

DCN FLEP-00003

COMMENTS Duke Power Company

SUBJECT DATA1

COMMENT The subject proposed rule is a step in the right direction, however, it does not go far enough. This position is based on EPA's own data generated by the Research Triangle Park Report (RTP). The RTP Report concluded that "the impacts of mercury in MSW landfill leachates on groundwater quality is negligible"; and "no significant human exposure to mercury is likely to result from MSW landfill leachate contamination of groundwater"; and "most mercury entering (MSW) landfills is retained within the waste and that the amount of mercury released from the MSW waste stream via leachate is insignificant". Even further support of this conclusion is presented in the new Proposed Rule when it states that "less than 0.01 percent of the mercury in MSW landfills leaches from the landfill" (Baccini et al., 1987). Factor into this extremely low percentage the fact, also in the Proposed Rule, that lamps only contribute 3.8 percent of the mercury found in MSW landfills. NEMA estimates their manufacturers will reduce the mercury in lamps another 35 percent by 1995. Add the 14 percent they have reduced as of 1990 and that is a 49 percent reduction in the mercury contained in lamps, since the 1987 Baccini report, by 1995. That reduces the 3.8 percent virtually in half, and even further lowers the negligible 0.01 percent mercury leachate from MSW landfills.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes and thus is adding hazardous waste lamps to the universal waste rule.

The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model

and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, **Mercury Emissions From the Disposal of Fluorescent Lamps**,@discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices). It also discusses inputs for estimating the energy savings from using high-efficiency T8 lamps, and the effects on mercury emissions from electric utilities.

DCN FLEP-00013

COMMENTS Coors Brewing Company

SUBJECT DATA1

COMMENT We are unable to comment on the veracity and completeness of the data you cite in the "III. Environmental Release and Fate" section of the Preamble, although the data used certainly suggest a strong argument concerning minimal impacts on groundwater stemming from municipal landfill disposal.

RESPONSE

The Agency thanks the commenter for submitting comments on the proposed rule. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, **Mercury Emissions From the Disposal of Fluorescent Lamps**,@discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

DCN FLEP-00039

COMMENTS Spectrum Technologists

SUBJECT DATA1

COMMENT 1. Groundwater impacts (Page 38291). EPA is using the 0.002 mg/l drinking water MCL to assess the impact of landfill leachate whose mercury concentration, in a small number of tests, ranged from 0.0008 mg/l to 0.0098 mg/l. The relevant standard is 0.000012 mg/l for aquatic life which takes into account bioaccumulation in fish and the 1 ppm human health advisory level. This standard is as low as 0.000002 mg/l (2 ppt) in at least one state. Since leachate is filtered before analysis, the mercury found is in a soluble form that in many cases will find its way into surface waters and biota. 2. Mercury in landfill gas (P. 38292). EPA is too quick to dismiss Swedish data in this regard.. Data developed in the past regarding incinerator emissions in Sweden indicates that Swedish MSW is likely to contain less mercury than its U.S. counterpart. Thus Swedish emissions in this regard would likely understate ours. Indeed, a recent report from Minnesota (excerpt attached) shows landfill emissions three orders of magnitude higher than those reported in Sweden. [See hard copy of Comment FLEP-00039 for attachment.] While the rate of emission is significantly lower than the typical incinerator, this material will be sitting there forever.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for

estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

DCN FLEP-00082

COMMENTS Square D Company

SUBJECT DATA1

COMMENTS Comments on Subtitle D Landfilling Incorporating Subtitle C requirements are unnecessary because the agency has already documented through demonstrations that leachable mercury from lamps is insignificant and because air emissions requirements in Subtitle C offer minor additional protection from Subtitle D. EPA studies have demonstrated that landfilling of mercury-containing lamps presents little risk to human health or the environment. Mercury has been shown not to leach or otherwise escape from municipal landfills. This, combined with the fact that the amount disposed in landfills each year (250 million pounds) is insignificant in comparison to the 1 million tons of household hazardous waste and the 160 million tons of municipal waste landfilled each year. In fact, U.S. lamps contain less than .2 percent of total mercury in the environment and account for only 3.8 percent of total mercury in municipal solid waste. The quantity of mercury potentially released from landfilling of lamps (.04 to .31 tons) is minimal when considering emissions from combustible sources at 286 tons per year.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of

landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00083

COMMENTS Unenco Services, Inc.

