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LOWRY LANDFILL SUPERFUND SITE

THIRD EXPLANATION OF SIGNIFICANT DIFFERENCES

MAY 2007

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INTRODUCTION

The purpose of this document is to explain the significant differences between the remedy selected by the U.S. Environmental Protection Agency (EPA) in the Record of Decision (ROD) for the Lowry Landfill Superfund Site (the Site) in Arapahoe County, Colorado, and the remedy described herein. EPA issued the ROD for the Site on March 10, 1994. EPA has modified the selected remedy for landfill gas at the Site as a result of new information received subsequent to its issuance of the ROD. These changes do not fundamentally alter the Site-wide remedy presented in the ROD. The Site-wide remedy 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 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, highlighting scope, performance, and cost. It also summarizes the support agency's comments on the changes to the remedy and discusses compliance with applicable or relevant and appropriate requirements.

EPA prepared this ESD in fulfillment of its 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 in scope, performance, or cost from the remedy described in the ROD.

PUBLIC PARTICIPATION

EPA placed a copy of this ESD and the documentation supporting it in the administrative record which is available for public review at the following location:

EPA Superfund Records Center
1595 Wynkoop Street
Denver, Colorado 80202
Phone number: (303) 312-6474
Hours: Monday through Friday - 8:00 a.m. to 4:30 p.m.

This ESD is also available at the following Lowry Landfill Superfund Site information repository:

Aurora Public Library
14949 East Alameda Drive
Aurora, Colorado 80012
Phone number: (303) 739-6600
Hours: Monday through Thursday - 9:00 a.m. to 9:00 p.m.
Saturday - 9:00 a.m. to 5:00 p.m.
Sunday - 12:30 p.m. to 6:00 p.m.
Closed Friday

EPA will place a notice of availability and a brief description of the ESD in the Denver Post and Rocky Mountain News as required by CERCLA Section 117(c).

SUMMARY OF SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

Summary of Site History and Contamination

The 507-acre Site, located in an unincorporated area of Arapahoe County, consists of the western 3/4 of Section 6, Township 5 South, Range 65 West, and the extreme southern portion of Section 31, Township 4 South, Range 65 West. The Site is located northeast of the intersection of Quincy Avenue and Gun Club Road, 15 miles southeast of the City of Denver and 2 miles east of the City of Aurora, Colorado. The Denver Arapahoe Disposal Site (DADS), an operating municipal solid waste landfill northeast of the intersection of Gun Club Road and East Hampden Avenue, forms the northern and eastern boundaries of the Site. The City and County of Denver (Denver) owns the Site.

In 1930, 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 approximately 1940 until 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 comprising the bombing ranges back to Denver by Quitclaim Deed.

Beginning in February 1966 and continuing until 1980, Denver operated a "co-disposal" landfill at Section 6 of the Site, accepting liquid and solid municipal refuse 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 part of the DADS municipal solid waste landfill.) These materials included hazardous substances listed in 40 C.F.R. Section 302.4, such as volatile organic compounds (VOCs) and heavy metals. Approximately 75 unlined waste pits or trenches were excavated to accommodate a mixture of liquids, industrial waste, and municipal waste. In the southern half of Section 6, the pits were filled about three-quarters full with liquid wastes and topped with 25 to 60 feet of municipal waste. In the north-central portion of Section 6, excavated pits were filled with liquid wastes and municipal refuse, and then were covered with 2 to 5 feet of native soil and piles of discarded tires. No measures are known to

have been implemented to prevent leachate or liquid waste seepage from the pits. Consequently, over time, the liquid seeped out of the pits and mixed with the surrounding refuse and groundwater.

The types of waste disposed at the Site until 1980 using this practice included acid and alkaline sludges; asbestos; caustic liquids and solids; brines, including plating wastes and other water–based sludges; laboratory wastes; organics, including petroleum-based oils, grease, chlorinated solvents, and sludges; waste solvents, chemicals, and oil; biomedical wastes; low-level radioactive medical wastes; pesticides and garden chemicals; water-soluble oils; sewage sludge; paint and varnish waste, sludge and thinners; photographic chemicals; industrial solvents; construction waste; municipal refuse; household hazardous waste; appliances; tires; livestock carcasses; and metallic wastes.

EPA estimates that over the period of co-disposal operations at the Site, approximately 138 million gallons of liquid wastes were disposed. Nearly all of these wastes were disposed in the southern half of the Site within the 200-acre main landfill. A much smaller volume of waste was disposed north of the main landfill in ponds and waste pits.

