent the noxious gases from escaping into our atmosphere. The plan must include safety measures to protect the onsite workers.*

Excavation of the FTPA waste pits will be performed so that the cleanup, or performance, standards stated in the ROD are met. If it is found that these standards cannot be achieved, then engineering controls such as a bubble, foam suppressant, or other emissions control mechanism will be used to cover the pits during excavation. Such engineering controls will be evaluated during RD, if necessary.

3. *All gases that escape into the bubble should be piped to the flare for destruction.*

If a bubble or other engineering controls are used to control emissions from the excavation, then appropriate treatment methods such as destruction in the onsite landfill gas flare will be evaluated and a treatment option will be selected. This evaluation will occur during RD.

4. *It is important to examine the possibility of in-situ bacterial treatment for the toxins. Considering the fact that the flare is removing the methane from the mass, and this encourages the "bugs" to multiply, this is an important alternative to consider as it would allow treatment without the exposure of the chemical gases in to the atmosphere.*

Treatability tests performed in the FTPA included an enhanced biological degradation test that simulated an in-situ treatment option. It was found that this method would not adequately reduce the levels of contaminants. Specifically, tetrachloroethylene concentrations were not reduced below the Toxicity Characteristics Leaching Procedure (TCLP) regulatory limit and did not appear to decrease over time. Physical drying/controlled aeration was found to achieve the remedial action objective of reducing the TCLP-volatile organic compounds concentrations to below regulatory limits.

5. *CLLEAN supports the cleanup concept that is currently in effect at the Rocky Mountain Arsenal called the Pica Child. It is our opinion that private industry should be held to the same standards of cleanup as the military.*

The Rocky Mountain Arsenal does not use the pica child cleanup scenario in developing its cleanup standards. While the Rocky Mountain Arsenal uses a recreational exposure scenario to develop its cleanup standards, the Lowry Site uses residential and recreational exposure scenarios.

CERCLA Criteria

The following paragraphs were not bulleted or numbered in the original comments and are presented here in the order they appear in the original comments.

> *The CERCLA process uses a variety of criteria to judge the merits of various alternatives for a proposed remediation. Some of the arguments used in this document are very questionable relative to their bearing on the selection. For instance, stating that two trucks of waste are being hauled (Alternatives 2B and 2C) from the site is a detriment based on the criteria of 'Overall Protection of Health and Environment' is not a valid weighing factor. There is a tremendous amount of truck traffic around this site and two more trucks a year has to be considered inconsequential.*

The extra truck traffic described in the report would be one truck, loaded with hazardous waste sludge, per month. While this may be a marginal increase to the truck traffic associated with the Denver Arapahoe Disposal Site, the transport of hazardous waste from the Lowry Site would present an increase in risk to human health and the environment in comparison to sewer transport of pretreated Lowry Site ground water to the POTWs.

> *The analysis of alternatives implies that the treatments in the alternatives are similar. This is not the case. The POTW alternative does not treat heavy metals. They are simply diluted in the mass of sludge. This is not treatment. The costs of the POTW alternative should not be directly compared to the costs of the options labeled 2A, 2B, and 2C. These alternatives truly treat the inorganic heavy metals in that they are removed from contact with the environment. That cannot be said about the POTW option.*

The comment suggests that the costs of the alternatives should not be compared directly because the commenter believes that Alternative 1 does not treat metals. As with Alternatives 2A, 2B, and 2C, Alternative 1 will result in treated water that complies with ARARs and performance standards in the ROD. EPA does not agree that there is less treatment associated with Alternative 1. Alternatives 2A, 2B, and 2C will result in the production of highly concentrated hazardous sludge that will require disposal in a landfill, while Alternative 1 will produce

biosolids that may be land applied as fertilizer. Alternative 1 does treat metals and therefore the costs of the alternatives can be compared directly.

> *In fact, the POTW treatment option may ultimately be detrimental to the environment. As the sludge is landfarmed, the organic components and necessary trace metals are used in the biocycle. The heavy metals and salts that are a concern at Lowry Landfill will simply accumulate in the soil. At some point they may reach levels that will be detrimental to the land. There are documented cases where land applied sludges have caused unacceptable metal build up in the soil over time.*

Assuming all of the metals within the Lowry Site ground water would settle to the solids, there will be no observed difference in the concentrations of metals in the biosolids produced by Metro. In addition, the biosolids will still comply with EPA's criteria for exceptional quality sludge and land application. EPA biosolids regulations (40 CFR Part 503) are based on over 20 years of studies. Inorganic standards were established based on crop uptake, human receptors, ecological receptors, and other pathways. EPA believes these requirements establish concentrations that are not harmful to crops, human health or the environment.

> *In CERCLA terms, the reduction of TMV is judged by us to be better for Alternative 2. The POTW option spreads the materials treated at Metro over a large volume of sludge and discharge water. The volume of waste is thus increased and the mobility increases for inorganic materials sent to the POTW. Alternative 2 reduces inorganic waste volumes and reduces mobility by placing them in a secure landfill. This criteria favors Alternative 2.*

EPA's and CDPHE's evaluation concluded that the overall ranking for the TMV category is approximately the same for both alternatives. Under Alternative 2, metals would be concentrated and the resulting brine would require disposal in a hazardous waste landfill. While mobility would be restricted, toxicity and volume will actually be increased.

Under Alternative 1, metals will be collected in the biosolids produced at the Metro facility. The biosolids will then be applied as fertilizer on crop land and private gardens. While there will be a reduction in the toxicity and volume of the Site waste, land application of the biosolids could create circumstances in which the metals may have some mobility in the environment. The concentrations and toxicity of these metals would, however, be low.

> *The community acceptance for Alternatives 2B and 2C were judged negatively based on plume presence. There is no reason to have a plume. The steam effluent should be passed through a heat exchanger to recover the heat and preheat the incoming stream. The example of this type of equipment used in the document,*

Appendix C, aqua-chem evaporative crystallizer, even had this feature. This should be struck as a negative community acceptance item for Alternatives 2B and 2C.

This comment is referring to the Respondents' Draft POTW Evaluation (Parsons ES, 1996) and not to EPA's and CDPHE's technical evaluation of the alternatives. (See Attachment E.) EPA and CDPHE conducted a separate technical evaluation of the alternatives as part of the ESD process. It is this technical evaluation that EPA and CDPHE used to develop the recommendations for selection of the POTW option. In the EPA and CDPHE technical evaluation, it was assumed that Modified Alternative 2B had full community acceptance (a "5" in the technical evaluation), which is consistent with the commenter's remarks.

One issue of particular importance to the community is the removal of water from their aquifer. This is a negative item for community acceptance of Alternative 1 and is not addressed in the document. It would appear that the authors took it upon themselves to decide what was significant to community acceptance without actually asking the community.

Again, this comment is referring to the Respondents' Draft POTW Evaluation (Parsons ES, 1996) and not to EPA's and CDPHE's technical evaluation of the alternatives. (See Attachment E.) The authors referred to in the comment are the Respondents to the RD/RA Order. The commenter's concern, with regard to the authors' failure to interact with the community, is noted.

EPA and CDPHE conducted their own evaluation of the alternatives. (See Attachment E.) In the EPA and CDPHE technical evaluation, EPA and CDPHE concluded that Modified Alternative 2B had full community acceptance (a "5" in the technical evaluation). Furthermore, EPA and CDPHE assumed that Alternative 1 would receive poor community acceptance (a "1" in the technical evaluation) because of the community's opposition to the water augmentation portion of Alternative 1. Both of these ratings are consistent with the comment.

Costs within engineering uncertainties are judged to be equal for the alternatives. Likewise, the short term effectiveness and compliance with ARARs are judged to be equal for Alternatives 1 and 2. Implementability will be slightly higher for the options in Alternative 2. However, the equipment is certainly established technology and is no more complex than the treatment equipment currently installed and maintained at the Metro Treatment complex.

The equipment and technology for Alternative 2 is considerably more complex and difficult to operate and maintain than the equipment and technologies associated with the activated sludge treatment processes at the Aurora and Metro POTWs. In addition, a higher level of operator expertise would be required to operate and maintain a chemical precipitation, reverse osmosis,

and mechanical evaporation onsite plant. Therefore, the category of implementability was considered to be less attractive for Alternative 2 than for Alternative 1.

> *The long term effectiveness of the Metro POTW itself can hardly be considered an issue. However, there is question relative to the site effluent and the long term effectiveness of the POTW alternative. The combination of remedies to be installed includes slurry walls and an effective cap. This treatment will effectively eliminate the majority of ground and surface water recharge to the site. The amount of contaminants will not diminish significantly and the net effect could likely be a significant increase in contamination concentration levels in the effluent. It is very likely that as the overall effluent stream drops it will be mainly due to a drop in percentage of the water component. This could easily create an effluent stream from Lowry that is over the influent limits for the discharge to the POTW in inorganics. The site treatment plant would be unable to address this situation and equipment similar to what is available in Alternative 2 may very well have to be added in the future if Alternative 1 is chosen. On this basis, Alternative 2 should be judged as more effective for long term effectiveness.*

Although the scenario described in the comment is possible, it has not yet been confirmed that the concentrations of chemical residues and heavy metals in the Lowry Site ground water will increase over time. Historical data from the onsite treatment plant suggest that these concentrations may decline.

Ground-water quality will be monitored as part of the ongoing performance monitoring programs. EPA and CDPHE will require changes to process operations or equipment to assure continued compliance with the performance standards in the ROD and Metro's and Aurora's influent standards. Based on existing data, it is not expected that a reverse osmosis system will be required in the future.

Process Comments

> *Reverse Osmosis - It is common in this type of scenario to install a second stage RO unit to retreat the brine discharge from the first unit. The efficiency is not as good as the first pass; however, more water can be recovered. A second stage RO would typically recover 50% of the primary brine discharge. Thus a 10 gpm stream with 75% primary recovery would produce 7.5 gpm of clean water and the 2.5 gpm secondary treatment might yield another 1.25 gpm for a total recovery of 8.75 gpm. Numbers from water supply district personnel indicate that a 75% recover of supply water is considered good. If we can recharge 87.5% of the treated water with a primary/secondary RO system, along with the condensate from an evaporative treatment of the 1.25 gpm brine stream, there should be no need to supply augmentation water. This would remove this line item from the*

cost and have better community acceptance. Also, the size and cost of the evaporative unit under Alternative 2B would decrease significantly. This scenario should improve the overall standing of Alternative 2B.

Items discussed in this comment are design issues and will not be addressed because these issues do not relate to the alternative that has been selected. Whether or not there is a 1-stage or 2-stage reverse osmosis process does not alter the EPA and CDPHE technical evaluation of the alternative, since the technical evaluation assumed that appropriate technologies would be used.

Evaporator - As stated earlier under community acceptance, the vapor stream from the evaporator in Alternative 2B and 2C should be condensed and recovered. The condensing apparatus can be used as a preheater for the incoming treatment stream as a cost savings.

Again, items discussed in this comment are design issues and will not be addressed because these issues do not relate to the alternative that has been selected. Design details such as this do not affect the EPA and CDPHE technical evaluation of Modified Alternative 2B because the technical evaluation assumed that best available technology would be used.

Wetlands

The onsite recovery of the water from the treatment process could be used to augment the wetlands program. A recharge system to groundwater would also be in place so that the water could be diverted either way as necessary. This would allow for more flexibility in the wetlands design and maintenance, and increase the likelihood of a successful implementation of the wetlands mitigation project.

Please see the response to Comment #3, under the POTW subsection of the responses to the June 30, 1997 CLLEAN letter.

Treatment of Waste Pit Material Former Tire Pile Area

The off-gas from the treatment of the tire pile pits will have to be captured and treated. Presumably this could be accomplished with a carbon absorber or by sending it through the landfill gas flare. Of specific concern will be the contents of the off gas and the method of treatment.

Excavation of the FTPA waste pits will be performed in such a manner as to comply with the performance standards stated in the ROD. If it is found that these standards cannot be met, then other engineering controls will be considered. If engineering controls are needed to control emissions from the excavation, then appropriate treatment methods such as destruction in the

onsite landfill gas flare will be evaluated and a treatment option will be selected. These evaluations will be conducted during RD.

> *While the burning of the gas in the flare seems to be a logical and economical choice, the issue of hazardous waste treatment will arise with this method. These implications will also have to be addressed in addition to the technical issues. CLLEAN will be very interested in the specifics of these issues.*

The comment is noted. Details, including treatment technologies to comply with ARARs, will be investigated during RD.

Response to Kenneth Ross'
May 23, 1997 Telephone Message

> *The commenter is opposed to the proposal and is concerned about flooding, sewage sludge washing into the ravines, and blowing dust. The commenter wants EPA to guarantee that there will never be a problem in the next 50 years.*

These concerns relate to Metro's biosolids' application techniques, which are regulated under Federal and State laws. In response to expressed public concern, Metro is investigating and improving its soil conservation practices and land application procedures.

Over the past 20 years, biosolids' management practices in the United States have changed significantly, moving from disposal toward more beneficial use. Beneficial use of biosolids, such as land application, is continuing to rise. In a recent poll by a trade industry magazine, 30 states indicated that beneficial use rates are expected to increase and more biosolids will be land applied in the future.

The biosolids that are spread on Metro's land near Deer Trail, Colorado are classified under Federal and State regulations as "exceptipnal quality." This means that the concentrations of pollutants remaining in the biosolids are so low that the biosolids can be applied beneficially to land anywhere, even home gardens, and the biosolids are regulated as a fertilizer.

Although we do not know everything there is to know about the disposal of biosolids, this topic has been one of the most extensively studied waste management practices in the United States. While there can be no absolute guarantees, the past use of biosolids has been reassuring when used in accordance with acceptable practices.

Response to Tammie Scott's/President, Strasburg Community Council, Inc.
May 16, 1997 Letter

It would be helpful if the deadline for public comment could be extended so that residents in our area could become more knowledgeable about the issues involved and about any proposed methods of dealing with any problems that might result.

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

Response to Charles and Helene Shields'
June 27, 1997 Letter

We in New Hampshire stand with those in Colorado who oppose your plan to pump water contaminated with radioactivity and hazardous wastes from the Lowry Landfill Superfund Site into the Denver-Metro sewer system, with the toxic residuals to be sold to an unsuspecting public as "bagged fertilizer" or spread on America's farmland for introduction into the food chain.

We always knew the landspreading of sewage sludge was a monumental scam perpetrated on the American people by the EPA and the waste companies to dispose of toxic industrial waste on the cheap.

All ground water collected at the Lowry Site will be pretreated prior to discharge to the sewer system. Concentrations of inorganic chemicals within the Lowry Site ground water will be lower than for typical industrial discharges.

The quantity of Lowry Site inorganic chemicals that may accumulate in the sewage sludge (or biosolids) will not affect the "exceptional quality" status of Metro's treated sludge, or biosolids (See Executive Summary - Human Health, Environmental, and Biosolids Concerns). EPA recognizes that the commenter may have serious reservations about using sewage sludge as a fertilizer. This is an important issue that continues to foster lively debate. EPA intends to carefully collect and evaluate evidence relating to Metro's ongoing biosolids' land application activities.

There is no historical or sampling evidence of radionuclide contamination at the Lowry Site. Current chemical analyses confirm that the pretreated Lowry Site ground water does not contain levels of radionuclides that could accumulate in the sewage sludge. Although radionuclide contamination does not currently appear to be evident, there is an onsite early-warning ground-water monitoring system in operation. This system has been designed to alert EPA and CDPHE

if unacceptable levels of radionuclides appear in ground water. If this scenario were to occur, Site water would not be sent offsite until the levels of radioactive contaminants were reduced to ROD performance standards or pretreatment standards.

With regard to the commenter's concerns about land application of biosolids, please refer to the response to Mr. Kenneth Ross' May 23, 1997 telephone message.