SUBJECT DATA1

COMMENT In fact, U.S. lamps contain less than .2% of total mercury in the environment and account for only 3.8% of total mercury in municipal solid waste. The quantity of mercury potentially released from landfilling of lamps (.04 to .31 tons) is dwarfed by the emissions of mercury from combustion sources, estimated to be 286 tons per year. Clearly EPA resources are better spent addressing mercury emissions from combustion than in unnecessarily regulating a minor mercury source such as fluorescent lamps.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11,

1997 (62 FR 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00091

COMMENTS Sterling Environmental Services, Inc.

SUBJECT DATA1

COMMENT Please find the enclosed study that was performed by Sterling Environmental for a client to properly characterize spent light bulbs as a waste stream. In reading your proposed rule for

mercury containing lamps (July 27, 1994) I felt that the enclosed study may be of interest to you. One issue that we had found in our study that was not mentioned in the rule is the presence of leachable lead in various light bulbs along with the mercury. [See hard copy of Comment FLEP-00091 for attachment of study.]

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. EPA studies and data provided by some commenters have also determined that the majority of spent lamps fail the TCLP for mercury but that some spent lamps fail TCLP for lead. For this reason, spent lamps that exhibit for any hazardous waste characteristic are subject to today's final rule. The final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

DCN SCSP-00114

COMMENTER National Electric Manufacturers Assn.

SUBJECT DATA1

COMMENT EPA has asked for data to address whether lamps containing mercury posed a risk when managed in landfills and municipal waste combustors (MWCs). NEMA has submitted data which supports low risk when lamps are managed in solid waste landfills. NEMA has recently met with the Integrated Solid Waste Association (ISWA) and examined its limited data on the performance of MWCs with mercury controls. These data suggest that MWCs with these mercury controls would also serve as protective management facilities for lamps. NEMA has also examined recycling/reclamation facilities for lamps containing mercury, and is currently collecting additional data.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps,*

discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

DCN SCSP-00118

COMMENTS Robert M. Quintal

SUBJECT DATA1

COMMENT MERCURY IN THE WASTE STREAM The results of mercury contamination, and subsequent ecological damage that has occurred, has been widely documented. Mercury vapor in the atmosphere can come from a variety of natural and artificial sources. Many of these sources are currently being addressed by individual states as well as the EPA. A recent task force in New Jersey concluded that, next to batteries, fluorescent and HID lamps are the largest contributor to mercury in the NJ MSW stream. [1] [Reference 1: "Interim report to the Commissioner of the NJ DEP and Energy on the Findings and Recommendations of the Task Force on Mercury Standard Setting" December 1992.] As a result of battery regulations, fluorescents are now the largest single source of unregulated mercury. [See hard copy of Comment SCSP-00118 for table of Mercury in Consumer Products in the New Jersey MSW Stream.] Many individual states that heavily incinerate their MSW (State of New York and other northeast states in particular), have conducted similar studies. Comprehensive mercury emissions standards are being adopted. These studies conclude that source reduction and separation programs will be an integral part of meeting the proposed standards. [2] [Reference 2: "A Different Viewpoint, Cleaning up the Waste Stream" - Michael Winka, Executive Assistant NJDEP and Energy Division of Solid Waste Management.] MERCURY CONTAINING LAMPS Nationally, lamps contribute 34 tons of mercury per year into various non-regulated, household and MSW streams. This waste is then put in landfills or incinerated. Segregation of fluorescent waste at this juncture is near impossible. Mercury may be found in varying amounts in landfill leachate, or dispersed in water runoff. Incineration of mercury containing waste will contribute to atmospheric mercury pollution. LANDFILL EMISSIONS Measurements of air quality to detect mercury vapor in the ambient air at sanitary landfills have been carried out at landfills in 4 Swedish townships. The results of the

measurements show significant levels of mercury vapor in the air above the landfills. The levels of mercury vapor vary with meteorological parameters like temperature, windspeed and direction of wind. [3] [Reference 3: "Release of Mercury Vapor from Landfill Sites" - Sweden DEPA, December 1989.] NEMA advocates "Subtitle D" landfills as a disposal option for lamp waste. To substantiate their position, they cite that no test data is available that shows mercury in leachate or present in vapor emissions around landfills. The Swedish tests show otherwise. In fact, it is data such as this that has led much of Europe and the Netherlands to set strict standards for mercury containing wastes in landfills.