From 1969 until 1986, municipal sewage sludge was applied to approximately 160 acres along the northern and eastern boundaries of the Site. The sludge was applied to the surface of the land and then incorporated into the native soils. After 1980, leachate that had been 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 in 40 C.F.R. Section 302.4.

During the 1970s, approximately 8 million tires were stockpiled at the Site. Beneath the stockpiles of tires were three separate waste pits, each approximately 20-30 feet deep and north of the main landfill. From 1989 through 1992, Denver and its contractors removed, shredded, and consolidated the tires and placed the tire shreds in a monofill on the east side of the Site for potential future re-use as fuel. The area underlying the tires and encompassing the waste pits became known as the Former Tire Pile Area (FTPA).

In 1980, Denver stopped co-disposal practices. From 1980 to 1990, Waste Management of Colorado (WMC) operated the Site under a contract with Denver. At that time, waste disposal at the Site was restricted to municipal solid waste and asbestos.

The waste disposed at the Site contaminated the soils and eventually contaminated shallow groundwater. Additionally, gases from the buried wastes contaminated the air spaces in subsurface soil.

The public issued complaints to regulatory authorities from 1971 to 1979 regarding odors, fires, and disposal practices which caused concern about the potential for spreading contamination to the surrounding area and groundwater. EPA, CDPHE (at that time, known as the Colorado Department of Health), and Denver worked jointly to identify contamination problems and modify operational practices.

In 1984, Denver entered into an Administrative Order on Consent with EPA for the design, construction and operation of a groundwater control and treatment system at the northern boundary of the Site, known as the North Boundary Barrier Wall (NBBW). The

system includes the following four main components: (1) a 1,000-foot-long and 30-foot-deep subsurface clay wall constructed at the intersection of the unnamed creek alluvial channel and the northern Site boundary to provide a barrier to groundwater flow to the north; (2) a gravel trench located immediately upgradient of the clay wall and associated pump and underground piping to collect and transport shallow groundwater; (3) an on-Site water treatment plant (WTP) for treatment of groundwater from the trench; and (4) a re-injection trench located in the alluvium north and downgradient of the clay wall. The WTP effluent was pumped into the re-injection trench.

In May 1988, EPA issued an Engineering Evaluation/Cost Analysis which described and evaluated alternatives for enhancing the existing measures that prevented off-Site migration of contaminants by managing contaminated surface water that had been intermittently flowing off-Site. Between 1988 and 1990, Denver developed preliminary designs of the alternatives. In November 1990, EPA selected the Surface Water Removal Action (SWRA) from among the alternatives. The SWRA consisted of an upgrade to the WTP and construction of a collection system within unnamed creek designed to segregate contaminated groundwater from uncontaminated surface water using a blanket drain concept. On August 15, 1991, Denver entered into an Administrative Order on Consent with EPA to construct and operate the SWRA.

The SWRA prevents contaminated groundwater from coming into contact with surface water within the unnamed creek streambed. Permeable material has been placed beneath the streambed and covered with a clay layer. The permeable material provides a pathway for groundwater to flow to the NBBW without contacting surface water. The top of the clay cover is now the streambed, allowing uncontaminated surface water to run off the surrounding Site areas and migrate to the north without coming into contact with contaminated groundwater flowing underneath the cover.

EPA initiated a drum removal action at the on-Site drum storage area on March 1, 1989. The removal action consisted of construction of two temporary lined storage pads to contain damaged drums. In 1990, EPA conducted Phase II of the Drum Removal Action in cooperation with Denver. Phase II consisted of re-packaging highly-contaminated liquids and solids from the old drums, decontaminating and disposing empty drums, and closing the temporary drum storage pad.

EPA placed the Site on the National Priorities List on September 21, 1984 (49 Federal Register 37083). EPA conceptually divided the Site into six operable units (OUs) for response, and grouped the OUs according to the media which they address:

- OUs 1 and 6 address shallow groundwater, subsurface liquids, and deep groundwater;
- OUs 2 and 3 address landfill solids and landfill gas; and
- OUs 4 and 5 address soils, surface water and sediments.

From 1984 until 1993, EPA conducted and the responsible parties performed remedial investigations/feasibility studies within the OUs to determine the nature and extent of

contamination, assess potential risks to human and ecological receptors, and develop and evaluate remedial alternatives.

In 1990, all municipal solid waste landfill operations stopped at the Site to allow environmental investigations to proceed without interference. WMC constructed a soil cover over the 200-acre main landfill in the southern part of the Site. The landfill cover is approximately 4 feet thick and up to 12 feet thick in some places.

On March 10, 1994, EPA and CDPHE signed the ROD for the Site.