> *Once these radioactive and hazardous wastes enter the sewer plants, they become the "property" of the taxpayers who own the wastewater treatment plants and are ultimately responsible for the financial consequences of dumping these toxic sludges on land used to grow cattle feed and food crops. And the industries who dumped these poisons on the land and created these Superfund Sites are off the hook!*

The types of chemicals within the pretreated Lowry Site ground water will be no different than the chemicals that are found in pretreated wastewater from local industrial discharges. In fact, concentrations of chemicals in the pretreated Lowry ground water will be lower than for typical industrial discharges.

Under the Superfund law, the liability of any responsible party is not affected by the method of cleanup selected by EPA.

Response to Scott B. Smith's/Director, Environmental Health & Safety Policy, Coors Brewing Company May 20, 1997 Letter

> *Coors fully agrees with EPA's decision to consider minor modifications to their previously selected remedy for the waste materials beneath the former tire pile area (FTPA) and the approach to the treatment of contaminated groundwater collected as part of remediation activities. We concur with EPA's conclusions presented in the Second ESD that the proposed modifications do not fundamentally alter the sitewide remedy and that the sitewide remedy, as modified by the proposal, will remain protective of human health and the environment. Coors applauds the EPA's willingness to consider the results of the ongoing data collection efforts and to modify and adapt the overall remedy to be consistent with the current understanding of Site conditions.*

The comment is noted.

Response to Lori T. Tagawa's/Waste Management of Colorado, Inc. and Dennis D. Bollman's/Environmental Services, City and County of Denver May 20, 1997 Letter

In light of the new information from recent investigations and proposed changes to the ROD, the Respondents believe that the remedy as proposed to be modified in the ESD is protective of human health and the environment and complies with applicable or relevant and appropriate requirements. In conclusion, we commend EPA and CDPHE for considering the options for cost effective treatment technologies available at this time, realizing that technology has progressed in the last few years. We strongly support the two changes to the ROD in the recent ESD.

The comment is noted.

Response to Delores Tippett's/Women Involved in Farm Economics (WIFE) June 21, 1997 letter

What good it will do you to give in to the polluters so they can have more money and power. From the time the sludge leaves Lowry Landfill the taxpayers are liable. How can you or your kids eat food grown on that -- who knows what soil?

Consistent with the requirements of the Superfund law, EPA and CDPHE are requiring the polluters to clean up the contamination at the Lowry Site. EPA and CDPHE evaluated several proposals relating to the treatment of water from the Lowry Site. The following criteria were used to evaluate the POTW option:

- Compliance with Metro's CDPS/NPDES discharge permit
- Compliance with State water quality standards
- Ability to achieve risk-based effluent concentration limits developed by EPA for analytes not regulated by water quality standards
- Ability to maintain "clean sludge" levels of analytes in Metro's biosolids
- Ability to prevent interference with Metro's treatment processes
- Ability to prevent releases of significant quantities of hazardous air pollutants from Metro's facilities
- Ability to protect workers from adverse health and safety effects due to toxic compounds in the sewer system

Denver, WMC, CWM, and Metro have demonstrated to the satisfaction of EPA and CDPHE that each of these criteria will be met under the POTW option. The pretreated ground water from the Lowry Site will meet Metro's and Aurora's permitted influent standards, and, once treated, will meet effluent, or discharge, standards established to protect the South Platte River and Sand

Creek environments. Also, there will be no adverse impact to the "exceptional quality" status of Metro's biosolids.

EPA and CDPHE believe that the POTW option offers an effective, reliable, and safe solution to properly treat the ground water from the Lowry Site.

Response to Mary Ulmer's/Family Farmers for Environmentally Safe Use of Property (FESUP) May 15, 1997 Letter

> *In regards to the proposed "Lowry Landfill Superfund Site Second Explanation of Significant Differences for the Record of Decision" we request that the public comment period be extended 60 days from May 22, 1997, to end on July 22, 1997, to give the people of the communities time to review the information, and research any questions they have. Due to the delay in getting all the documents to the public libraries, and the limited access to it, due to distance and times the libraries are open, there are many people in these communities, that are interested in this issue, that have not had sufficient time to review this information and send comments to you on this matter.*

In response to requests from the public, EPA extended the public comment period from April 22 through May 22, 1997. The public comment period was further extended through June 30, 1997 to allow the public additional time to review Site information (including new information regarding treatment of a portion of the water from the Lowry Site in Aurora's POTW). With these extensions, the public comment period on the Second ESD extended more than 90 days.

Response to Roland Wadsworth's June 23, 1997 letter

> *I'm against the murder of Metro wastewater workers and the poisoning of Coloradans and others for any reason, especially to just save money. I want to go on record as against the Lowry landfill sludge proposal.*

The comment is noted. EPA and CDPHE have a responsibility to protect human health and the environment. Based upon current data and knowledge, EPA and CDPHE believe the proposed option is the most effective, reliable, and safe way to handle the ground water at the Lowry Site. EPA and CDPHE will monitor the ground water and the biosolids to ensure that all applicable health and environmental standards are met.

Response to Richard Walker's/President, Applewood Sanitation District June 12, 1997 Letter

The Board of Directors of the Applewood Sanitation District, Jefferson County, Colorado is in complete agreement with the EPA proposal to have the Metro District Plant treat ground water from the Lowry Landfill Superfund site which will be pretreated at the Superfund site. We have complete confidence in Metro being able to do the treatment and fully protect the health of Metro employees, the environment and the public at large. As rate payers we believe the proposed plan is most economic for all parties and gives all parties the greatest return for money spent.

The comment is noted.

Response to Barbara White's June 26, 1997 Letter

The commenter is opposed to placing a superfund waste site at Deer Trail, Colorado.

There is no proposal to place a Superfund waste site at Deer Trail, Colorado. The POTW option involves pretreatment of Lowry Site ground water at an onsite treatment plant, followed by final treatment at the Metro and Aurora wastewater treatment plants. The pretreated ground water will be piped from the Lowry Site via the sewer system and will comply with the pretreatment influent standards established for each wastewater treatment plant. Additionally, the pretreated Lowry Site ground water will not adversely affect the "exceptional quality" status of the biosolids produced at the Metro plant. The biosolids will continue to be in compliance with all Federal and State standards.

Response to State Representative Brad Young's June 30, 1997 E-mail

Commenter states that as the State Representative of eastern Elbert and Arapahoe Counties, he has some concerns about the proposal to send wastewater from the Lowry Site to Metro. Specifically, he mentions the allegations that plutonium and hydrazine may be added to the waste stream and concern over the amount of contaminants the Lowry Site wastewater would add to the waste stream at Metro. His main concern is that there be adequate safeguards to ensure that the Lowry Site waste problems aren't simply transferred somewhere else.

There is no historical or sampling evidence of plutonium or spent rocket fuel (hydrazine) contamination at the Lowry Site. As part of the Lowry Site cleanup project, EPA conducted detailed reviews of all information available on the wastes disposed at the Lowry Site. This

evaluation concluded that no radioactive wastes (e.g., plutonium) were transported to the Lowry Site from Rocky Flats, and no hydrazine was disposed of at the Lowry Site. Additionally, EPA and CDPHE will monitor the pretreated ground water leaving the Lowry Site using an "early warning system." This system has been designed to alert EPA and CDPHE if unacceptable levels of constituents appear in the ground water. If this scenario were to occur, Lowry Site water would not be sent offsite until the levels of contaminants were reduced to ROD performance standards or pretreatment standards.

Metro's biosolids currently meet "exceptional quality" standards. After pretreatment, the level of contaminants in the Lowry Site ground water will have no measurable effect on Metro's waste stream and will not adversely affect the "exceptional quality" status of Metro's biosolids. Under the POTW option, Lowry Site ground water will first be treated onsite to meet Metro's industrial pretreatment standards and will then be conveyed via a sewer line to Metro's and Aurora's POTWs for final treatment. It is estimated that the amount of Lowry Site water that will require treatment would be approximately 10 gallons per minute, or 14,400 gallons per day. (This represents only about 0.01 percent of the total daily flow of wastewater to Metro.)

EPA and CDPHE share the concern that solving the environmental problems of one locality not create problems for another. EPA and CDPHE have a responsibility to protect human health and the environment and plan to closely monitor Lowry Site activities to ensure that Federal and State health and environmental protection standards are met.

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Glossary

absorbed dose—The energy of ionizing radiation absorbed per unit mass of any material. The common unit of absorbed dose is the rad. One rad is equal to 100 ergs of energy per gram of material.

activity (also radioactivity)—The amount of nuclear transformations (disintegrations) of a radioactive substance that occur over a specific time interval. The common unit of activity is the Curie.

agronomic rates—The rate at which nitrogen is supplied to plants as a fertilizer in order for the plants to absorb growth - farmers consider plant needs and soil nutrient levels when applying fertilizer.

aquifer—An underground rock formation composed of materials such as sand, soil, or gravel that can store and supply ground water to wells and springs. Most aquifers used in the United States are within a thousand feet of the earth's surface.

as low as reasonably achievable (ALARA)—A basic concept of radiation protection that specifies that exposure to ionizing radiation and releases of radioactive materials should be managed to reduce doses as far below regulatory limits as is reasonably achievable considering economic, technological, and societal factors, among other things.

augmentation—The process of adding to or increasing, such as adding a volume of water to an existing water supply system or aquifer.

background—The presence of a substance in the environment due to conditions other than those associated with the waste disposal activities at a Superfund site (a site on the National Priorities List). Examples would be: naturally-occurring metals such as arsenic, copper, and zinc; cosmic or radon radiation; or radiation from naturally-occurring radioactive minerals such as uranium.

biosolids—When wastewater is cleaned, the treated solid, semi-solid, or liquid residues removed are called biosolids. The Colorado Biosolids Regulation defines biosolids as the accumulated residual product resulting from a domestic wastewater treatment works. Biosolids do not include grit or screenings from wastewater treatment works, grease, commercial or industrial sludge, or domestic or industrial septage. Biosolids do not include animal manures, untreated septage, municipal solid wastes, hazardous wastes, industrial sludges such as those generated by oil and gas refining operations, or grit and screening removed from wastewater during preliminary treatment.

capital cost—The costs of items such as buildings, equipment, engineering, and construction.

chemicals of concern—The most prevalent and toxic chemicals at a Superfund site (a site on the National Priorities List).

Clean Water Act of 1977, as amended (CWA)—The objective of this law is to restore and maintain the chemical, physical, and biological integrity of the nation's waters and is achieved through the control of discharges of pollutants to surface waters.

co-disposal—A waste disposal technique used at the Lowry Site from 1965 to 1980. Liquid industrial wastes were dumped into unlined trenches or pits, and municipal refuse was added to soak up the liquids.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA)—A Federal law passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act. CERCLA created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up inactive hazardous waste sites.

counting error—A measure of the uncertainty or error associated with a single result at a predetermined confidence level. Typically this uncertainty is calculated at the 95 percent confidence level, and is expressed as the expected range of activity concentrations that a sample could contain with 95 percent confidence.

Curie—A special unit of activity equal to a nuclear transformation (disintegration) rate of 3.7×10^{10} disintegrations per second. One picocurie is equal to 10^{-12} Curies, which is approximately 2 disintegrations per minute. The Curie was originally defined as the amount of radioactivity in one gram of radium-226.

effective dose equivalent—A unit of radiation dose equivalent adjusted for organ risk. Effective dose equivalent is a dose to organs adjusted for different radiation types and by an organ weighting factor to account for organ sensitivity to the effect of radiation. Effective dose equivalent is measured in units of rem.

"exceptional quality" biosolids—A classification for biosolids under Federal and state regulations that means that the concentrations of pollutants remaining in the biosolids are so low that the biosolids can be applied beneficially to land anywhere, even home gardens. Biosolids are regulated as a fertilizer.

Explanation of Significant Differences (ESD)—As a result of new information submitted during the remedial design/remedial action process, EPA may make a significant change to a component of the remedy. If this change does not fundamentally alter the overall approach intended by the remedy, then EPA publishes a document that provides an explanation of the reasons for the change.

flare—A piece of equipment (a burner) used to burn landfill gas after collection; the burner and flame are enclosed.

former tire pile area (FTPA)—A 30-acre area near the center of the Lowry Site where approximately eight million old tires were stockpiled.

ground water—Water found beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. In aquifers, ground water occurs in quantities that can be used for drinking water, irrigation, and other purposes.

hazardous substance—As defined by Section 101(14) of CERCLA, any substance EPA has designated for special consideration under the Clean Air Act (CAA), Clean Water Act (CWA), or Toxic Substances Control Act (TSCA), and any "hazardous waste" under the Resource Conservation and Recovery Act (RCRA).

hazardous waste—Under RCRA, the definition of hazardous waste means that either: (1) the material has certain characteristics or properties that make it a hazardous waste, or (2) the material is included

on a list of hazardous materials developed by EPA. The characteristics or properties that make a material hazardous are ignitability, corrosivity, reactivity, and toxicity.

inorganics—Material such as sand, salt, iron, calcium salts, and other mineral materials. Inorganic substances are of mineral origin, whereas organic substances are usually of animal or plant origin.

land application—The process of applying biosolids to land to serve as a soil amendment.

Metro—The Metro Wastewater Reclamation District is a large Publicly Owned Treatment Works (POTW), or wastewater treatment plant, serving the greater Denver area.

minimum detectable activity (MDA)—The MDA is the activity level that a specific instrument and technique can be expected to detect 95 percent of the time.

mixed waste—A waste that contains both a hazardous waste, as defined under RCRA, and a radioactive waste, as defined under the Atomic Energy Act.

monofill—A solid waste disposal cell used at the Lowry Site to contain tire shreds.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP)—Regulations that provide the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

NCP criteria—Nine criteria identified in the NCP: overall protection of human health and the environment; compliance with all Federal and state environmental laws; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost-effectiveness; state acceptance; and community acceptance. Each cleanup alternative at a Superfund site (a site on the National Priorities List) is evaluated using these nine criteria.

National Pollutant Discharge Elimination System (NPDES) Program—This is the national program for issuing, monitoring, and enforcing permits for direct discharge of treated wastewater to surface waters.

National Pretreatment Program—This national program establishes standards to control pollutants which pass through treatment processes in POTWs or which may contaminate sewage sludge, or biosolids.

operation and maintenance (O&M) costs—Operating labor costs, maintenance materials, energy, disposal costs, and administrative costs.

primary treatment—The first stage in a wastewater treatment process in which solid materials are removed from the incoming wastewater. Large debris may be removed by screens or may be reduced in size by grinding devices. Inorganic solids are removed in grit channels, and much of the organic suspended solids are removed by sedimentation. A typical primary treatment system should remove approximately one-half of the suspended solids in the incoming wastewater.

Publicly Owned Treatment Works (POTW)—A wastewater treatment system that serves a segment of the public. Wastewater is typically delivered to a POTW via sewer lines.

rad—A unit of radiation absorbed dose.

radioactive decay—The spontaneous transformation of an unstable atom into one or more different nuclides accompanied by either the emission of energy and/or particles from the nucleus of the unstable atom.

Radioactivity—see "activity".

Record of Decision (ROD)—A public document that explains which cleanup alternative(s) will be implemented at a Superfund site (a site on the National Priorities List).

rem (radiation equivalent man)—A unit of radiation dose equivalent from ionizing radiation to the total body or any internal organ or organ system. It is equal to the absorbed dose in rads multiplied by a quality factor (to account for different radiation types). A rem effective dose equivalent (ede) is a dose to organs adjusted for different radiation types and by an organ weighting factor to account for organ sensitivity to the effect of radiation. A millirem (mrem) is 1/1,000 of a rem.

Remedial Action (RA)—The actual construction or cleanup phase that follows the remedial design of a selected cleanup alternative at a Superfund site (a site on the National Priorities List).

Remedial Design (RD)—An engineering phase in which technical drawings and specifications are developed for the subsequent remedial action at a site on the National Priorities List.