RESPONSE

The Agency appreciates the commenter's submission of data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards). Regarding the disposal of hazardous waste lamps, today's rule specifies that universal waste destination facilities (i.e., facilities that treat, dispose, or recycle universal waste) are subject to all applicable Subtitle C requirements for hazardous waste treatment, storage, and disposal facilities and must receive a RCRA permit for such activities.

Simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 *FR* 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 *FR* 48348) (remanded for further explanation, *Sierra Club v. EPA*,

167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN SCSP-00135

COMMENTS New York Dept. of Environ. Conservation

SUBJECT DATA1

COMMENT TO: For the Record FROM: Ward Stone SUBJECT: Rock Site Visit, March 14, 1992 DATE: March 16, 1992 On March 14, 1992, I sampled the Rock Site (C&D) in Saratoga County between 3:30 and 6:15 PM (total time including travel was 4 hours 45 minutes). I was assisted by Ms. Colleen Kimble, of my staff, during sampling. No one was seen on the property but I entered anyway, as I have permission to sample the site. The pigs were friendly, in the pig pen to the rear and east of the house. The pigs were in moderate flesh. A small man-made pond (frozen; temperatures in the 20's) was east of the pigpen. This might be a place to take a water sample in the future as this pond is bordered within fifty feet by the north edge of the C&D dump. Boards, metallic materials, a roll of aluminum-backed material (perhaps some kind of insulation) was protruding from this area of the dump. Ten samples were taken from the eastern and southeastern portion of the landfill, and three 35 mm slides and some video were taken. Among the strewn debris just south of the central portion of the extreme eastern edge of the dump, an unfrozen area of leachate was found. The leachate was flowing and had a "rusty" color, the water in the pool had a oily sheen. The leachate pool was about 12 feet long and two feet wide with a slow flow in and out. Surrounding wet areas were iced over and could support my somewhat greater than 200 lb weight. From the leachate pool a water sample was taken for PCBs, another for elemental analysis, and a sediment for ICP, chlorinated hydrocarbon screen, and Hg. No trip blank for volatiles was available so no volatile sample was taken. A sample was taken from a gully on the SE of the landfill. No water was presently flowing, but when the floor of this gully was dug in layers a dark material could be seen

(should be on video). These layers appeared to be oil layers, but might also be organic material produced in the fire. When the sand sample was mixed in the jar, the darkened portions were, at best, difficult to discern. Monitoring wells are needed to check on the path of groundwater flow and extent of contamination the dump has (or will) made on the groundwater. Several more samplings are needed during warmer, wet, weather in order to study contaminants in the leachate and to better check the adjacent wetlands for contamination.

DCN SCSP-00135

COMMENTS New York Dept. of Environ. Conservation

SUBJECT DATA1

COMMENT I have found that mercury is a widespread contaminant in the Rock Dump, Milton, Saratoga County, and have found large quantities of broken fluorescent lights which contain mercury on the site. I saw the crushed glass and ends from fluorescent lights on the surface and edges of the landfill. The fluorescent light debris (broken glass and the metal-ends) is widespread and I observed it an the west central, northwestern, southwestern, eastern and northeastern portions of the landfill. In November of 1991, Mr. John Rock told me that the fluorescent lights came from Connecticut and that he believed originated from the Sylvania Corporation in that state. I talked with Ms. Holzman of the State of Connecticut, Bureau of Environmental Protection (BEP), on July 8, 1992 and she faxed me the attached policy on fluorescent light tubes. The movement of large quantities of fluorescent lights Connecticut to New York could have been to avoid Connecticut's Special Waste Approval Permit and the expense of complying with their regulation of fluorescent lights. The Connecticut BEP did not know about the production of waste fluorescent tubes by Sylvania, but indicated that electrical power corporations sometimes collect quantities of fluorescent tubes and ballast for disposal. I am attaching some analytical data, for which strict chain-of-custody was maintained. Water samples (WPU Log Nos: #92-17-13 and #92-17-14) were taken from the wetland area off the east - southeast region of the Rock Dump. The respective waters contain 1.3 parts per billion and 4.7 ppb (4,700 parts per trillion) total mercury. Neither sample was in a concentrated area of leachate. Sample #92-17-13 was in clear-appearing water forty