Summary of the Selected Site-wide Remedy

Under the Site-wide remedy selected in the 1994 ROD, contaminated groundwater shall be addressed through containment, collection, and treatment, utilizing the existing WTP or an upgraded facility. The remedy for contaminated groundwater includes implementation of a long-term monitoring program and, if necessary, contingency measures. Landfill gas shall be addressed through containment, collection, and treatment using an enclosed flare. The remedy for landfill gas includes implementation of a long-term monitoring program and, if necessary, contingency measures. Contaminated seepage and surface water shall be addressed through a drainage and underground collection system in the unnamed creek area as part of the SWRA. The selected remedy for the FTPA shall address principal threats through treatment and off-Site disposal to reduce the toxicity, mobility, and volume of contaminants. Landfill mass solids shall be addressed through containment. The selected Site-wide remedy includes on-Site and off-Site institutional controls.

Several minor modifications of the ROD, ESDs, and a ROD Amendment followed the signing of the ROD. These documents are as follows:

- Minor Modification of the ROD, August 7, 1995. Clarifies institutional controls and allows on-going permitted waste disposal activities to continue.
- Explanation of Significant Differences, August 1995. Clarifies the basis for establishing performance standards, revises the Point of Action boundary for groundwater, clarifies the point of compliance for air emissions at the WTP, and clarifies the performance standards and points of compliance for the landfill gas component of the selected remedy.
- Minor Modification of the ROD, March 21, 1996. Clarifies the requirements for wetland mitigation.
- Second Explanation of Significant Differences, October 1997. Revises the selected remedy for the FTPA waste pits to allow on-Site treatment and disposal of excavated materials, revises the selected remedy for groundwater to allow off-Site discharge of pre-treated groundwater from the WTP to a Publicly Owned Treatment Works (POTW) under an enforceable discharge permit.
- Minor Modification of the ROD, May 8, 2001. Revises the air quality performance standard for 1,1-dichloroethene (1,1-DCE).

- Minor Modification of the ROD, September 30, 2002. Revises the performance standards for groundwater, surface water, landfill gas, and air.
- Amendment to the ROD, August 12, 2005. Modifies the selected remedy for the FTPA waste pits from excavation and on-Site treatment and disposal to recovery of non-aqueous phase liquids, off-Site disposal of recovered liquids, and capping.
- Minor Modification of the ROD, July 14, 2006. Identifies a new Applicable or Relevant and Appropriate Requirement for the FTPA remedy and designates a Corrective Action Management Unit at the Site.

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 information supporting a change in the landfill gas remedy submitted to EPA by Denver, Chemical Waste Management, Inc., and WMC, collectively the Work Settling Defendants (WSDs), under Consent Decree, Civil Action No. 02-CV-01341-EWN-MJW, for the Lowry Landfill Superfund Site, entered by the U.S. District Court for the District of Colorado on November 16, 2005.

The remedy for landfill gas selected in the ROD requires extracted gas to be burned in an enclosed flare. A blower/flare station was constructed on-Site in 1997 and has been operating since that time. In 2001, landfill gas from the DADS municipal solid waste landfill was introduced to the blower/flare station for the dual purposes of enabling the flare to operate at a flow rate closer to the optimal feed rate of the flare and to treat landfill gas produced from DADS.

In May 2005, Waste Management Renewable Energy, LLC, with support from the WSDs, submitted a proposal to Xcel Energy to construct a landfill gas-to-energy facility at the Site that would use the landfill gas that is currently being burned in the enclosed flare as fuel for four reciprocating internal combustion engines (ICEs) that would be used for the generation of electricity. The proposal was accepted by Xcel. The WSDs submitted a request for a change to the treatment component of the landfill gas remedy to EPA for approval along with supporting information. EPA considered the request and supporting information and has determined that the information supports the need to modify the treatment component of the remedy described in the ROD for landfill gas. The beneficial use of landfill gas at the Site is consistent with the mission of EPA's Landfill Methane Outreach Program, i.e., to reduce methane emissions by promoting the development of cost-effective and environmentally beneficial landfill gas-to-energy projects. The landfill gas-to-energy project at the Site provides several benefits such as destroying hazardous substances in extracted landfill gas, offsetting the use of non-renewable energy resources for the generation of electricity, and reducing emissions of sulfur dioxide, nitrogen oxides, carbon dioxide and particulate matter from the use of non-renewable resources. EPA has further determined that this modification significantly alters the scope of the landfill gas remedy but does not significantly alter the

performance or cost of the landfill gas remedy. The modification does not fundamentally alter either the overall approach of the Site-wide remedy or the remedy selected for landfill gas.