Remedial Investigation/Feasibility Study (RI/FS)—The RI is a study that collects and analyzes information about the nature and extent of contamination at a Superfund site (a site on the National Priorities List). The FS identifies and evaluates the most appropriate cleanup technologies for a Superfund site.

Resource Conservation and Recovery Act of 1976, as amended (RCRA)—The Federal law controlling the generation, treatment, transportation, storage and disposal of hazardous wastes.

Respondents to the RD/RA Order—Parties to the Lowry Landfill Administrative Order for RD/RA. These parties are required to perform a remedial design described in the Record of Decision and to implement the design by performing a remedial action.

risk—The incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. A cancer risk of 1×10^{-6} is one additional case of cancer (over background levels) per million people exposed (a one in a million chance of getting cancer). The Superfund regulations specify that 1×10^{-6} is an acceptable risk level for multiple contaminants. EPA uses a 1×10^{-4} to 1×10^{-6} risk level as a "target range" within which to manage risk at Superfund sites.

secondary treatment—Secondary treatment follows primary treatment by using microorganisms to remove suspended and dissolved organic matter. After the microorganisms have "eaten" the waste, they clump together and settle to the bottom in a secondary clarifier tank. Chlorine is then mixed with

the water to kill harmful microorganisms called pathogens. The chlorine is removed before the water is discharged to the river.

semivolatile organic compounds—An organic compound (carbon-containing) that does not typically volatilize at room temperature.

sewage—The used water and solids that flow from homes and businesses through sewers to a wastewater treatment plant.

sludge—The settleable solids separated from water during wastewater treatment.

Superfund Amendments and Reauthorization Act of 1986 (SARA)—Amendments to CERCLA that were enacted on October 17, 1986.

Technical Assistance Grant (TAG)—A grant program that provides funds for qualified citizens' groups to hire independent technical advisors to help them understand and comment on technical decisions relating to Superfund cleanup actions.

tertiary treatment—In most cases, secondary treatment of wastewater is sufficient to meet effluent standards. In some instances, however, additional treatment may be required. Tertiary treatment most often involves further removal of suspended solids and/or removal of nutrients.

volatile organic compounds (VOCs)—An organic compound (carbon-containing) that evaporates (volatilizes) readily at room temperature.

wastewater treatment—A process by which wastewater is treated using a combination of physical, chemical, and biological processes to produce cleaner water.

Attachments

Attachment A

Metro's Methods to Calculate Pretreatment Standards

PRELIMINARY

PROPOSED SELF-MONITORING REQUIREMENTS AND POLLUTANTS TO BE LIMITED BY PERMIT FOR THE LOWRY SUPERFUND SITE DISCHARGE TO THE CITY OF AURORA AND THE METRO DISTRICT

The permittee will be required to sample an initial batch for all monitored parameters and submit the analytical results to Metro for approval to discharge the batch and commence normal discharge. The permittee will then be required to sample the continuous discharge for all monitored pollutants on the first three consecutive days of discharge. If these samples are in compliance for all parameters, the monitoring frequency will be reduced to the frequencies identified below. Monthly and quarterly monitoring requirements and frequencies will be reevaluated after the first twelve months of system operation and adjusted accordingly. Yearly monitoring requirements will be reevaluated after five years and adjusted accordingly.

If at any time monitoring data indicate the need for inclusion of a permit limit for a pollutant not proposed to be limited, or the advisability of increased monitoring for any pollutant, the necessary changes will be made to the permit by the District as it deems appropriate.

Twenty-four hour flow composite samples must be collected for all pollutants except, cyanide and volatile organics which must be grab samples. Lower Explosive Limit (LEL) and discharge flow ("on/off") must be monitored and recorded continuously. The continuous recording device on the effluent discharge shall be installed and maintained so that all periods of discharge flow and all interruptions of discharge flow are recorded. The explosion hazard monitoring equipment shall be calibrated so as to read in units of % LEL, and shall be installed so that the sensor is located no more than eighteen (18) inches above the flow in the control manhole. The explosion hazard monitoring equipment shall be further equipped so that, upon a reading of 10% LEL or greater, all discharge to the sanitary sewer system shall be automatically terminated. Discharge may resume only after permission is granted from the Metro District.

The listed pollutants must be analyzed by 40 CFR 136 methods and the method detection limits must be equal to or less than the value listed as the Metro Method Detection Limit (MDL). Analytical results that are reported as less than the detection limit shall be considered zero for compliance purposes. If approved analytical procedures are improved and result in lower detection limits, those detection limits will be incorporated into the permit.

Finally, the permittee will be required to develop a contingency plan detailing all facilities and operating procedures used by the permittee to prevent the accidental discharge of prohibited materials and other substances to the POTW..

PRELIMINARY

THE FOLLOWING CRITERIA WERE USED TO DETERMINE MONITORING REQUIREMENTS AND THE INCLUSION OF SPECIFIC POLLUTANT LIMITS IN THE PERMIT:

Criteria	Limit?	Monitoring
Samples above proposed limit; detected in 10% or more of samples	Yes	Monthly
Samples above proposed limit; detected in less than 10% of samples	Yes	Quarterly
Samples above proposed limit; values not confirmed	Yes	Yearly
Samples below proposed limit; detected in 70%-100% of samples	No	Monthly
Samples below proposed limit; detected in 40%- 70% of samples	No	Quarterly
Samples below proposed limit; detected in 10%- 40% of samples	No	Yearly
Samples below proposed limit; detected in less than 10% of samples	No	None

PRELIMINARY

POLLUTANT	MONITORING FREQUENCY	LIMIT @ 20 GPM (ug/L)	METRO MDL* (ug/L)
1,1-Dichloroethane	Monthly	4,580.00	5.00
1,1-Dichloroethylene	Monthly	3.00	5.00
1,1,1-Trichloroethane	Monthly	1,550.00	5.00
1,2-Dichloroethane	Monthly	58.00	5.00
1,2-Dichloroethene (trans)	Monthly	280.00	5.00
Arsenic (total)	Monthly	330.00	10.00
Benzene	Monthly	50.00	1.00
Carbon disulfide	Monthly	60.00	n/a
Chloroform	Monthly	73.00	5.00
gross Alpha	Monthly	To be Determined	n/a
gross Beta	Monthly	To be Determined	n/a
specific Radioisotopes	To be Determined	To be Determined	n/a
Methylene Chloride	Monthly	1,993.00	5.00
Pentachlorophenol	Monthly	136.00	50.00
Phenanthrene	Monthly	1.40	10.00
Phenol	Monthly	22,813.00	10.00
Selenium (total)	Monthly	660.00	2.00
Tetrachloroethylene	Monthly	1,500.00	5.00
Toluene	Monthly	1,360.00	5.00
Trichloroethylene	Monthly	710.00	5.00
Vinyl Chloride	Monthly	0.30	5.00
Zinc (total)	Monthly	15,600.00	20.00
Silver (total)	n/a	2,900.00	0.20
1,2-Dichloropropane	Quarterly	78.00	5.00
Acrylonitrile	Quarterly	28.00	50.00
Carbon Tetrachloride	Quarterly	30.00	1.00
Ethylbenzene	Quarterly	1,590.00	5.00
Xylenes	Quarterly	22,813.00	5.00
1,1,2-Trichloroethane	Yearly	92.00	5.00

1,1,2,2-Tetrachoroethane	Yearly	25.00	5.00
1,2,4,-Trichlorobenzene	Yearly	390.00	10.00
1,4-Dichlorobenzene	Yearly	214.00	10.00
2,4,5-T	Yearly	n/a	n/a
4-Methyl-2-Pentanone (MIBK)	Yearly	n/a	n/a
4-Methylphenol	Yearly	n/a	n/a
4,4-DDD	Yearly	0.40	0.10
4,4-DDE	Yearly	0.29	0.10
alpha-Chlordane	Yearly	0.28	0.50
Benzo(G,H,I)Perylene	Yearly	n/a	10.00
Bis(2-Ethylhexyl)Phthalate	Yearly	2,333.00	10.00
Cadmium (total)	Yearly	3,400.00	0.50
Chromium (total)	Yearly	3,600.00	20.00
Chrysene	Yearly	n/a	10.00
Copper (total)	Yearly	6,100.00	1.00
Cyanide (total)	Yearly	2,000.00	30.00
Endrin	Yearly	n/a	0.10
Ethylene Glycol	Yearly	n/a	1,000.00
Lead (total)	Yearly	2,200.00	10.00
Mercury (total)	Yearly	130.00	0.20
Molybdenum (total)	Yearly	710.00	30.00
Naphthalene	Yearly	2,650.00	10.00
Nickel (total)	Yearly	5,600.00	20.00
PCBs	Yearly	0.02	1.00

*For inorganic analyses the lab limits are instrument detection limits not MDL

No Limit or Monitoring Requirements:

1,2-Dibromo-3-Chloropropane
1,2-Dibromomethane (EDP)
1,2-Dichlorobenzene
1,2-Dichloroethene (cis)
1,2,4,5-Tetrachlorobenzene
1,3-Dichlorobenzene
1,3-Dichloropropene (cis)
1,3-Dichloropropene (trans)
2-Butanone (MEK)
2-Chloroisopropyl Ether
2-Chlorophenol
2-Methylphenol
2,3,7,8-TCDD
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-D
2,4,5-TP
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,-Chloronapthalene
2,-Hexanone
2,-Methylnapthalene
3,3-Dichlorobenzidine
4,-Chloro-3-Methylphenol
4,-Chloroaniline
4,-Nitroaniline
4,-Nitrophenol
4,4-DDT
Acenaphthene
Acetone (2-Propanone)
Aldicarb
Aldicarb Sulfonate
Aldicarb Sulfoxide
Aldrin
alpha-BHC
Aniline
Anthracene

Benzoic Acid
Benzo(A)Anthracene
Benzo(A)Pyrene
Benzo(B)Fluoranthene
Benzo(K)Fluoranthene
Benzyl Alcohol
Benzyl Butyl Phthalate
beta-BHC
Bis(2-Chloroethyl)Ether
Bromodichloromethane
Bromoform
Carbaryl
Carbazole
Carbofuran
Chlorobenzene
Chloroethane
Chloromethane
delta-BHC
Dibenzofuran
Dibromochloromethane
Dicamba
Diethyl Phthalate
Dimethyl Phthalate
Di-n-Buthyl Phthalate
Di-N-Octyl Phthalate
Dinoseb
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Endrin Aldehyde
Endrin Keton
Ethylenedibromide
Fluoranthene
Fluorene
gamma-BHC
gamma-Chlordane
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Indeno(1,2,3-cd)Pyrene
Isophorone

MCPA
Methoxychlor
Nitrobenzene
n-Nitroso-Di-N-Propylamine
n-Nitrosodiphenylamine
Pentachlorobenzene
Ppropoxur
Styrene
Total Trihalomethanes
Vinyl Acetate

Preliminary Lowry Limits Determination

Pollutant	(1) Worker Health/Safety Sewer Conc. (ug/L)	(2) Hazardous Air Pollutants Tot. Plant Inf. (Tons)	(3) Water Qual. Stds./RBC Plant Eff. (ug/L)	(4) Local Limits Ind. Discharge (ug/L)	(1) Allowable Ind. Discharge @ 20 gpm (ug/L)	(2) Allowable Ind. Discharge @ 20 gpm (ug/L)	(3) Allowable Ind. Discharge @ 20 gpm (ug/L)	(4) Allowable Ind. Discharge @ 20 gpm (ug/L)	Limit @ 20 gpm (ug/L)
1,1-Dichloroethane	4580	10	810		4580	22813	393750	**********	4,580
1,1-Dichloroethylene	3	10	0.044		3	22813	21	**********	3.0
1,1,1-Trichloroethane	1550	10	200		1550	22813	97222	**********	1,550
1,2-Dichloroethane	1050	10	0.12		1050	22813	58	**********	58
1,2-Dichloroethene (trans)	280		100		280	**********	48611	**********	280
Arsenic				330	**********	**********	**********	330	330
Benzene				50	**********	**********	**********	50	50
Carbon Disulfide	60	10	21		60	22813	10208	**********	60
Chloroform	410		0.15		410	**********	73	**********	73
Methylene Chloride	2060	10	4.1		2060	22813	1993	**********	1,993
Pentachlorophenol	4370	10	0.28		4370	22813	136	**********	136
Phenanthrene			0.0028		**********	**********	1.4	**********	1.4
Phenol	1024000	10	2560		1024000	22813	1244444	**********	22,813
Selenium				660	**********	**********	**********	660	660
Tetrachloroethylene				1500	**********	**********	**********	1500	1,500
Toluene	1360	10	750		1360	22813	364583	**********	1,360
Trichloroethylene	710	10	1.6		710	22813	778	**********	710
Vinyl Chloride	0.3		0.019		0.30	**********	9	**********	0.30
Zinc				15600	**********	**********	**********	15600	15,600
Silver				2900	**********	**********	**********	2900	2,900
1,2-Dichloropropane	3620		0.16		3620	**********	78	**********	78
Acrylonitrile	1190		0.058		1190	**********	28	**********	28
Carbon Tetrachloride	30		0.16		30	**********	78	**********	30
Ethylbenzene	1590	10	680		1590	22813	330556	**********	1,590

Preliminary Lowry Limits Determination

Pollutant	(1) Worker Health/Safety Sewer Conc. (ug/L)	(2) Hazardous Air Pollutants Tot. Plant Inf. (Tons)	(3) Water Qual. Stds./RBC Plant Eff. (ug/L)	(4) Local Limits Ind. Discharge (ug/L)	(1) Allowable Ind. Discharge @ 20 gpm (ug/L)	(2) Allowable Ind. Discharge @ 20 gpm (ug/L)	(3) Allowable Ind. Discharge @ 20 gpm (ug/L)	(4) Allowable Ind. Discharge @ 20 gpm (ug/L)	Limit @ 20 gpm (ug/L)
Xylenes	182300	10	10000		182300	22813	4861111	**********	22,813
1,1,2-Trichloroethane	1150		0.19		1150	**********	92	**********	92
1,1,2,2-Tetrachoroethane	440		0.052		440	**********	25	**********	25
1,2,4,-Trichlorobenzene	390	10	50		390	22813	24306	**********	390
1,4-Dichlorobenzene	3550	10	0.44		3550	22813	214	**********	214
4,4-DDD			0.00083		**********	**********	0.40	**********	0.40
4,4-DDE			0.00059		**********	**********	0.29	**********	0.29
alpha-Chlordane	1270	10	0.00058		1270	22813	0.28	**********	0.28
Bis(2-Ethylhexyl)Phthalate		10	4.8		**********	22813	2333	**********	2,333
Cadmium				3400	**********	**********	**********	3400	3,400
Chromium (total)				3600	**********	**********	**********	3600	3,600
Copper				6100	**********	**********	**********	6100	6,100
Cyanide				2000	**********	**********	**********	2000	2,000
Lead				2200	**********	**********	**********	2200	2,200
Mercury				130	**********	**********	**********	130	130
Molybdenum				710	**********	**********	**********	710	710
Naphthalene	2650	10	620		2650	22813	301389	**********	2,650
Nickel				5600	**********	**********	**********	5600	5,600
PCBs	5	10	0.000044		5	22813	0.02	**********	0.02

EFFECT OF PROPOSED LOWRY SITE DISCHARGE ON METRO BIOSOLIDS QUALITY

Pollutant	"EQ" Biosolids ug/g	Current Metro Biosolids ug/g	Maximum Addition From Lowry ug/g	Maximum Metro Plus Lowry ug/g	Expected Addition From Lowry ug/g	Expected Metro Plus Lowry ug/g
Arsenic	41	1.7	0.3	2.0	0.1	1.8
Cadmium	39	6	2	8	0.01	6
Chromium	1200	66	3	69	0.004	66
Copper	1500	519	5	524	0.04	519
Lead	300	78	2	80	0.02	78
Mercury	17	2.2	0.1	2.3	0,0001	2.2
Molybdenum	N/A	19	1	20	0.01	19
Nickel	420	31	3	34	0.04	31
Selenium	100	3.1	0.2	3.3	0.05	3.1
Zinc	2800	684	11	695	0.18	684
Alpha, gross*	N/A	20	N/A	N/A	0.03	20
Beta, gross*	N/A	23	N/A	N/A	0.04	23