feet out in the marsh from the dump. Attached are six 35 mm slides, taken by myself, at the Rock Dump site, town of Milton, Saratoga County, during May and July, 1992. Descriptions are as follows: Slide #1. Debris in the wetland on the east end of Rock dump. Contains ends and glass from florescent lights. Slide #2. Hard polymer (plastic) from a cardboard barrel on east edge of Rock dump. Slide #3. Large metal funnel by crushed barrel on east end of Rock dump. Slide #4. East edge of Rock site. Debris with glass end of a florescent light. Slide #5. A 50 gallon crushed plastic barrel with a label indicating it came from the Mt. Siani Medical Center in New York City. The barrel is marked with ALX-R and probably contained a caustic material. Slide #6. A view indicating the heterogeneous nature of the debris in the Rock dump. Our investigation of the Rock site is continuing. The attached data was from surface "dirt" at the southeast end of the Rock site. The sample area contained pieces of glass from fluorescent lights and the metal ends from these lights. The sample location was six feet from the open water of the wetland. Among the most notable finds in the elemental analysis are: 1) Mercury is at 16.3 ppm (dry-weight) in this sample from the Rock dump and this level is more than 163 times the background level for mercury in uncontaminated soil near the Rock C&D dump. This plus other sampling done by the Wildlife Pathology Unit shows to be a widespread contaminant associated with numerous fluorescent lights at the Rock site. 2) Beryllium at 5.1 ppm is present at about eight times its local background level. 3) Cadmium at 7 ppm is about 15 times higher than background. 4) Chromium at 86 ppm is about triple the expected background. 5) Copper at 55 ppm is slightly higher than background. 6) Iron at 76,660 ppm is more than five times the background. 7) Nickel is slightly above the background level. 8) Zinc at 301 ppm is about 6 times above background. 9) Lead at 295 ppm is about 18 times above the expected background. 10) Aluminum is slightly above background. 11) Calcium is more than 10 times background. Wallboard may be a major contributor to this increase.

RESPONSE

The Agency thanks the commenter for providing information on contaminants detected in elevated concentrations at a dump that contains fluorescent lamps, among other wastes. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury

releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release. The deposition of atmospheric mercury into surface waters, its presence in runoff from soil, or the recycling of mercury from sediment into the water column can result in the accumulation of the metal in many animal species, particularly aquatic organisms. Examples of mercury-related risks include neurotoxicological problems and developmental effects in fetus and adults (e.g., Mad Hatter's disease), and accumulation of the metal in many animal species, particularly aquatic organisms. For example, fish with high levels of mercury in their tissues have exhibited increased mortality, reduced reproductive success, impaired growth, and behavioral abnormalities.

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards). Today's rule specifies that universal waste destination facilities (i.e., facilities that treat, dispose, or recycle universal waste) are subject to all applicable Subtitle C requirements for hazardous waste treatment, storage, and disposal facilities and must receive a RCRA permit for such activities.

DCN SCSP-00140

COMMENTS Advanced Environmental Recycling Corp.

SUBJECT DATA1

COMMENT In response to EPA's request for information on the risks posed

by fluorescent light bulbs in landfills, enclosed (see Exhibit D) please find copies of correspondence and data from the New York Department of Environmental Conservation's Wildlife Pathology Unit. In a test sample taken by NYDEC Wildlife Pathologist Ward Stone from a construction and demolition dump near Saratoga Springs, N.Y., he found that: "Mercury is at 16.3 ppm (dry weight) in this sample from the Rock dump and this level is more than 163 times the background level for mercury in uncontaminated soil near Rock C & D dump. This plus other sampling done by the Wildlife Pathology Unit shows mercury to be a widespread contaminant associated with numerous fluorescent lights dumped at the Rock site."

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

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DCN FLEP-00141

COMMENTS Dow Chemical Company

SUBJECT DATA

COMMENT At the Louisiana site discussed above, fluorescent lamps are managed as part of the on-site garbage. Providing protection beyond that required by government regulation, this on-site garbage is generally commingled with and incinerated with other waste generated on-site, in an on-site hazardous waste incinerator. Trial burn data from this on-site hazardous waste