Description of the Significant Differences

The significant differences are as follows:

1. The ROD (Section 11.4) states that containment, collection, and treatment of landfill gas shall be achieved through the construction and installation of perimeter and interior gas extraction wells and treatment of the gas using an enclosed flare.

The new landfill gas-to-energy facility constructed on-Site will alter the treatment component of the landfill gas remedy but will not modify the containment and collection components. Extracted landfill gas from both the Site and DADS will be combusted in four ICE units in the new landfill gas-to-energy facility. The ICE units and associated electric generator sets will provide electricity to the local power utility grid. Each ICE unit will be capable of producing up to 820 kilowatts of electricity. The ICE units will be housed in a new on-Site building. Additional ICE units may be added in the future as an increased volume of landfill gas becomes available from DADS due to its expansion. The enclosed flare will remain on-Site and available for backup use at all times.

2. The ROD (Table 11-1) identifies 40 C.F.R. Part 60, Subpart WWW, Standards of Performance for Municipal Solid Waste Landfills (Landfills New Source Performance Standard (NSPS)) as a "To Be Considered" requirement.

The Emissions Guidelines for Landfills, 40 C.F.R. Part 60, Subpart Cc, apply to the Site. The Emissions Guidelines standards require an owner or operator of a municipal solid waste landfill to install a landfill gas collection and control system in accordance with the Standards of Performance for Municipal Solid Waste Landfills (40 C.F.R. Part 60 Subpart WWW). The collected gas must be routed to a flare, a control device (e.g., boiler or process heater), or to a treatment system that processes the collected gas for subsequent sale or use. EPA has determined that the processes that occur at the landfill gas-to-energy facility prior to combustion in the ICE units qualify as a "treatment system" for the purpose of compliance with 40 C.F.R. Part 60 Subpart WWW. EPA has also determined that the ICE units would not be subject to the requirements in 40 C.F.R. Section 60.752(b)(2)(iii)(B). However, emissions from any atmospheric vent from the gas treatment system, including any compressor, are subject to the requirements of 40 C.F.R. Section 60.752(b)(2)(iii)(A) and (B).

3. EPA has determined that the additional requirements in the following table are applicable to the combined landfill gas-to-energy facility and enclosed flare treatment system.

Summary of Applicable or Relevant and Appropriate Requirements for Landfill Gas-to-Energy Facility and Enclosed Flare
Lowry Landfill Superfund Site

	Citation	Description	Evaluation
Federal Clean Air Act	40 C.F.R. Part 60, Subpart Cc	Establishes emissions guidelines for municipal solid waste landfills.	Requirements apply to both the Site and DADS.
Federal Clean Air Act	40 C.F.R. Part 63, Subpart ZZZZ	Establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating ICEs located at major sources of HAP emissions.	Applicable if ICEs are located at a major source of HAP emissions. The State has imposed synthetic minor limits on HAP emissions in its construction permit for the landfill gas-to-energy plant. If future expansion of the landfill gas-to-energy plant results in HAP emissions that meet the criteria for a major source, this requirement would be applicable.
Federal Clean Air Act	40 C.F.R. Part 63, Subpart AAAA	Establishes national emission standards for HAP for existing and new municipal solid waste landfills.	Applicable to both the Lowry Landfill Site and DADS.
Colorado Air Quality Control Act	5 CCR 1001-14, Ambient Air Quality Standards	Establishes ambient air quality standards for sulfur dioxide, ozone, carbon monoxide, nitrogen dioxide, particulate matter, and visibility.	Applicable to emissions from the landfill gas-to-energy plant.
Colorado Air Quality Control Act	5 CCR 1001-5 Regulation No. 3, Stationary Source Permitting and Air Pollutant Emission Notice Requirements	Establishes reporting and permitting requirements for stationary sources of air pollutants.	Substantive requirements are applicable. The Site and DADS combined is currently a minor source. If future expansion of the landfill gas-to-energy plant and/or DADS would result in emissions that meet the criteria for a major source, the substantive requirements of Part D would apply.
Colorado Air Quality Control Act	5 CCR 1001-9 Regulation No. 7, Emissions of Volatile Organic Compounds	Establishes limitations on emissions of volatile organic compounds.	Provisions in Section V are applicable to the landfill gas-to-energy plant.

All other applicable or relevant and appropriate requirements identified in Section 11 of the ROD remain valid.

SUPPORT AGENCY COMMENTS

CDPHE concurs with the ESD and the changes to the selected remedy described herein.

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.

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