* Units are pCi/g

COMPARISON OF PROPOSED LOWRY SITE DISCHARGE METALS WITH OTHER INDUSTRIAL DISCHARGERS

Pollutant	Metro Limit ug/L	Expected Lowry Discharge ug/L	Actual Electroplater "A" ug/L	Actual Electroplater "B" ug/L	Actual Coil Coater ug/L	Actual Dye Manufacturer ug/L
Arsenic	330	62	55	<1	<1	<1
Cadmium	3,400	17	49	2	29	<1
Chromium	3,600	5	210	911	4	<1
Copper	6,100	54	237	14	39	103
Lead	2,200	25	1,186	26	48	4
Mercury	130	<1	<1	<1	<1	<1
Molybdenum	710	6	N/A	470	<1	<1
Nickel	5,800	76	64	64	144	<1
Selenium	660	126	<1	2	49	50
Silver	2,900	6	1	5	30	<1
Zinc	15,800	258	2,455	72	23	1,128

EFFECT OF PROPOSED LOWRY SITE DISCHARGE ON METRO EFFLUENT QUALITY (DISCHARGE PERMIT)

Pollutant	Permit Limit ug/L	Current Metro Effluent ug/L	Maximum Addition From Lowry ug/L	Maximum Metro Plus Lowry ug/L	Expected Addition From Lowry ug/L	Expected Metro Plus Lowry ug/L
Arsenic	50	<10	0.002	<10	0.0004	<10
Cadmium	2.23	<.50	0.1	<.50	0.0005	<.50
Chromium	11	<5.0	0.06	<5.0	0.0001	<5.0
Copper	24.6	6.7	0.06	6.8	0.001	6.7
Cyanide	30	<30	0.2	<30	0.002	<30
Lead	13.1	<10	0.05	<10	0.001	<10
Manganese	400	45	N/A	N/A	0.3	45
Mercury	0.4	<.20	0.002	<.20	0.000002	<.20
Nickel	184	<20	0.3	<20	0.003	<20
Selenium	8	<2.0	0.04	<2.0	0.007	<2.0
Silver	1.4	0.20	0.008	0.21	0.00002	0.20
Tetrachloroethene	5	<5.0	0.03	<5.0	0.002	<5.0
Zinc	219	39	0.3	39	0.006	39

EFFECT OF PROPOSED LOWRY SITE DISCHARGE ON METRO EFFLUENT QUALITY (STREAM STANDARDS)

Pollutant	Standard ug/L	Current Metro Effluent ug/L	Maximum Addition From Lowry ug/L	Maximum Metro Plus Lowry ug/L	Expected Addition From Lowry ug/L	Expected Metro Plus Lowry ug/L
Chloride	250,000	- 90,000	N/A	N/A	215	90,000
Sulfate	250,000	- 165,000	N/A	N/A	125	165,000
1,1-dichloroethylene	0.057	<5.0	0.00002	<5.0	0.00002	<5.0
1,2-dichloroethane	0.4	<5.0	0.005	<5.0	0.005	<5.0
Benzene	1	<1	0.001	<1	0.001	<1
1,2-dichloropropane	0.56	<5.0	0.006	<5.0	0.002	<5.0
Naphthalene	620	<10	0.17	<10	0.001	<10
Pentachlorophenol	0.28	<50	0.004	<50	0.004	<50
Phenol	2,560	<10	2	<12	0.1	<10
1,1,2,2-tetrachloroethane	0.17	<5.0	0.0003	<5.0	0.0003	<5.0
Toluene	1,000	<5.0	0.1	<5.1	0.1	<5.1
1,2,4-trichlorobenzene	50	<10	0.04	<10	0.001	<10
Trichloroethylene	2.7	<5.0	0.06	<5.0	0.006	<5.0
Vinyl Chloride	2	<5.0	0.00001	<5.0	0.00001	<5.0

Attachment B

Superfund Sites Sending Liquids to a POTW

SITE NAME	LOCATION	EPA REGION	DATE OF ROD	CONTACT	SEND TO POTW	NAME OF POTW	CONTAMINANTS OF CONCERN	TYPE OF DISPOSAL	LAND APPLY
AM CREOSOTE WORKS	PENSACOLA, FL	4	2/3/94	MARK FITE	NO				N
AMD	SUNNYVALE, CA	9	9/11/91	RICHARD PROCUNIER	NO				N
ARLINGTON BLENDING & PACK.	ARLINGTON, TN	4	6/28/91	DERE- MATORY	NO				N
BELL LUMBER & POLE	NEW BRIGHTON, MN	5	12/31/92	DARRELL OWENS	NOT IMPLEMENTED				N
BRUNSWICK NAVAL AIR STN	BRUNSWICK, ME	1	6/16/92	BOB LIM	YES - ground water	BRUNSWICK		LAND APPLY	Y
CENTRAL LANDFILL	JOHNSTON, RI	1	6/17/94	JOHN COURCIER	NO				N
CHEM CENTRAL	GRAND RAPIDS	5	9/30/91	TIM PRENDOVIL	YES - ground water	CITY OF WYOMING WASTER WATER TRMT	Ground Water: volatile and semi-volatile organic compounds Soil: phthalates, volatile organic compounds, polychlorinated biphenyls	NO SUCH LISTING OF POTW	N
CIMARRON MINING	CARRIZOZO, NM	6	9/22/93	DON WILLIAMS	YES - ground water	CARRIZOZO	Ground Water: cyanide Soil: volatile and semi-volatile organics PCBs, inorganics	STILL ACCUMULATING	N
CONKLIN DUMPS	CONKLIN, NY	2	3/29/91	ARNOLD BERNES	YES Leachate	BINGHAMTON-JOHNSON	Ground Water, leachate: heavy metals, volatile organic compounds	COMPOST	N
CTS PRINTEX	MONTANVIEW, CA	9	6/28/91	RICHARD PROCUNIER	YES - ground water	PALO ALTO	Ground Water: volatile organic compounds, heavy metals (lead, copper) Soils: lead, copper	INCINERATED ON SITE	N
ELMORE WASTE	GREER, SC	4	4/26/93	RALPH HOWARD	NO				N
FAIRFIELD COAL GASIFICATION	FAIRFIELD, IA	7	9/21/90	BRUCE MORRISON	YES - ground water	FAIRFIELD	Ground Water: PAHs (anthracene, pyrene) Soil volatile organic compounds (benzene, toluene, xylene) lead, mercury, cyanide salts	LAND APPLY	Y
FCX	STATESVILLE, NC	4	9/27/93	KEN MALLORY	NOT IMPLEMENTED	CITY OF STATESVILLE		STAY LIME TO FARMERS IN SOME CASES	Y
FIELDS BROOK	ASHTABULA, OH	5	9/30/86	TERESE VAN DONSEL	NO				N
GE WIRING	JUANA DIAZ, PR	2	9/30/88	CAROL'NE KWAN	NO				N
GOLD COAST OIL	MIAMI, FL	4	9/11/87	BRAD JACKSON	NO				N
GOLDEN STRIP SEPTIC	SIMPSON, SC	4	9/12/91	GIZELLE BENNETT	YES - ground water	SIMPSON POTW	Ground Water: heavy metals (chromium, cadmium, lead, zinc) Sediments, Surface/Subsurface Soils heavy metals	INCINERATED ON SITE	N
HAYFORD BRIDGE ROAD	ST. CHARLES, MO	7	12/28/88	STEVE AUCHERLONIE	YES	CITY OF ST. CHARLES		LAND APPLY	Y
HIPPS ROAD	JACKSONVILLE, FL	4	9/3/86	KEN LUCAS	YES - ground water	CITY OF JACKSONVILLE	Ground Water: volatile organic compounds (vinyl chloride, benzene)	INCINERATED ON SITE	N
JADCO-HUGHES	BELMONT, NC	4	9/27/90	MIKE TOWNSEND	YES - ground water	CITY OF MT. HOLLY	Sediments: heavy metals (chromium, lead, nickel), polychlorinated biphenyls Soil: heavy metals, volatile organic compounds (methylene chloride, toluene), Surface Water: barium, dichloroethane Ground Water: volatile organic compounds, heavy metals	LANDFILL	N
K&L LANDFILL	KALAMAZOO, MI	5	9/28/90	PABLO VALENTENE	NO				N
KEARSARGE METALLURGICAL CORP	CONWAY, NH	1	9/28/90	TOM STEELE	YES - ground water	CVFD	Ground Water: volatile organic compounds (trichloroethene) Sediment: chromium, nickel Soils: volatile organic compounds, chromium, copper, nickel, silica dust Surface Water: volatile organic compounds	NOT ENOUGH TO DEAL WITH YET	N
KENTWOOD LDFL	KENTWOOD, MI	5	3/29/91	DAVID LANIER	YES - ground water	KENT CO	Ground Water, Soil, Leachate: volatile organic compounds heavy metals (arsenic, nickel)	LAND APPLY 10 MOS. OUT OF YEAR	Y
KOPPERS CO	CHARLESTON, SC	4	3/29/95	KELLY SINGER	YES - ground water	N. CHARLESTON SEWER DIST.	Soil, Ground Water, and Drainage Ditches numerous polynuclear aromatic hydrocarbons	INCINERATED ON SITE	N

SITE NAME	LOCATION	EPA REGION	DATE OF ROD	CONTACT	SEND TO POTW	NAME OF POTW	CONTAMINANTS OF CONCERN	TYPE OF DISPOSAL	LAND APPLY
KOPPERS CO	GALESBURG, IL	5	6/28/89	FRED NICA	NO				N
LEXINGTON CO	CAYCE, SC	4	9/29/94	TERRY TANNER	NO				N
LIPARI LANDFIL	MANTUA TWNSHP, NJ	2	8/15/92	FRED CATANEO	YES Leachate	MANTUA	Air: volatile organic compounds Ground Water, Surface Water, Sediments: volatile organic compounds, heavy metals (arsenic, chromium, lead) Soil: volatile organic compounds, heavy metals, phthalates Leachate: volatile organic compounds, arsenic, beryllium, lead, nickel, zinc, phenols	INCINERATED ON SITE	N
MACGILLIS & GIBBS	NEW BRIGHTON, MN	5	12/31/92	DARRELL OWENS	YES - ground water	NEW BRIGHTON POTW	Ground Water, Sediments, Soils: polycyclic aromatic hydrocarbons, PCP, heavy metals (copper, chromium, arsenic)	INCINERATED ON SITE	N
MALLORY CAPACITOR	WAYNESBORO, TN	4	8/29/91	ROBERT MORRIS	NO				N
MCGRAW EDISON	CENTERVILLE, IA	7	9/24/93	PAULETTA FRANCE-ISETTS	NOT IMPLEMENTED				N
MIAMI COUNTY INCIN.	TROY, OH	5	6/30/89	TONY RUGTER	YES - ground water	TROY WATER TRMT. PLNT	Ground Water: volatile organic compounds, heavy metals (arsenic, benum, cadmium) Sediments: pesticides, PCBs Soils: volatile organic compounds, polycyclic aromatic hydrocarbons, PCBs, dioxins, pesticides, heavy metals (arsenic, lead, cadmium, chromium)	LANDFILL	N
MICHIGAN DISPOSAL	KALAMAZOO, MI	5	9/30/91	TIM PRENDOVIL	NO				N
MIDWEST MANUFACTURING	KELLOGG, IA	7	9/27/90	DIANE EASLEY	NO				N
MINOT LANDFILL, ND NDD980959548					YES - ground water		Ground Water: Benzene, Toluene, Halogenated Aliphatics, Inorganics, Phenol and Compounds, Polycyclic Aromatic Hydrocarbons, (PAHs), Acetone, Aroclor 1253		
MONSANTO CO	AUGUSTA, GA	4	12/7/91	JOHN MCKEWEN	YES - ground water	VERY SMALL SITE: SLUDGE TO LANDFILL	Ground Water: arsenic		N
MUSKEGON CHEM.	WHITHALL, MI	5	3/10/93	LONNIE LEE	YES - ground water	WHATEHALL AREA POTW	Ground Water: perchloroethylene, trichloroethylene, chloroform	LANDFILL	N
N.W. MAUTHE	APPLETON, WI	5	3/31/94	JESSICA CARRETT	YES - ground water	CITY OF APPLETON	Ground Water, Soil: volatile organic compounds, heavy metals (chromium)	LAND APPLY	Y
NAT'L. PRESTO IND	EAU CLAIRE, WI	5	9/30/91	STEVE PHON	NO				N
NEW HANOVER CO AIRPORT BURN PIT	WILMINGTON, NC	4	9/29/92	BEVERLY HUDSON	NOT IMPLEMENTED				N
NIAGARA COUNTY REFUSE	NIAGARA CO., NY.	2	9/24/93	MIKE NEGRELLI	YES	N. TANAWANDA	Soil, Ground Water, Surface Water, Sediment: volatile organic compounds, semi-volatiles, pesticides, heavy metals	NO SLUDGE FROM SITE (ASKED HIM 3 TIMES)	N
NIAGARA MOHAWK	SARATOGA SPGS	2	9/29/95	MARIA JON	NOT IMPLEMENTED	SARATOGA SEWER DIST.		LANDFILL	N
PARA-CHEM	SIMPSONVILLE, SC	4	9/27/93	TERRY TANNER	NO				N
REDWING CARRIERS	SARALAND, AL	4	12/13/92	MIKE ARNETT	NOT IMPLEMENTED				N
RSR CORP.	DALLAS, TX	6	2/28/96	CARLOS SANCHEZ	NO				N

SITE NAME SAND CREEK SITE, OU 3-5 (48th and Holly Landfill/COD980717953	LOCATION	EPA REGION	DATE OF ROD	CONTACT	SEND TO POTW YES - ground water	NAME OF POTW	CONTAMINANTS OF CONCERN Surface Water and Ground Water Volatile Organics Naphthalene Inorganics	TYPE OF DISPOSAL	LAND APPLY
SCHUYLKILL METAL	PLANT CITY, FL	4	9/28/90	GALLO JACKSON	YES - ground water	PLANT CITY POTW	Ground Water heavy metals (lead, chromium, sulfate ammonia) Subsoil, Surface Water, Sediments lead	INCINERATED ON SITE	N
SEYMOUR RECYCLING	SEYMOUR, IN	5	9/30/87	JOE MOSIER	YES - ground water	SEYMOUR POTW	Ground Water volatile organic compounds, chloroform, phenols heavy metals (arsenic, barium, iron, manganese) Soils volatile organic compounds heavy metals (beryllium)	LAND APPLY	Y
SOLID STATE CIRCUITS	REPUBLIC, MO	7	9/27/89	STEVE AUCHERLONIE	YES - ground water	CITY OF REPUBLIC MO	Ground Water volatile organic compounds (TCE, methylene chloride chloroform)	LAND APPLY	Y
TELEDYNE SEMICONDUCTOR	MONTANVIEW, CA	9	3/22/91	RICHARD PROCUNIER	YES - ground water	PALO ALTO	Soil, Ground Water volatile organic compounds	INCINERATED ON SITE	N
TINKHAM GARAGE	LONDONDERRY, NH	1	9/30/86	JIM DILORENZO	YES - ground water	DERRY POTW	Ground Water, Surface Water, Soils volatile organic compounds	LAND APPLY	Y
TRI COUNTY/ELGIN LANDFILL	ELGIN, IL	5	9/30/92	TIM PRENDOVIL	NO				N
UNITED CHROME PRODUCTS	CORVALLIS, OR	10	12/20/91	AL GOODMAN	YES - ground water	CITY OF CORVALLIS	Sediments, Soils, Surface Water, Ground Water, chromium	LAND APPLY	Y
USMC LOGISTICS	ALBANY, GA	4	10/11/94	ROBERT POPE	YES-ground water/leachate	CITY OF ALBANY	Soil Gas volatile organic compounds Ground Water: volatile organics, inorganics Surface Water volatile organics	UNKNOWN	N
USN NAS PATUXENT RIVER	PATUXENT RIVER, MD	3	7/29/96	ANDY SOCHANSKI	YES - ground water	UNKNOWN	Ground Water: 1,2-dichloroethene, carbon-tetrachloride, chloromethane, tetrachloroethene, trichloroethene, 4,4'-DDT, Arclor-1260, inorganics, Sludge, Sediment, Surface Water: pesticides, PCBs inorganics		N
UTAH POWER & LIGHT	SALT LAKE, UT	8	7/7/89	PAULA SCHMITTDIEL	YES - ground water	SALT LAKE CITY CO. METRO WASTE	Soils, polycyclic aromatic hydrocarbons, volatile organic compounds cyanide Surface Soils, lead, pesticides Ground Water: volatile organic compounds (benzene, styrene, toluene, xylene, cyanide)	LAND APPLY SOME/REST TO LANDFILL	N
VALLEY PARK TCE	VALLEY PARK, MO	7	9/29/94	STEVE AUCHERLONIE	NO				N
WASATCH CHEMICAL	SALT LAKE, UT	8	3/29/91	ERNA ACHESON WATERMAN	NO				N
WASTE INC.	MICHIGAN CITY, IN	5	8/18/94	DION NOVAK	YES - ground water	MICHIGAN CITY SANITARY DIST.	Ground Water volatile and semi-volatile organic compounds, inorganics	LAND APPLY	Y
WOODSTOCK MUNI.	WOODSTOCK, IL	5	6/30/93	JOHN O'GRADY	NO				N