incinerator showed that waste spiked with mercury released <<1% of the mercury fed to the atmosphere. The incinerator ash and air pollution control scrubber solids are both disposed of in an on-site hazardous waste landfill, without stabilization. TCLP testing (1992-mid 1994) of these residues have shown that mercury is not a contaminant in ash (32 samples) or scrubber solids (11 samples). All analyses were below the Toxicity Characteristic limit for mercury (0.20 mg/L) and the proposed Universal Treatment Standard (LDR Phase II) limit for mercury (0.025 mg/L). In addition, 10 leachate samples from the hazardous waste landfill contained less than the MCL mercury limit of 0.002 mg/L. At times, the on-site garbage is disposed of in the on-site industrial, non-hazardous landfill. The groundwater samples taken for this non-hazardous landfill are not analyzed for mercury. However, the analyses from the hazardous landfill leachate indicate that there should not be mercury contamination in the non-hazardous landfill's leachate.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards). Today's rule specifies that universal waste destination facilities (i.e., facilities that treat, dispose, or recycle universal waste) are subject to all applicable Subtitle C requirements for hazardous waste treatment, storage, and disposal facilities and must receive a RCRA permit for such activities.

DCN FLEP-00142

COMMENTS The Fertilizer Institute

SUBJECT DATA1

COMMENT C. Disposal of Mercury-Containing Lamps in MSW Landfills Would

Not Pose a Health Risk EPA has presented compelling evidence that the disposal of mercury-containing lamps in municipal solid waste landfills would not pose a health risk. According to EPA, the environment human exposure pathway for mercury is through consumption of contaminated fish. Based on data concerning the quantity of mercury in MSW landfill leachate, there appears to be little potential for mercury disposed of in MSW landfills to reach surface waters and bioaccumulate in fish. In this regard, EPA estimates that less than 0.01% of the mercury in MSW landfills leaches from the landfill. Moreover, EPA notes that of 109 MSW landfill leachate samples, only 6 were above the drinking water level or maximum contaminant level for mercury (0.002 mg/L) and none were above the Toxicity Characteristic for mercury (0.2 mg/L). 59 Fed. Reg. 38,291. Additional facts put these data into perspective. First, mercury-containing lamps represent a very minor source of mercury in MSW landfills - less than 3.5%, as compared to household batteries which account for approximately 88% of the mercury in municipal solid waste. Second, most of the data on mercury levels in MSW landfill leachate predate the new Subtitle D regulations for MSW landfills, which impose leachate collection and groundwater monitoring requirements designed to prevent leachate from contaminating groundwater and surface water. See 40 C.F.R. Part 258. Consequently, the data cited by EPA most likely overstate the potential for mercury to leach from MSW landfills and bioaccumulate in fish. In sum, from an environmental perspective, then: does not appear to be any reason to require that mercury-containing lamp wastes exhibiting the toxicity

characteristic be managed pursuant to Subtitle C.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule is less stringent than full Subtitle C management standards).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. The Agency published a Notice of Data Availability on July 11, 1997 (62 FR 37183). This notice presented data collected by the Agency and an assessment of potential mercury emissions from the management of hazardous waste-containing lamps under several regulatory approaches.

The Agency believes that management controls under RCRA are needed to minimize the release of mercury from lamps into the environment. Studies have shown a significant potential for mercury emissions from hazardous waste lamps during storage and transport. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00145

COMMENTS ASTSWMO

SUBJECT DATA1

COMMENT We are also concerned that the mercury in landfill leachate will be released to the atmosphere and surface waters through management of leachate at waste water treatment plants. Waste water treatment facilities receive significant amounts of leachate from landfills with leachate collection systems. In Minnesota, for example, ninety percent (90%) of the landfills with leachate collection systems send the leachate off-site to waste water treatment facilities for disposal. This percentage is consistent with the national trend for management of landfill leachate. Under the conditional exclusion proposal, the likely

recipients of waste fluorescent lamps will be those landfill facilities with leachate collection systems. Waste water treatment facilities are subject to strict federal mercury effluent limits and may be subject to more stringent State and local limits. A small percentage of influent mercury evaporates in the waste water treatment process. The actual percentage depends on the specific facility's design and operation. Approximately eighty five percent (85%) of mercury influent to waste water treatment facilities is captured in sludge produced in the treatment process. The remaining percentage is discharged with other effluent from the treatment facilities to surface waters of the nation or is released through air emissions from the plant. Sludge from waste water treatment facilities is typically either incinerated or land applied for disposal. If the sludge is incinerated, one hundred percent (100%) of the mercury contained in the sludge will be released to the environment immediately. If the sludge is land applied, the release is slower but nearly as complete; soils retain only about two percent (2%) of the mercury deposited on them. If the leachate that is collected is not sent off-site to a waste water treatment system for disposal, it will be land applied through some type of land irrigation. Any mercury in the leachate will likely be released to the atmosphere as the leachate is applied to the land.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management, particularly landfill leachate. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of

mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes and thus is adding hazardous waste lamps to the universal waste rule. Because the universal waste rule requires hazardous waste lamps to ultimately be recycled or treated and disposed at RCRA Subtitle C facilities, the scenarios envisioned by the commenter will generally be prevented. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00156

COMMENTER National Electrical Manufacturers Assn.

SUBJECT DATA1

COMMENT NEMA has summarized available risk information on mercury in spent lamps in the enclosed document entitled "Environmental Risk Analysis: Spent Mercury-Containing Lamps" (Enclosure 5). This document shows that if all of the 27 tons of mercury contained in the spent lamps generated per year in the U.S. were to be landfilled in either a hazardous waste landfill or a municipal landfill, only .04 to .31 tons, or 15 percent to 1.15 percent of the mercury would likely be released into the environment. If all 27 tons were to be recycled, only .05 tons to .81 tons would be released, or .2 percent to 3 percent of the mercury, not including any emissions resulting from processing of recovered materials. Clearly, recycling and landfilling

results in very little release of mercury.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

DCN FLEP-00160

COMMENTS Central and South West Services, Inc.

SUBJECT DATA1

COMMENT 3. Air Emission Impacts Do Not Warrant Regulating Mercury-Containing Lamps as Hazardous Waste
Recognizing that the management of mercury-containing lamps in MSWLFs does not pose a threat to human health and the environment from the perspective of leachate contamination. The Agency seeks comment on another possible route of contamination; namely, the potential for contamination of soil and surface water due to the volatilization of mercury during the transportation and crushing of mercury-containing bulbs and the release of mercury in landfill gas. 59 Fed. Reg. at 38292-93. Here again, however, the record evidence demonstrates that these scenarios do not result in the release of mercury to the environment that warrants regulating mercury-containing lamps as hazardous wastes when managed in qualified MSWLFs. First, the

record demonstrates that mercury landfill gas emissions attributable to the disposal of mercury containing bulbs is exceedingly small and in effect barely measurable when compared to other sources. *Id.* at 38292. Based on the results of a Swiss study of landfill gas from municipal waste landfills, which EPA found were comparable to U.S. MSWLFs, the record demonstrates that "the amount of mercury annually released in landfill gas can be estimated as 0.8 kg, about 0.0001 percent of the total mercury load entering MSW landfills (643 Mg)." *Id.* Taking this amount and adjusting it "to the proportion of total mercury contributed by mercury-containing lamps to the MSW streams (3.8 percent), provides an estimate of annual landfill gas emissions from lamps of about 0.03 kg, less than 0,00001 percent of the total municipal solid waste mercury input." *Id.* (emphasis added). As EPA correctly reasons, this amount is extremely small (0.00003 Mg) "when compared to the 3 Mg of mercury from lamps that is estimated to be emitted into the atmosphere through municipal waste combustors." *Id.* The RTI report also cites a Finnish study, which found based on an assessment of landfill gas that accepted municipal refuse, including mercury from batteries, fluorescent lamps, and broken thermometers, that "mercury concentrations in the air around landfills is slightly higher than rural areas, but at the same level as other city areas and that the refuse dump does not seem to increase the metal concentrations in &! to levels above normal urban values." RTI Report at 112. Based on the above findings, the RTI Report concludes that "mercury concentrations in landfill gases appear to have little or no measurable impact on air quality around a landfill." " *Id.* at 113 (emphasis added).

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, **Mercury Emissions From the Disposal of Fluorescent Lamps**, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00161

COMMENTS American Forest and Paper Association

SUBJECT DATA1

COMMENTS As EPA emphasized in the preamble to the proposed rule, available data shows that spent lamps disposed of in municipal landfills release almost no mercury into the environment. EPA studies have shown that spent lamps account for only 3.8% of mercury disposed of in municipal waste, or approximately 20 Mg per year. 59 Fed. Reg. At 38291. Ongoing EPA studies indicate that mercury is much less mobile in landfill environments than previously thought. 59 Fed. Reg. At 38289. Studies of municipal landfills show that landfill leachate rarely exceeds the MCL for mercury. 59 Fed. Reg. At 38291 (only 7% of leachate samples tested exceeded the MCL). Studies of Swiss landfills show that landfill leachate rarely exceeds the MCL for mercury. 59 Fed. Reg. At 38291 (only 7% of leachate samples tested exceeded the MCL). Studies of Swiss landfills estimate that only about .007% of mercury disposed of in municipal landfills leaches out. *Id.* It follows therefore, that of the 20 Mg disposed of in municipal landfills each year, approximately