Attachment C

A Detailed Assessment of the Radioisotopes Data for Lowry Landfill

Introduction

Because of concerns over the possible presence of radioactivity in ground water at the Lowry Site, an additional review of the available radionuclide data in the Lowry Site ground-water database has been conducted. This review has focused on the radionuclides that could be present if material originating at the Rocky Flats Plant had been disposed of at the Lowry Site at some point in the past. The purposes of this review and data evaluation are: 1) to determine if the ground water potentially addressed by the Second ESD has been adequately characterized for radionuclides, and 2) if characterization is adequate, to determine if potential radionuclide concentrations have any health or environmental exposure impacts if the proposed Second ESD is implemented.

The man-made radionuclide isotopes that could have originated from weapons manufacturing at Rocky Flats were investigated. These isotopes include:

- Americium-241
- Neptunium-239
- Plutonium-238
- Plutonium-239/240
- Plutonium-241

These isotopes, together with the nuclear fission products, cerium-141, cerium-144, cesium-137, cobalt-60, strontium-85, strontium-90, and tritium, are reported present in our environment because of atmospheric fallout that resulted from above-ground nuclear weapons testing conducted between the late-1940s and late-1960s. However, it should be noted that tritium and the isotopes of cerium, cesium, cobalt, and strontium could not have originated from Rocky Flats, nor any other mining, milling, or manufacturing complex, because they are products of nuclear fission (i.e., products of a nuclear reaction, or detonation), and no fission testing was conducted at these sites. Other radionuclides, such as uranium, thorium, and their associated daughter products (i.e. isotopes of radium), are naturally occurring, and in the Rocky Mountain region, generally are found at relatively high background concentrations due to the regional geology. For these reasons, and because the commenter has focused on the man-made isotopes that could be present above background levels at the Lowry Site, this attachment presents a detailed analysis of americium, neptunium, and plutonium.

A listing of americium and plutonium isotopic data from Lowry Site ground water was included in "Evaluation of Data Quality and Occurrences of Transuranic Radionuclides in the Shallow Groundwater and Subsurface Liquids and Deep Groundwater Operable Units, Lowry Landfill" (HLA, 1992b). Neptunium data in the sitewide ground-water database, and an additional radionuclide sampling event that was conducted in 1994 at Well MPZ-1, were also evaluated. All of these data were reevaluated for purposes of assessing the validity of the data, as measured against the parameters of precision and comparability. Next, the data were assessed for usability with respect to practical parameters such as a comparison of detections in upgradient wells compared to waste pit wells where contamination would be most expected. In addition, an evaluation of isotopic ratios that would be expected if a radionuclide were really present, was also performed.

Regarding the validity of the data, the following definitions are presented for general information:

- **Counting Errors**: An error in the number of disintegrations accumulated over the designated count timeframe. This variable was used to assess the precision of the laboratory reported value; the greater the counting error, the less precise the reported value.

- **Recounting**: The process of confirming or reevaluating the number of disintegrations over the designated count timeframe. This process was used for quality assurance, instrumentation calibration, and data verification.

- **Blank Contamination**: A quality assurance mechanism that consists of a quantitative assessment of sample collection and analytical processes to assess the potential for cross-contamination and/or counting error originating from laboratory instrumentation or analyst.

- **Confirmatory Sampling**: A quality assurance mechanism to qualify the presence of a detection, and if present, to quantify the detected concentration. This variable was very important in this assessment because, due to the uncertainties of the sampling and analytical protocol, it provided a quantitative comparison of results. A duplication of results was essential to establishing the comparability of a sample location over time.

- **Reporting Limit**: Limit of detection as required by contract or instrumentation parameters (i.e. minimum detectable activity, count time, sample size, etc.). For purposes of this assessment, this variable was used to assess the sensitivity of the analytical procedure. It was also used to assess the comparability of the analysis to EPA-specified protocol.

Americium, neptunium, and plutonium are discussed separately in the following sections.

Radionuclide Data

Americium 241 (Am-241)

Upgradient Ground Water. Ground water was analyzed for americium-241 at eight background ground-water locations. Americium-241 was not detected in well B-520. In another well (B-519), americium-241 was not detected at a reporting limit of 4.0 pCi/L; but was detected at a lower detection limit of 1.8 pCi/L +/- 0.4 pCi/L. In the remaining six wells (MW-003, MW-004, MW-005, MW-22BU, U-509 and U-510), americium-241 was detected at concentrations ranging between 1.3 pCi/L +/- 0.3 pCi/L and 13.0 pCi/L +/- 6.0 pCi/L. No additional sampling was conducted to confirm detections at these upgradient locations.

Waste Pits. Waste pit liquids were analyzed for americium-241 at twenty-one waste pit locations. Americium-241 was not detected at fifteen locations. Americium-241 was detected in

one sample, but when recounted showed a non-detection, meaning the presence of americium-241 could not be confirmed. The remaining five samples showed detections ranging between 0.30 pCi/L +/- 0.20 pCi/L, and 3.6 pCi/L +/- 1.8 pCi/L. No additional sampling was conducted to confirm detections at these waste pit locations.

Source Area Weathered Dawson. Ground water was analyzed for americium-241 at two locations in the weathered Dawson in the source area (GW-111 and GW-112). Americium-241 was not detected in two sampling events at GW-111. Americium-241 was detected in GW-112 at 94 +/- 80 pCi/L in the first sampling event, but was not detected in the second event.

Downgradient Weathered Dawson. Ground water was analyzed for americium-241 at seven downgradient weathered Dawson locations. Americium-241 was not detected at six of the locations. Americium-241 was not detected in the seventh location (MW02-AD) during one event, but during the second event, was detected at 0.22 pCi/L +/- 0.17 pCi/L.

Unweathered Dawson. Ground water was analyzed for americium-241 at ten unweathered Dawson locations. Americium-241 was not detected at eight locations. Americium-241 was detected at two locations as follows:

- Well GW-104 showed a non-detection at 1.0 pCi/L and a detection at 0.26 pCi/L +/- 0.24 pCi/L
- Well MW11-BB showed a non-detection at 0.5 pCi/L and a detection at 10.0 pCi/L +/- 1.0 pCi/L. Americium-241 was also detected in the field blank for this event

Deep Ground Water. Ground water from four deep ground-water wells was analyzed for americium-241. Americium-241 was not detected in two of the wells for two sampling events. Americium-241 was detected and not detected in the other two wells as follows:

- Well GW-103 reported a detection of 0.66 pCi/L +/- 0.39 pCi/L, and a non-detection of 0.42 pCi/L
- Well GW-113 reported detections in both samples (0.31 pCi/L +/- 0.23 pCi/L and 0.57 pCi/L +/- 0.26 pCi/L), but recounts of these two samples showed non-detections at 0.12 pCi/L and 0.07 pCi/L

Summary and Conclusions for Americium-241. Of the fifty-two wells sampled for americium-241, americium-241 was not detected in thirty-three wells, and eight showed initial detections, but when recounted or resampled and analyzed, the recounting or resampling showed non-detections.

Americium-241 was detected in eleven wells. Of these eleven, six were located upgradient of the Lowry Site, and five were located in waste pits. Most of the concentrations reported for the upgradient samples exceeded those of the waste pit samples. In addition, americium-241 data for these eleven wells are considered inconclusive because:

- Well B-707 (0.95 pCi/L +/- 0.52 pCi/L) with no confirmatory sample
- Well B-709 (0.82 pCi/L +/- 0.38 pCi/L) with no confirmatory sample
- Well GW-101 (0.17 pCi/L +/- 0.15 pCi/L, and a recount of 0.16 pCi/L +/- 0.12 pCi/L; no confirmatory sampling was performed

Deep Ground Water. Plutonium-239/240 was analyzed in seven deep ground-water wells. Plutonium-239/240 was not detected in five wells. Plutonium-239/240 was detected, and subsequently not detected, in the other two wells (C-702 P3 and C-702 Q1).

Summary and Conclusions for Plutonium-239/240. Plutonium-239/240 was not detected in fifty-one of the seventy-seven wells sampled, and twenty wells showed initial detections, but through recounting or resampling, these detections could not be confirmed.

Plutonium 239/240 was detected in six other wells. These are located in the waste pits (1), source area weathered Dawson (2), and unweathered Dawson (3). However, plutonium-239/240 data for these six wells are inconclusive because:

- Plutonium-239/240 was detected in two performance evaluation samples and one laboratory blank.

- High counting errors (ranging from 20 percent to 88 percent) were reported in the sample results.

- Three of the wells are unweathered Dawson wells that, to date, have shown no evidence of even the most mobile solvents disposed at the Lowry Site. By comparison, plutonium, when in contact with fine-particle soils such as clay, becomes immobile, and is therefore highly unlikely to have migrated vertically more than 50 feet into the unweathered Dawson. Transport of plutonium-239/240 a vertical distance of 50 feet is estimated to take approximately 67,000 years.

- In the eighteen wells where water quality data from the March, 1988 through July 1989 sampling events showed detections of plutonium 239/240, later sampling events showed non-detections in eleven of the twelve wells resampled.

- No confirmation sampling was conducted at these wells.

Based on these observations, and the absence of plutonium 239/240 in seventy-one of the seventy-seven wells sampled, the presence of plutonium-239/240 in ground water is considered questionable.

Plutonium 241 (Pu-241)

Upgradient Ground Water. Plutonium-241 was analyzed in eight upgradient locations. Plutonium-241 was not detected in six of the wells. Plutonium-241 was detected in B-520 during an initial sampling event at 78.0 pCi/L +/- 40.0 pCi/L, but in a subsequent sampling event, showed a non-detection at a reporting limit of 25.0 pCi/L.

Waste Pits. Plutonium-241 was not detected in any of the 14 waste pit wells sampled.

Source Area Weathered Dawson. Plutonium-241 was analyzed in fourteen source area weathered Dawson wells. Plutonium-241 was not detected in nine locations. Plutonium-241 was detected in the remaining five wells (B-704, B-710, U-503, U-704, and U-706). No confirmatory sampling was performed on these wells.

Another observation can be made of the plutonium radiochemical data from the wells that showed detections of plutonium-241. The radionuclide distribution by mass for weapons-grade plutonium is as follows: plutonium-238 at 0.01 percent; plutonium-239 at 93.9 percent; plutonium-240 at 5.8 percent; and plutonium-241 at 0.36 percent. Thus, plutonium-239/240 accounts for roughly 99.7 percent of the plutonium used in weapons manufacturing and testing, while plutonium-241 accounts for only 0.36 percent. Secondly, the half-lives of these plutonium isotopes are as follows: plutonium-238 at 86.4 years; plutonium-239 at 24,390 years; plutonium-240 at 6,580 years; and plutonium-241 at 13.2 years. Thus, plutonium-239/240 will remain in its isotopic form for thousands of years, while plutonium-241 will rapidly decay toward americium-241 in only 13.2 years. Together, these two factors indicate that plutonium-239/240 should be significantly more prevalent in the environment than plutonium-241. Applying this logic, a comparison of isotopic ratios of plutonium-241 to plutonium-239/240 for the wells in which plutonium-241 was detected was performed. In all of the five wells, the isotopic ratios were opposite what one would expect them to be. More specifically, plutonium-241 in each well was reported at concentrations significantly greater that plutonium-239/240 for the same well. Just the opposite should occur if the detections are real.

Downgradient Weathered Dawson. Ground water from seven downgradient weathered Dawson wells was analyzed for plutonium-241. Plutonium-241 was not detected in six of the wells. Plutonium-241 was detected in well MW23-WD at 18.0 pCi/L +/- 11 pCi/L in one sample, and not detected to a reporting limit of 50.0 pCi/L in another sample. It should also be noted that plutonium-239/240 was not detected in this well (detection limits down to 0.05 pCi/L), indicating an anomalous isotopic balance. Finally, this well had an average gross beta activity of only 6.8 pCi/L; considerably less than the detected plutonium-241 value.

Unweathered Dawson. Eleven wells were analyzed for plutonium-241; nine showed non-detections. The two wells showing detections included:

- Well MW-001 showed a detection at 14.0 pCi/L +/- 8.0 pCi/L. This well also reported non-detections at 70.0 pCi/L, 120.0 pCi/L, and 19.0 pCi/L. No plutonium-239/240 was detected in this well (detection limits down to 0.07 pCi/L). It also had a gross beta value of only 13.0 pCi/L. This well is located offsite.

- MW-11BB reported an estimated detection of 33.0 pCi/L +/- 13.0 pCi/L and a non-detection of 50.0 pCi/L. No plutonium-239/240 was confirmed in this well (down to detection limits of 0.80 pCi/L). The average gross beta for this well was only 12.4 pCi/L.

Deep Ground Water. Ground water from six deep ground-water wells was analyzed for plutonium-241. Plutonium-241 was not detected in five locations. The only detection was reported in well C-702 P3 at 24.0 pCi/L +/- 12.0 pCi/L. It was not confirmed. In addition, plutonium-239/240 could not be confirmed in this well (down to detection limits of 0.30 pCi/L). Finally, the average gross beta for this well was only 14.5 pCi/L.

Summary and Conclusions for Plutonium-241. Ground water from sixty wells was analyzed for plutonium-241. Forty-nine showed non-detections, and five showed initial detections, but through recounting or resampling, the detections could not be confirmed.

Plutonium-241 was detected in six wells. These are located in source area weathered Dawson (5), and deep ground water (1). However, plutonium-241 data for these six wells are inconclusive because:

- When considering the isotopic balance between plutonium-241 and plutonium-239/240, the balances are inconsistent with what would be expected in the environment. Specifically, the ratios imply that plutonium-241 is considerably more prevalent in the environment than plutonium-239/240. This is not correct.

- None of the 14 wells completed in waste pits detected plutonium-241; if it were present at the Lowry Site, one would have expected it to be in the waste pits.

- Plutonium-241 is reported to be detected in a deep well beneath the separation layer. Neither this well, nor any other well beneath the separation layer, has to date shown any evidence of even the most mobile solvents buried at the Site. By comparison, plutonium, when in contact with fine-particle soils such as clay, becomes immobile. Transport of plutonium-241 from the ground surface to the top of the screened interval of this well will take an estimated 116,000 years.