1.4 kilograms leaches out ($20 \text{ Mg} \times .00007 = .0014 \text{ Mg}$ or 1.4 kg). EPA estimates that emissions of mercury gas from municipal landfills are even lower. 59 Fed. Reg. At 38292 (concluding that air emissions attributable to spent lamps are approximately .03 kg. per year). Because available data show that municipal landfills can safely handle spent lamps, more stringent and expensive requirements are not necessary to protect human health and the environment. Clearly, full regulation of spent lamps as hazardous waste under RARA Subtitle C is not warranted to prevent the release of less than two kilograms of mercury from municipal landfills each year.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been

shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00164

COMMENTS E.I. Du Pont De Nemours and Co., Inc.

SUBJECT DATA1

COMMENTS Data from the EPA studies included in the preamble indicate that mercury does not leach in significant amounts from municipal landfills, thus presenting little or no impact on human health and the environment. In fact, domestically manufactured mercury-containing lamps account for less than 0.2% of the total amount of mercury in the environment today, and account for only 3.8% of total mercury in the municipal solid waste stream. Indeed, the estimated 250 million pounds of spent lamps assumed to be disposed of in landfills each year is minor when compared with the estimated 160 million tons of municipal solid waste landfilled each year.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of

this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00165

COMMENTS Ohio Chamber of Commerce

SUBJECT DATA1

COMMENTS EPA studies have shown that mercury does not leach in significant amounts from landfills making Subtitle C landfilling unnecessary. In addition, in the area of air emissions, Subtitle C does not offer significant protection over that offered by Subtitle D, making the expense of disposal vastly disproportional to the environmental benefit achieved. In fact, U.S. lamps contain less than .2% of total mercury in the environment and account for only 3.8% of total mercury in municipal solid waste. The quantity of mercury potentially released from landfilling of lamps (.04 to .31 tons) is dwarfed by the emissions of mercury from combustion sources, estimated to be 286 tons per year. Clearly EPA resources are better spent addressing mercury emissions from combustion than in unnecessarily regulating a minor mercury source such as fluorescent lamps.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, **Mercury Emissions From the Disposal of Fluorescent**

Lamps,@discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

The Agency also notes that, simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00168

COMMENTS Merck and Company, Inc.

SUBJECT DATA1

COMMENT Merck strongly supports the conditional exclusion option. This option with tailored contingent management provisions is the best means of ensuring safe and cost-effective disposal of mercury-containing lamps without imposing an undue burden on the generator. EPA studies have shown that mercury does not leach above MCLs from municipal landfills, presenting little or no risk to human health or the environment, therefore making

management/disposal in a Subtitle C facility unnecessary. Indeed, the quantity of lamps assumed to be disposed in landfills each year (250 million pounds) is insignificant in comparison to the 1 million tons of household hazardous waste and the 160 million tons of municipal waste landfilled each year. Concerning air emissions, Subtitle C will not offer significant protection over that offered by Subtitle D, making the expense of disposal in Subtitle C units vastly disproportional to the environmental benefit achieved. Air emissions due to breakage of mercury containing lamps can be controlled through proper handling and packaging practices without the additional restrictions Subtitle C would impose. U.S. mercury lamps contain less than 0.2% of the total mercury in the environment and account for only 3.8% of the total mercury in municipal solid waste. The quantity of mercury potentially released from landfill disposal of lamps is 0.04 to 0.31 tons which is minute in comparison to the estimated 286 tons emitted from coal-burning power plants. Clearly EPA resources are better spent addressing mercury emissions from combustion than in unnecessarily regulating a minor mercury source such as fluorescent lamps.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

The Agency also notes that, simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00169

COMMENTS Advanced Environmental Recycling Corp.