- No confirmation sampling was conducted at these wells.

Based on these observations, and the absence of plutonium-241 in fifty-four of the sixty wells sampled, the presence of plutonium-241 in ground water is considered questionable.

Summary and Conclusions

To address the potential impact of radionuclides on the proposed amendment to the Lowry Site ROD, an additional detailed evaluation of the radionuclide data from the Lowry Site ground-water database was performed as discussed in the previous sections. This assessment was based on the sitewide ground-water quality database that contains more than 2,900 records of speciated radionuclide data. In addition, this database contains another 933 records of gross alpha and gross beta data for ground water. EPA believes that this body of data provides adequate characterization of the Lowry Site with respect to assessing the potential radionuclide impacts associated with the proposed ROD amendment.

The conclusions from this assessment are:

- Man-made radionuclides that could have originated from Rocky Flats and been disposed of at the Lowry Site are limited to americium-241, neptunium-239, plutonium-238, plutonium-239/240, and plutonium-241. None of these radionuclides could be confirmed present in ground water beneath the Site.

- Man-made radionuclides that might be present in the ground water that might be pumped to the POTW are represented by wells GW-111, GW-112, and MPZ-1. No man-made radionuclides were confirmed present in these wells.

Based on these conclusions, EPA believes that implementation of the Second ESD will not cause any adverse impacts to humans or the environment from radionuclides in ground water at the Lowry Site.

Attachment D

Process for Developing the Final Version of the List of COCs to Be Included in the Pretreatment Discharge Permit

The Worker Health and Safety Based Discharge Screening Levels listed in Appendix B of the "Draft Evaluation of the POTW Treatment Option"(Parsons ES, 1996) are preliminary. The screening levels should not be considered the final version of the list of contaminants of concern (COCs) that will be included in the Pretreatment Discharge Permit, nor as the final health and safety-based discharge levels. Development of a final list of contaminants and allowable discharge limits will be based on a four-step process. This process will allow a complete review of all available physical, chemical, and toxicological information for the COCs, and will allow development of pretreatment discharge levels that are protective of worker health and safety. This process involves:

Step 1: Use of EPA Calculated Discharge Screening Levels: Appendix B of the EPA "Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors" (EPA, 1992b) provides a table listing gas/vapor toxicity-based discharge screening levels for commonly encountered chemicals. The screening levels presented in this table have been incorporated into the "Draft Evaluation of the POTW Treatment Option" (Parsons ES, 1996).

The calculation of the discharge screening levels is based on the threshold limit value (TLV) for a specific chemical. The TLV is the airborne concentration of a particular substance to which the "average worker" may be exposed without adverse effects. TLVs are set by the American Conference of Governmental Industrial Hygienists (ACGIH). There are a number of conservative assumptions concerning the "average worker" that are incorporated into the setting of a TLV, including:

- The worker is exposed to the substance throughout his or her entire occupational lifetime - 47 years (age 18 to 65)
- He/she works 40 hours each week
- Workers vary in susceptibility according to physical condition and lifestyle

The numbers developed in the EPA guidance rely on chronic TLVs for development of the discharge screening levels. Chronic TLVs are generally lower than acute TLVs, therefore, use of these values ensures that acute TLVs are also being addressed.

It should also be noted that the discharge screening levels calculated per the EPA guidance do not take into account any dilution of the chemicals with other discharges into the sewer system. Therefore, the discharge screening level is based on an assumption of a worst case exposure scenario (i.e., no dilution takes place between the point of discharge and the point of potential exposure.)

Step 2: Calculation of Discharge Screening Levels for Additional COCs: The EPA guidance presents discharge screening levels for approximately 50 chemicals. It also presents a methodology for calculating discharge screening levels for other chemicals not presented in the guidance. Step 2 will involve calculation of discharge screening levels for all COCs for which the EPA guidance has not already calculated a value, and for which the required physical and toxicological information exists (i.e., all chemicals for which TLVs are available and for which Henry's constants exist or can be calculated). Step 2 will also involve a review of the values used

to calculate the TLVs presented in the guidance. Updated TLVs will be incorporated into the screening level calculations where such information exists.

The EPA methodology is based on the TLV for a chemical and on its volatility. A chemical's volatility is based on its solubility in water and its vapor pressure. A chemical dissolved in water will, over a sufficient residence time, reach an equilibrium between the concentration of chemical in water and the concentration in air. This equilibrium can be closely approximated by Henry's Law, which states that, in a closed system, the concentrations of the liquid and vapor phases are related by a constant. This constant is used to calculate the discharge screening level based on the TLV for each chemical. Based on the chemical's solubility in water, formula weight, and vapor pressure, it is possible to calculate the Henry's constant for a chemical if one is not available in the literature.

It should be noted, however, that the EPA methodology makes several simplifying assumptions, including:

- Temperature is constant (the Henry's Law constant is affected by temperature)
- Air flow is assumed to be negligible (increased air flow would tend to reduce the actual concentrations and prevent the system from reaching equilibrium)
- Rate of volatilization is instantaneous (the equilibrium concentration is the maximum that can be achieved under a given set of conditions; the actual levels would be lower if the system has not had time to reach equilibrium; the time required to reach equilibrium is determined by the volatilization rate)
- The Henry's constant is not affected by other constituents in the wastewater

For the most part, these assumptions will introduce conservative safety factors into the calculations.

Step 3: Evaluate Effects of Exposure to Mixtures: Step 3 will involve an evaluation of the potential additive and synergistic effects caused by exposure to multiple chemicals. The EPA guidance presents a methodology for estimating the potential vapor toxicity from mixtures of contaminants. The EPA methodology assumes knowledge of the actual contaminant discharge levels; therefore, it will be necessary to develop reasonable estimates of actual contaminant levels in order to develop exposure limits based on mixtures. Toxicological information for all COCs will be examined to determine the target organ(s) of each chemical and to identify chemicals that may act synergistically. Chemicals that affect the same organ or systems will be grouped and discharge limits will be calculated to prevent an unacceptable risk based on the sum of the potential exposures.

Step 4: Development of Actual Exposure Scenarios: Step 4 will involve development of appropriate exposure scenarios to more accurately assess the potential for worker exposure. Total exposure is dependent on two parameters: concentration of contaminants at the point of exposure and the length of time during which the receptor is exposed. Site-specific information will be developed to more accurately determine these two parameters. Administrative, engineered, and personal protective controls will be considered during this step to more accurately estimate potential concentrations to which workers may be exposed. Concentrations

of contaminants at the point of exposure could be influenced by a number of factors, including, but not limited to, the temperature of the discharge, air flow through the exposure location, and dilution with other discharges. Duration of exposure could be influenced by occupation-specific parameters such as time spent within a particular area or performing a specific task. Policies and procedures employed by Aurora and Metro will be incorporated into the exposure scenarios.

Attachment E

Technical Evaluations

Technical Evaluation of Proposed Ground Water Treatment and Disposal Alternatives for the Lowry Landfill Site

Technical Evaluation of Proposed Ground Water Treatment and Disposal Alternatives

for the Lowry Landfill Superfund Site

Introduction

This document supplements the proposed Explanation of Significant Differences (ESD), for the Lowry Landfill Superfund Site (Site) in Arapahoe County, Colorado. New information has been submitted to the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) pertaining to the treatment component of the remedy for contaminated ground water. This document summarizes the proposed remedial design alternatives for ground-water treatment, analyzes the remedial design alternatives against the nine EPA criteria, and selects a preferred ground-water treatment remedial design.

Ground-Water Treatment and Disposal Remedy

The March 10, 1994 Record of Decision (ROD) for the Site specifies that the remedy for ground-water treatment is "design and construction of a new ground-water treatment plant unless it can be demonstrated through pilot-scale testing during the RD that the existing ground-water treatment plant can effectively treat the more highly contaminated ground water to the performance standards." The following were specified in the ROD as treatment technologies which were determined to be effective in treating highly contaminated ground water and may be used to treat the contaminated ground water collected from the Site: gravity-phase separation for nonaqueous phase liquids; lime soda softening for metals, radionuclides, hardness, and solids; and biological treatment (powdered activated carbon treatment, PACT) to remove organic compounds, biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammonia, and nitrate. In addition, the ROD specifies that the treated water will be injected into the shallow ground-water system downgradient of the Site.

Respondents' Proposed Remedial Design (Alternative 1)

Because the ROD does not specifically identify a treatment technology, an evaluation of potential treatment options was prepared by the City and County of Denver (Denver), Waste Management of Colorado, Inc. (WMC), and Chemical Waste Management, Inc. (CWM), Respondents to the Administrative Order for Remedial Design/Remedial Action (RD/RA Order). The Respondents' report is entitled *Draft Evaluation of the POTW Treatment Option* (dated April 23, 1996). In this evaluation, the Respondents evaluated four possible remedial designs:

- Alternative 1- Onsite treatment for removal of organics using air stripping and carbon adsorption, and offsite treatment for removal of inorganics and remaining organic contaminants using a POTW;

- Alternative 2A- Onsite organics removal by air stripping and carbon adsorption, and inorganics removal by reverse osmosis; onsite discharge of treated water by injection; offsite disposal of reverse osmosis brines;

- Alternative 2B- Organics removal by air stripping and carbon adsorption, and inorganics removal by reverse osmosis/evaporation; onsite discharge of treated water by injection; offsite disposal of evaporator sludges; and

- Alternative 2C- Organics removal by air stripping and carbon adsorption, and inorganics removal by evaporation; offsite disposal of evaporator sludges.

The Respondents' proposed remedial design (Alternative 1) will include onsite pretreatment of the Site ground water to meet publicly owned treatment works (POTW) influent standards, discharge to the City of Aurora's connection line and lift station, and conveyance to the Metro Wastewater Reclamation District (Metro) facility for final treatment and disposal. This alternative differs from the ROD in that the ground water would be pretreated for organics onsite and discharged to Metro's POTW for inorganics and additional organics treatment. The proposed remedial design was prepared in response to changes in Site and administrative conditions. The following items have occurred since issuance of the ROD:

- A new sanitary sewer interceptor and connection line was constructed one-half mile from the Site;

- The City of Aurora has agreed to allow connection of a discharge line from the Site to the sewer line;

- The City of Aurora has a cooperative agreement with Metro to allow water to be conveyed through the discharge line to Metro's POTW; and

- Metro has agreed to accept Site waters for treatment.

In light of the above-mentioned conditions, analysis of the POTW alternative, originally discussed in the Stage 3 Feasibility Study for Operable Units 1 and 6, was performed by the Respondents.

CLLEAN's Proposed Remedial Design (Modified Alternative 2B)

After reviewing the Respondents' proposed remedial design (Alternative 1), Citizens for Lowry Landfill Environmental Action Now (CLLEAN) proposed another approach to remediation. To address their concern that the Respondents' remedial design would reduce the water resources within the Arapahoe Formation, CLLEAN proposed that a modified version of Alternative 2B be selected as the ground-water treatment component of the sitewide remedy.

As indicated in the Respondents' evaluation, Alternative 2B includes onsite treatment for organics and inorganics, onsite discharge of treated water by injection into the aquifer, and offsite disposal of evaporator sludge. CLLEAN proposed the following modifications to Alternative 2B:

- Utilize a two-stage reverse osmosis (RO) system for near complete recovery of the treated water, which would eliminate the need for injection water augmentation and would gain community acceptance.

- Recycle the steam, which would be generated by the evaporator, through a heat exchanger to pre-heat the incoming water stream. This will eliminate the steam plume that would otherwise be emitted from the evaporator and would gain community acceptance.

- Utilize the recovered water to augment the wetlands program. This would also gain community acceptance.

CLLEAN also claimed that the additional truck traffic generated under the Modified Alternative 2B would be inconsequential since there is already a high level of existing truck traffic resulting from landfilling operations at the nearby Denver Arapahoe Disposal Site (DADS). CLLEAN judged the reduction of toxicity, mobility, and volume to be better for Modified Alternative 2B than Alternative 1 because volume would be reduced via the evaporation system and the sludge would be placed in a secure landfill rather than landfarmed. CLLEAN also asserted that the costs are equal, within the range of engineering uncertainty. Likewise, CLLEAN estimated that the short-term effectiveness and compliance with applicable or relevant and appropriate requirements (ARARs) are equal. CLLEAN judged Modified Alternative 2B to be more effective in the long-term. CLLEAN based this conclusion on the assumption that the concentration of contaminants in the Site discharge might increase to levels above POTW influent standards, thereby creating a problem.

Comparison of Alternatives

This section presents a comparison of the two alternatives using EPA's nine evaluation criteria: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume (TMV) through treatment; short-term effectiveness; implementability: cost; State acceptance; and community acceptance. A comparative analysis provides the basis for determining which alternative presents the best balance between the nine criteria.

Overall Protection of Human Health and the Environment

This criterion addresses whether an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Both of the alternatives would be protective of human health and the environment and would provide equal levels of organics removal. However, Alternative 1 would be more effective at treating inorganic contaminants within the waste stream.

Both alternatives would be protective of human health and the environment because they would both treat to meet ARARs and health-based standards, thereby minimizing potential exposure to site contaminants. In addition, monitoring would be used to ensure effectiveness of either of the alternatives.

Compliance with ARARs

This criterion addresses whether a remedy will meet all Federal and State environmental laws. Both of the alternatives would be constructed, operated, and maintained in accordance with the ARARs specified in the ROD. These include, but are not limited to, Colorado Water Quality Control Act, Safe Drinking Water Act, Colorado Discharge Permit System, Federal Water Pollution Control Act, National Pollutant Discharge Elimination System, Colorado Air Quality Act, Clean Air Act, and the Colorado Hazardous Waste Act. Modified Alternative 2B will produce a concentrated hazardous waste sludge that would require disposal in an approved Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste landfill. Sludge produced at Metro's POTW will meet the definition of "exceptional quality sludge" and will be suitable for soil amendment purposes.

Long-Term Effectiveness and Permanence

This criterion refers to the ability of an alternative to provide reliable protection of human health and the environment over time. It assesses the risk remaining after treatment objectives are achieved, including magnitude of residual risk and adequacy and reliability of controls. The magnitude of residual risk is equal for both alternatives since both alternatives

treat equal amounts of water. Specifically, this criterion assesses the risk resulting from residuals that remain after treatment. Based on Metro's established record as the wastewater treatment and disposal entity for the Denver metropolitan area, it is assured that the POTW will provide continued wastewater treatment throughout the life of the remedy. POTWs are widely used and have shown to be a reliable and effective means of treatment. Potential fluctuations of chemical concentrations in site water would be addressed equally for either alternative by identifying the changes during monitoring and making adjustments to either the pretreatment or onsite treatment systems.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion refers to the preference for an alternative that reduces health hazards of contaminants, the movement of contaminants, or the quantity of contaminants through treatment. Both of the alternatives achieve reduction of TMV through treatment as evaluated by the following criteria:

- treatment process used;
- degree and quantity of TMV reduction;
- irreversibility of TMV reduction; and
- type and quantity of treatment residual.

Both alternatives use air stripping and carbon for organics removal. Organics would be irreversibly destroyed because the organics will be thermally destroyed (air stripper residuals in LFG flare and carbon through regeneration). For Alternative 1, organic contaminants passing through the onsite treatment system would be removed at the POTW. For Modified Alternative 2B, trace organics passing through the onsite treatment system would not be treated; these trace organics would be transferred to the air through the evaporation system.

Neither alternative irreversibly treats inorganics. Under Alternative 1, trace amounts of metals will be collected in the nonhazardous sewage sludge produced by the POTW. Alternative 2B remove metals through RO and evaporation, resulting in a hazardous waste sludge that will require disposal at a RCRA Subtitle C facility. The quantity of sludge by either alternative will be about the same.

Both alternatives satisfy the statutory preference for treatment to reduce toxicity, mobility, or volume as a principle element.

Short-Term Effectiveness

This criterion addresses the period of time needed to complete an alternative, and any adverse effects to human health and the environment that may be caused during the construction and implementation of the alternative. Short-term effectiveness refers to the impacts of the remedial action during construction and implementation, up to the point when treatment objectives are achieved. It includes evaluation of the:

- protection of workers during remedial action;
- protection of the community during remedial action;
- environmental impacts of remedial action; and
- time until protection is achieved.

Potential for worker exposure would be minimized through adherence to a health and safety plan. Remedial construction under both alternatives is expected to be low short-term risk to the community. There will be offsite pipeline construction activities associated with Alternative 1. As a result, there will be some short-term traffic impacts to the area directly west of the Site.

Under Alternative 1, the ground water will be pre-treated onsite to remove organic contaminants to levels protective of Metro's POTW maintenance workers and compatible with Metro's treatment processes. Risks would be low because the POTW influent standards are protective of sewer maintenance personnel, as well as receptors located downstream of the POTW discharge.

Handling and offsite transportation of hazardous waste sludge, produced under Modified Alternative 2B, could present an increased risk to onsite workers and the surrounding community. Under Alternative 1, the pre-treated water that would be piped offsite for further treatment at the Metro facility would contain organic contaminants at measurable levels. However, the presence of Lowry water in the sewer system would not result in an increased risk because the water would not be hazardous.

Alternative 1 provides a positive environmental impact because the sewage sludge produced at Metro's POTW may be used as a soil amendment. Modified Alternative 2B provides a negative environmental impact because this alternative would produce a hazardous waste that would have to be disposed at a RCRA Subtitle C landfill.

Alternative 1 will have a construction time frame of three to four months, while Modified Alternative 2B will have a construction schedule of about 14 months. In addition, the time frame for design will be significantly less for Alternative 1 than Modified Alternative 2B.

Alternative 1 would involve augmenting the offsite alluvial aquifer system with ground water withdrawn, at a rate of about 10 gallons per minute (gpm), from an onsite well completed in the Arapahoe Formation. Computer modeling simulations suggest that drawdown will be about 0.02 feet per year in the onsite well. The Respondents have verified that they are legally entitled to withdraw ground water from the Arapahoe Formation. Although the amount of water loss associated with Modified Alternative 2B would be less than that for Alternative 1, a water augmentation program would be necessary nonetheless. It is estimated that Alternative 2B would require augmentation of about 2 gpm, which would result in a drawdown of about 0.004 ft/year.

Implementability

This criterion refers to the technical and administrative feasibility of an alternative, and includes the availability of materials and services needed to carry out an alternative. It also includes coordination efforts between Federal, State, and local government. Implementability consists of the following criteria: technical feasibility; administrative feasibility; and availability of services and materials.

Both of the alternatives are implementable from a technological point of view. Startup and operation of the onsite inorganics treatment system for Modified Alternative 2B would involve a significant amount of effort and is a complex engineering process in comparison to the treatment option proposed in Alternative 1. A key feature of Alternative 1 involves piping the ground water to Metro's POTW. In doing so, there will be no need to upgrade the onsite treatment system, thereby simplifying future operation and maintenance efforts.

There are administrative and permitting issues for both of the alternatives. In order to pipe the ground water to Metro's POTW, a discharge permit would be required. In addition, the City of Aurora has already granted approval for the sewer line to be connected to the Site, for the purpose of transferring the ground water to Metro's connection line. A modification to the existing CDPHE Air Pollutant Emission Notice (APEN) for the air stripper will be required for either alternative. Modified Alternative 2B will require an additional APEN for the evaporator emissions.

Availability of services and materials would be more notable for Alternative 1 because the POTW is already in operation and sewer line materials are readily available. For Modified Alternative 2B, procurement of a two-stage RO system with an evaporator would be more specialized.

Cost

This criterion evaluates the estimated capital, operation, and maintenance (O&M) costs of each alternative in comparison to other equally protective alternatives. Net present worth costs were estimated by adding the capital costs to the net present value of the annual operations and maintenance (O&M) costs for thirty years, using an interest rate of 5 percent.

The net present worth cost for Alternative 1 is estimated to be $6,354,000. This includes capital costs for a lift station, piping, excavation and construction, and the sewer connection fee ($423,110), design and construction management costs ($100,000), O&M costs for acid and caustic, equipment repairs, liquid and vapor carbon changeout, POTW treatment fee, labor, and electricity ($366,550 per year), and water augmentation costs ($196,569).

The net present worth cost for Modified Alternative 2B is estimated to be $9,300,000. This cost was calculated by the Respondents in a letter to EPA dated June 17, 1996. The net present worth cost includes capital costs for a reverse osmosis (RO) system, an iron removal

system, and an evaporation system ($780,000), design and construction management costs ($100,000), O&M costs for acid and caustic, RO and iron filter replacement, equipment repairs, liquid and vapor carbon changeout, sludge and filter disposal, labor, and electricity ($410,376 per year), and water augmentation costs ($75,392). In addition, it includes costs for pretreatment for the RO and evaporator systems (capital and chemical costs). The Respondents' estimate that 100 percent recovery of water for injection will not be achieved and that approximately 1 to 2 gpm would be required for augmentation. The costs for this augmentation water is included in the net present worth estimate.

State Acceptance

This criterion indicates whether the State agrees with, opposes, or has no comment on a given alternative. CDPHE consults with EPA on decisions made at the Site and has shown a preliminary preference for Alternative 1.

Community Acceptance

This criterion includes determining which alternatives are supported by interested persons within the community and which ones are opposed. The community does not accept Alternative 1. Although the Respondents legally own the water rights to an onsite well that could be used for augmentation purposes, the community is concerned about depletion of water resources in the area. In addition, the Respondents have conducted ground-water modeling of the effects of pumping the Arapahoe Formation well at 10 gpm and have concluded that a drawdown of approximately 0.02 feet may be expected below the Site after one year of continuous pumping. Ground-water drawdown would be less in surrounding areas.

The community is also concerned that drawdown of ground water within the Arapahoe Formation may cause increased vertical migration of Site contaminants. However, the presence of aquitards between the Arapahoe and Denver Formations, and the Arapahoe and Laramie/Fox Hills Formations, suggests that it is unlikely that the pumping will affect either of these aquifers.

Transportation of hazardous waste through the surrounding neighborhoods would be considered a negative community acceptance factor for Modified Alternative 2B. The amount of hazardous waste to be generated under this alternative is estimated to be one truckload per month. Despite the reduced rate of waste generation and small increase in truck traffic, the threat of an accident involving the transportation of hazardous waste would also be considered a public concern.

Community acceptance for Modified Alternative 2B is considered high because it was developed by a citizens' group, CLLEAN. Modified Alternative 2B would involve less aquifer depletion than Alternative 1.

Preferred Alternative

The attached table presents a scoring system for comparing the two alternatives. Alternative 1 received the higher score and is considered to be the alternative that achieves the best balance between the nine criteria. While Alternative 1 is not endorsed by the community, it achieves better long-term effectiveness, provides for a more pronounced reduction in toxicity, mobility and volume through treatment, is more implementable, is more cost effective, and would not produce a hazardous waste sludge.

EPA Assessment Criterion	Alternative 1	Modified Alternative 2B
1. Overall Protection of Human Health & the Environment	5	5
2. Compliance with ARARs	5	5
3. Long-Term Effectiveness and Permanence	3	2
4. Reduction of TMV Through Treatment	4	3
5. Short-Term Effectiveness	3	3
6. Implementability	5	3
7. Cost	4	2
8. State Acceptance	-	-
9. Community Acceptance	-	-
Total Score	29	23

Note: 5 = completely achieves the objectives of the criterion; 1 = minimally achieves the objectives of the criterion

Technical Evaluation of Proposed Former Tire Pile Area Treatment and Disposal Alternatives for the Lowry Landfill Superfund Site

Technical Evaluation of Proposed Former Tire Pile Area Treatment and Disposal Alternatives

for the Lowry Landfill Superfund Site

Introduction

This document supplements the proposed Explanation of Significant Differences (ESD), for the Lowry Landfill Superfund Site (Site) in Arapahoe County, Colorado. New information has been submitted to the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) pertaining to the treatment and disposal component of the remedy for contaminated materials in the former tire pile area (FTPA). This document summarizes the proposed remedial design alternatives for the FTPA treatment and disposal, analyzes the remedial design alternatives against the nine EPA criteria, and selects a preferred FTPA treatment remedial design.

FTPA Treatment and Disposal Remedy in ROD

The March 10, 1994 Record of Decision (ROD) for the Site specifies that "...contaminated materials in the former tire pile area shall be excavated and characterized for offsite treatment and disposal." Furthermore, the ROD states that "...it is anticipated that the solids and soils shall be treated using stabilitzation before disposal, but actual treatment methods shall be determined by EPA, in consultation with CDH, during RD." For the purposes of this technical memorandum, the alternative identified in the ROD will be referred to as Alternative 1.

Respondents' Proposed Remedial Design

Because the ROD does not specifically identify a treatment technology, treatability studies and an evaluation of potential treatment options were performed by the City and County of Denver (Denver), Waste Management of Colorado, Inc. (WMC), and Chemical Waste Management, Inc. (CWM), Respondents to the Administrative Order for Remedial Design/Remedial Action (RD/RA Order). The Respondents' report is entitled *Treatability Test Summary Report, Former Tire Pile Area Waste Pits* (dated February 19, 1997). In this evaluation, the Respondents evaluated two possible remedial designs:

- physical drying/controlled aeration
- enhanced bioremediation

Results from the treatability tests indicated that enhanced bioremediation would not meet the remedial objectives. Consequently, physical drying/controlled aeration will be the only alternative of the two that is carried forward for evaluation in this technical memorandum. For the purposes of this technical memorandum, the Respondents' remedial design will be referred to as Alternative 2 and includes the following elements:

- excavation, handling, and staging of FTPA waste pit materials
- treatment of FTPA waste pit materials
- disposal of treated materials in an onsite cell or other designated area onsite

Comparison of Alternatives

This section presents a comparison of the two alternatives using EPA's nine evaluation criteria:

- overall protection of human health and the environment
- compliance with applicable or relevant and appropriate requirements (ARARs)
- long-term effectiveness and permanence
- reduction of toxicity, mobility, or volume (TMV) through treatment
- short-term effectiveness
- implementability
- cost
- State acceptance
- community acceptance

A comparative analysis provides the basis for determining which alternative presents the best balance between the nine criteria. The two alternative evaluated are:

- Alternative 1, offsite treatment and disposal
- Alternative 2, onsite treatment and disposal

Overall Protection of Human Health and the Environment

This criterion addresses whether an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Both of the alternatives would be protective of human health and the environment and would provide equal levels of treatment (removal of hazardous characteristics). Both alternatives would treat to meet ARARs, thereby minimizing potential exposure to site contaminants.

Compliance with ARARs

This criterion addresses whether a remedy will meet all Federal and State environmental laws. Both of the alternatives would be constructed, operated, and maintained in accordance with the ARARs specified in the ROD. These include, but are not limited to, the Colorado Hazardous Waste Act and the Resource Conservation and Recovery Act (Subtitles C and D). Under both alternatives, the materials from the FTPA would be treated to remove hazardous characteristics (such as ignitability and toxicity) and will comply with ARARs.

Long-Term Effectiveness and Permanence

This criterion refers to the ability of an alternative to provide reliable protection of human health and the environment over time. It assesses the risk remaining after treatment objectives are achieved, including magnitude of residual risk and adequacy and reliability of controls. The magnitude of residual risk is equal for both alternatives since both alternatives treat equal amounts of material. Under Alternative 2, the material will be remain onsite for disposal. For Alternative 1, the material will be disposed offsite.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion refers to the preference for an alternative that reduces health hazards of contaminants, the movement of contaminants, or the quantity of contaminants through treatment. Both of the alternatives achieve reduction of toxicity, mobility, and volume (TMV) through treatment, as evaluated by the following criteria:

- treatment process used;
- degree and quantity of TMV reduction;
- irreversibility of TMV reduction; and
- type and quantity of treatment residual.

Both alternatives will remove the hazardous characteristics of the material. Alternative 1 assumes stabilization will be used. Although stabilization would reduce the toxicity and mobility of contaminants, overall volume would increase because stabilizing materials such as cement would be added to the waste pit materials. Alternative 2 uses physical drying/controlled aeration and air emissions from this process will be treated using carbon adsorption or thermal treatment. Alternative 2 will achieve reductions in toxicity, mobility, and volume.

Both alternatives satisfy the statutory preference for treatment to reduce toxicity, mobility, or volume as a principle element.

Short-Term Effectiveness

This criterion addresses the period of time needed to complete an alternative, and any adverse effects to human health and the environment that may be caused during the construction and implementation of the alternative. Short-term effectiveness refers to the impacts of the remedial action during construction and implementation, up to the point when treatment objectives are achieved. It includes evaluation of the:

- protection of workers during remedial action;
- protection of the community during remedial action;
- environmental impacts of remedial action; and
- time until protection is achieved.

Potential for worker exposure would be minimized through adherence to a health and safety plan. Both alternatives include excavation, treatment, and disposal and, therefore, represent similar exposure risks to workers.

Remedial construction under both alternatives is expected to be low short-term risk to the community. Alternative 2 will take longer because excavation and treatment would both occur onsite, whereas Alternative 1 will have a short onsite duration because the treatment would occur offsite. Offsite transportation of hazardous waste under Alternative 1 could present an increased risk to onsite workers and the surrounding community.

Implementability

This criterion refers to the technical and administrative feasibility of an alternative, and includes the availability of materials and services needed to carry out an alternative. It also includes coordination efforts between federal, state, and local government. Implementability consists of the following criteria: technical feasibility; administrative feasibility; and availability of services and materials.

Both of the alternatives are implementable from a technological point of view. They both use currently available technologies and standard equipment.

There are administrative requirements for both of the alternatives. In order to haul the hazardous waste pit material offsite in Alternative 1, manifests must be properly filled out and signed. In order to treat the material onsite in Alternative 2, a CDPHE Air Pollutant Emission Notice (APEN) will be required. These administrative requirements are routine and should not delay or hinder the project.

Cost

This criterion evaluates the estimated capital, operation, and maintenance (O&M) costs of each alternative in comparison to other equally protective alternatives. Both alternatives are moderately priced. Alternative 1 will be more expensive due to the high transportation costs of hauling the waste pit material to a licensed hazardous waste disposal facility.

State Acceptance

This criterion indicates whether the State agrees with, opposes, or has no comment on a given alternative. CDPHE consults with EPA on decisions made at the Site and will provide an indication of its preference during the public comment period.

Community Acceptance

This criterion includes determining which alternatives are supported by interested persons within the community and which ones are opposed. Community acceptance will be evaluated after the public comment period on the proposed ESD.

Preferred Alternative

The attached table presents a scoring system for comparing the two alternatives. The proposed alternative received the higher score and is considered to be the alternative that achieves the best balance between the nine criteria. Both alternatives would achieve long-term effectiveness; however onsite treatment (Alternative 2) provides for a more pronounced reduction in toxicity, mobility and volume through treatment, is more cost effective, and would not require the offsite transportation of hazardous waste.

EPA Assessment Criterion	Alternative 1	Alternative 2
1. Overall Protection of Human Health & the Environment	5	5
2. Compliance with ARARs	5	5
3. Long-Term Effectiveness and Permanence	5	5
4. Reduction of TMV Through Treatment	2	4
5. Short-Term Effectiveness	3	3
6. Implementability	4	4
7. Cost	3	5
8. State Acceptance	3	4
9. Community Acceptance	3	4
Total Score	33	39

Note: 5 = completely achieves the objectives of the criterion; 1 = minimally achieves the objectives of the criterion

Attachment F

Second Explanation of Significant Differences

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

LOWRY LANDFILL SUPERFUND SITE

SECOND EXPLANATION OF SIGNIFICANT DIFFERENCES

OCTOBER 1997

LOWRY LANDFILL SUPERFUND SITE
EXPLANATION OF SIGNIFICANT DIFFERENCES
October 1997

INTRODUCTION

The purpose of this document is to explain the significant differences between the remedy selected in the Record of Decision (ROD) for the Lowry Landfill Superfund Site in Arapahoe County, Colorado (Site), issued by the U.S. Environmental Protection Agency (EPA) on March 10, 1994, and the remedy described herein. The changes to the ROD have been made as a result of new information that EPA received subsequent to the issuance of the ROD. These changes do not fundamentally alter the sitewide remedy presented in the ROD. The sitewide remedy for the Site remains protective of human health and the environment.

EPA is the lead agency for overseeing the cleanup of the Site; the Colorado Department of Public Health and the Environment (CDPHE) is the support agency.

This Explanation of Significant Differences (ESD) provides a brief history of the Site, describes the remedy selected in the ROD, and explains the ways in which the remedy described herein differs from the remedy selected in the ROD. It also summarizes the support agency's comments on the changes to the remedy and discusses compliance with all legal requirements.

This ESD is prepared in fulfillment of EPA's public participation responsibilities under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Section 9601, et seq. (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and Section 300.435(c)(2)(i) of the National Contingency Plan (NCP), 40 C.F.R. Part 300. These laws and regulations require EPA to publish an ESD when the remedy to be implemented differs significantly from the remedy described in the ROD.

PUBLIC PARTICIPATION

The administrative record, which contains this ESD and the documentation supporting it, is available for public review at the following location:

EPA Superfund Records Center
999 18th Street, 5th floor North Terrace
Denver, Colorado 80202
(303) 312-6473
Hours: Monday-Friday - 8:00 a.m. to 4:30 p.m.

This ESD is also available at the following Lowry Site information repository:

Aurora Public Library
14949 East Alameda Drive
Aurora, Colorado 80012
(303) 340-2290
Hours: Monday-Thursday - 10:00 a.m. to 10:00 p.m.
Friday and Saturday - 10:00 a.m. to 6:00 p.m.
Sunday - 12:30 p.m. to 6:00 p.m.

A notice of availability and brief description of the ESD was published in the Denver Post and Rocky Mountain News on March 21, 1997, as required by CERCLA Section 117(c).

EPA accepted public comment on these proposed modifications to the sitewide remedy for a period of ninety (90) days. The comment period was from March 24, 1997 to June 30, 1997. Written comments were submitted to:

Marc E. Herman
Remedial Project Manager
U.S. Environmental Protection Agency
Mail Code 8EPR-SR
999 18th Street, Suite 500
Denver, Colorado 80202

SUMMARY OF SITE HISTORY, CONTAMINATION PROBLEMS, AND SELECTED REMEDY

Summary of Site History and Contamination Problems

The Site is located northeast of the intersection of Quincy Avenue and Gun Club Road, approximately 15 miles southeast of downtown Denver and two miles east of the City of Aurora, Colorado (Figure 1). In 1930, the City and County of Denver (Denver) purchased land including the Site to attract an Army Air Corps Technical School to Denver. In 1937, the Denver City Council conveyed title to the land to the Federal government. From about 1940 to 1962, the U.S. Air Force used the Site as a bombing range. In 1964, the United States conveyed all or portions of the five sections of the bombing range back to Denver by Quitclaim Deed.

From 1966 until 1980, Denver operated a municipal landfill at Section 6 on the Site, accepting liquid and solid municipal and industrial wastes, including sewage sludge. (Section 6 is the principal area of the Superfund Site. Section 31, a portion of which is included in the Superfund site, is currently used for municipal landfilling.) These materials included hazardous substances, such as volatile organic compounds and heavy metals, listed pursuant to 40 C.F.R. Section 302.4. Organic compounds are

compounds that contain the e ement carbon in their molecular structure. Examples of materials composed of organic compounds include petroleum products, solvents, and pesticides. Inorganics are elements and compounds that do not contain carbon in their molecular structure. Examples of inorganics are metals (such arsenic and selenium), chlorides, and sulfates.

From 1966 until 1980, approximately 130 million gallons of waste were disposed of at the Site, primarily by a disposal practice known as "co-disposal." Approximately 75 unlined waste pits or trenches were excavated to accommodate a mixture of municipal and industrial wastes. In the southern half of the Lowry Site, the pits were filled about three-quarters full with liquid wastes and topped with 25 to 60 feet of municipal refuse. The waste pits ranged from approximately 15 to 30 feet in depth, approximately 100 to 1,100 feet in length, and approximately 50 to 150 feet in width. Over time, the liquids seeped out of the pits and mixed with the surrounding refuse and ground water. In the north-central portion of the Lowry Site, excavated pits were filled with liquid wastes and municipal refuse, then covered with two to five feet of native soil and discarded tires. Over time, these liquid wastes seeped out to ground water and to surface water in Unnamed Creek. Approximately 8 million tires were stockpiled at the Site in the 1970s.

From 1969 until 1986, municipal sewage sludge was applied to approximately 160 acres along the northern and eastern boundaries of the Lowry Site. The sludge was applied to the surface of the land and then incorporated into the native soils. After 1980, leachate collected in on-site surface impoundments was injected in the same 160-acre area. Both the municipal sewage sludge and the leachate contained hazardous substances listed pursuant to 40 C.F.R. Section 302.4.

Preliminary investigations at the Site began in the mid-1980s. Various parties, including EPA, CDPHE, and Denver, performed studies before 1984, when the Site was placed on the Superfund National Priorities List. Contaminants were found in surface water and sediments, ground water, soils, and landfill solids. From 1984 to 1993, a series of remedial investigation/ feasibility studies (RI/FSs) were performed to study the nature and extent of the contamination and to investigate the potential threats that the Site posed to human health and the environment.

Contaminated surface water and shallow ground water at the Site are currently being addressed through two interim remedial measures: a ground-water barrier wall/ treatment facility and the Surface Water Removal Action (SWRA). The ground-water barrier wall and SWRA are key components of the sitewide remedy selected in the ROD.

EPA conceptually divided the Site into six Operable Units (OUs) for response and grouped them according to the media that they address: OUs 1 and 6 address

shallow ground water, subsurface liquids, and deep ground water; OUs 2 and 3 address landfill solids and gas; and OUs 4 and 5 address soils, surface water, and sediments. Each medium contains hazardous substances listed pursuant to 40 C.F.R. Section 302.4. The primary threats at the Site are posed by: landfill gas; waste-pit liquids; contaminated ground water; and buried drums, drum contents, and contaminated soils within the former tire pile area.

Summary of Selected Sitewide Remedy

Under the selected sitewide remedy, contaminated ground water shall be addressed through containment, collection, and treatment, utilizing the existing treatment facility or an upgraded facility. Landfill gas shall be addressed through containment, collection, and treatment using enclosed flare technology. Contaminated seepage and surface water are addressed through a drainage and underground collection system in the Unnamed Creek area as part of the SWRA. The response action identified for the former tire pile area shall address principal threats (drums, drum contents, and contaminated soils) through treatment and offsite disposal to reduce the toxicity, mobility, and volume of contaminants. Landfill mass solids and soils are low-level threats at the Site that shall be addressed through containment.

DESCRIPTION OF SIGNIFICANT DIFFERENCES AND THE BASIS FOR THOSE DIFFERENCES

Summary of Information Giving Rise to the Significant Differences

The changes memorialized in this ESD are based on remedial design documents that have been submitted by Denver, Waste Management of Colorado, Inc., and Chemical Waste Management, Inc., Respondents to the Administrative Order for Remedial Design/Remedial Action, EPA Docket No. CERCLA VIII-95-05 (RD/RA Order). EPA has considered the proposed changes and has determined that the information supports the need to modify certain aspects of the remedy described in the ROD. These changes do not fundamentally alter either the overall approach of the sitewide remedy or any individual component of the sitewide remedy.

Description of Significant Differences

The significant differences are as follows:

1. The ROD (Subsection 11.3.1) states that contaminated materials in the former tire pile area shall be excavated and characterized for offsite treatment and disposal.

As part of remedial design, the Respondents performed treatability tests on the excavated waste to evaluate the possibility of treating and disposing the contaminated materials onsite. The two treatability tests were: physical drying/controlled aeration; and enhanced bioremediation. For the physical drying/controlled aeration test, covered stockpiles of soils/sludges were allowed to dry in a controlled manner. Air emissions associated with this test were monitored to provide a basis for designing engineering controls for emissions from the full-scale treatment system. The enhanced bioremediation test involved aerobic biodegradation (a process in which bacteria degrade or destroy organic compounds). For the enhanced bioremediation test, stockpiles of soils/sludges were treated with bacteria. Bacterial growth was controlled by regulating the amount of oxygen and nutrients, and the temperature, within the stockpiles.

After evaluating the results of the treatability tests, EPA selected physical drying/controlled aeration as the method of treatment. In order to dispose of these wastes onsite, the contaminated materials shall be treated to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act and the Colorado Hazardous Waste Act.

2. In the ROD (Subsection 11.2.2), it is stated that:

   (a) the ground-water remedy shall treat approximately 6.4 million gallons of contaminated ground water annually, collected from the new and existing collection systems and barrier walls; and

   (b) a new onsite treatment plant shall be designed and constructed unless it can be demonstrated through pilot-testing that the existing plant can be upgraded to effectively treat the more highly contaminated ground water from the toe of the landfill.

As discussed in the ROD, contaminated ground water shall be collected at the northern barrier wall and at the north toe collection system and shall be treated onsite to address organic contaminants. The change to the above-mentioned components of the ROD involves the piping of pre-treated ground water offsite for treatment of inorganic contaminants and remaining organics at the Metro Wastewater Reclamation District (Metro) facility, a Publicly Owned Treatment Works (POTW), and the City of Aurora's (Aurora's) Sand Creek Wastewater Reclamation Facility, also a POTW.

The POTWs shall issue an enforceable discharge permit to the Respondents and require that the water discharged to the POTWs meets contaminant-specific limits. Metro's and Aurora's authority to issue discharge permits has

been previously approved by both EPA and CDPHE, pursuant to section 402 of the Federal Water Pollution Control Act, also known as the Clean Water Act. By receiving approval of their Pretreatment Programs, Metro and Aurora are authorized to enforce the requirements of sections 307(b) and (c), and 402(b)(8) of the Clean Water Act. The contaminant-specific limits identified in the discharge permit shall be set to ensure that the POTWs shall:

- Comply with its Colorado Discharge Permit System/National Pollutant Discharge Elimination System discharge permit;
- Comply with State water quality standards;
- Achieve risk-based effluent concentration limits developed by EPA for pollutants not regulated by water quality standards;
- Maintain "exceptional quality sludge" levels of pollutants, as defined by Table 3 of 40 C.F.R. Section 503.13, in Metro's biosolids products (Aurora's POTW pipes its biosolids to Metro, via the sewer system, for treatment);
- Prevent interference with the POTWs' treatment processes;
- Restrict releases of hazardous air pollutants from the POTWs' facilities; and
- Protect workers from adverse health and safety effects caused by the presence of toxic and reactive gases in the sewer system.

SUPPORT AGENCY COMMENTS

CDPHE concurs with the ESD and the changes to the selected remedy.

AFFIRMATION OF STATUTORY DETERMINATIONS

Considering the new information that has been received and the changes that have been made to the selected remedy, EPA and CDPHE believe that the remedy remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

Max H. Dodson

OCT 24 1997

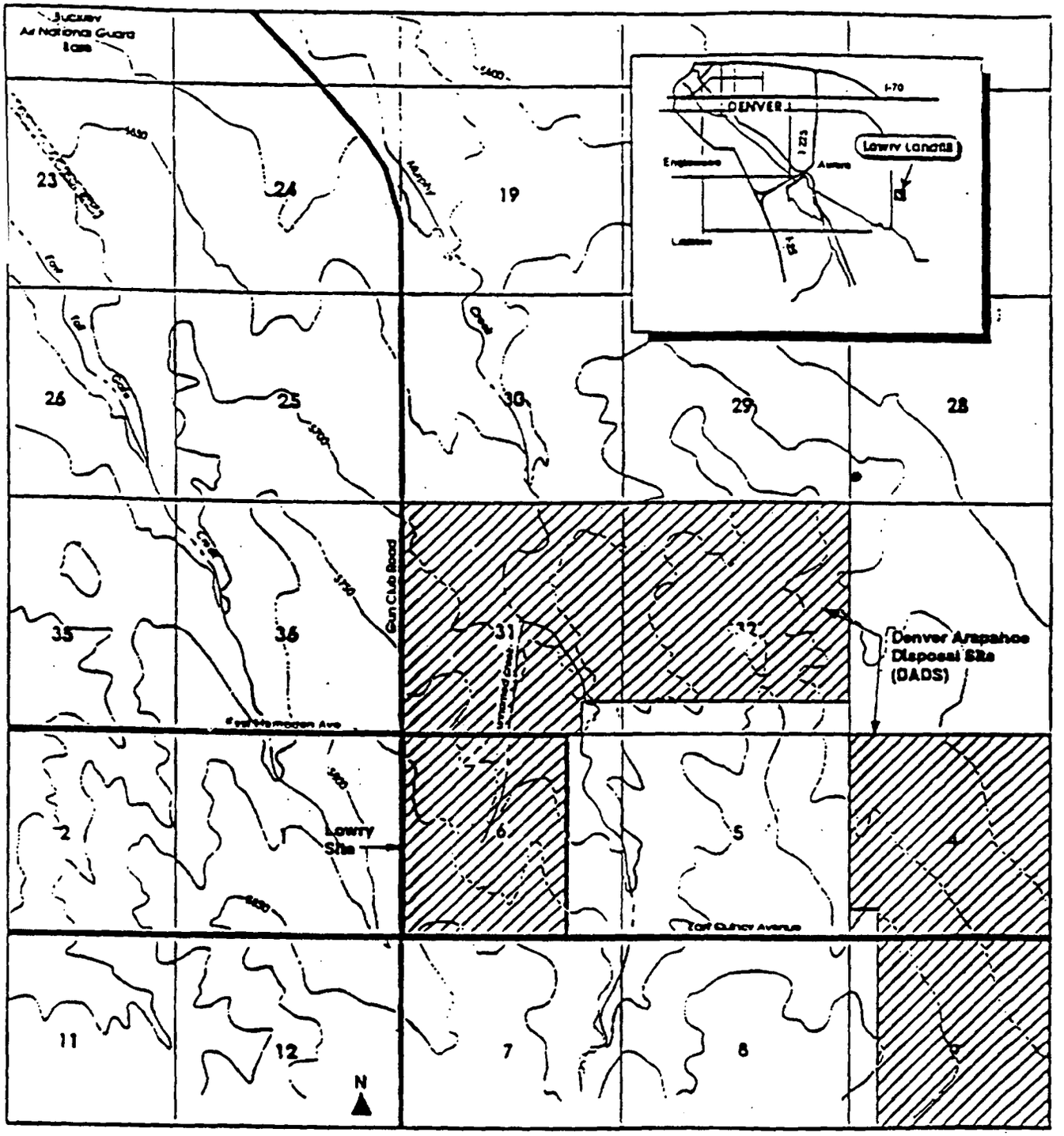
Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region 8

Date

LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
CDPHE	Colorado Department of Public Health and Environment (also known as CDH)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
C.F.R.	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
MSW	Municipal Solid Waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	Operable Unit
POTW	Publicly Owned Treatment Works
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act of 1976
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SWRA	Surface Water Removal Action

List of Figures



LEGEND

- Roads
- Topographic Contours (interval 50')
- 11 Section Number
- Lowry Site
- DADS

The locations shown are approximate.

Figure 1
THE LOWRY SITE

Attachment G
Biosolids References

Chapter 7

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