SUBJECT DATA1

COMMENT The magnitude of lamps being disposed at one time in landfill operations will magnify the risks and associated environmental releases of mercury. In addition, temperatures in landfills, impacted by not only climatic conditions but also the degradation process within the landfill, will increase the amount of mercury released in all forms. AERC/MTI is in the process of completing additional tests that will quantify all of the previously detailed parameters. These results will be forwarded to the USEPA by the end of the year.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. In today's rule, the Agency is not finalizing

the conditional exclusion option for the management of hazardous waste lamps because it is not sufficient to protect human health and the environment. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

DCN FLEP-00171

COMMENTS Monsanto Company

SUBJECT DATA1

COMMENT By the Agency's estimates, 643 metric tons of mercury is disposed in MSW landfills per year. NEMA estimates that only 27 tons of mercury is contained in spent Hg-lamps, or less than 5% of the tonnage to MSW landfills. (Undoubtedly, most of the 27 tons ends up in MSW landfills.) in spite of the quantity of Hg to MSW landfills, the Agency reported that out of 109 leachate samples collected from MSW landfills, only 6 samples were above the MCL for Hg, and none exceeded the TCLP limit for Hg. (59 FR 38291, 7/27/94) Note that these were leachate samples and not groundwater samples; considerable attenuation of leachate would occur if leakage occurs from the landfill. The clear message, as concluded by the Agency, is that "municipal solid waste has a significant capacity for retaining mercury in the landfill."

(ibid)

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 FR 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury

Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00178

COMMENTS General Electric Company

SUBJECT DATA1

COMMENT IV. Setting a context for Mercury Emissions from Lamps Mercury containing lamps in the United States contain less than 0.2 percent of all the mercury contained in yearly global releases. The total annual mercury content of spent lamps per year in the United States is approximately 27 tons. [1] [Footnote 1: Truesdale, Beaulieu, and Pierson, Research Triangle Institute, Management of Used Fluorescent Lamps: Preliminary Risk Assessment, May 1993.] This is compared to the yearly global releases from natural sources (7000 tons per year), from fossil fuel combustion including power plants (3,000 tons per year), and from other manmade sources (6,000 tons per year). [2] [Footnote 2: Begley and Linderson, Stockholm University, Management of Mercury in Lighting Products, 1992.] Additionally, the mercury in lamps has decreased significantly in recent years as GE and other manufacturers have worked to reduce mercury use. From 1985 to 1990, the industry's average mercury content in a 4 foot T12 fluorescent lamp decreased from 46.2 mg to 41.6 mg. [3] [Footnote 3: National Electrical Manufacturers Association, The Management of Spent Electric Lamps Containing Mercury, September 1994. Second Edition.] The industry average was expected to drop to 27 mg by 1995. However, a current industry survey revealed that the average mercury content in a 4 foot T12 lamp is now at 23 mg, already 15 percent lower than the 1995 projection. Since

1985, GE has reduced the mercury content in this product category by more than 50 percent. In addition to the total amount of mercury in lamps being small, only a tiny percentage of that mercury is released to the environment through air emissions. According to EPA's own analysis, only .06 percent to 0.2 percent of the mercury in a lamp is in vapor form when the lamp is not use (when almost all lamps are broken).[4] [Footnote 4: Battye, McGeough, and Overcash, Evaluation of Mercury Emissions from Fluorescent Lamp Crushing, EPA-453/D-94-018, February 1994.] Therefore, only 0.04 mg of mercury vapor is released from a lamp when broken. Even if all the mercury in the lamp were exposed to air at room temperature, research performed by Lawrence Berkeley labs shows that evaporation would occur at a rate of approximately only 1 percent over the first 24 hours. Most of the evaporation occurs during the first 2 hours and decreases dramatically after that. [5] [Footnote 5: Clear and Berman, Lawrence Berkeley Laboratory, "Environmental and Health Aspects of Lighting: Mercury," Journal of the Illuminating Engineering Society, Summer 1994.]

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of

landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes in part to address the potential for mercury emissions from lamps during storage and transport, as noted by the commenter.

DCN FLEP-00182

COMMENTS Eastman Kodak Company

SUBJECT DATA1

COMMENT II. Environmental Impact: Kodaks Landfill Data In its proposal, the Agency requested that commenters provide leachate or groundwater data on industrial Subtitle D landfills that was not considered in its analysis. Data of this type has recently been provided by Kodak to EPA Region II [1] [Footnote 1: "Hydrogeological Investigation Monitoring Report - Weiland Road Landfill", Enclosure in letter from Rowan Smoicha (Kodak) to Thomas Marriott (NYSDEC) January 26, 1994. Copies to A. Bellina and J. Reidy - USEPA Region H.], and we do not believe that it has been considered in the proposed rulemaking. Therefore we are providing a summary of this information as part of our comments on this proposal. Kodak has operated the Kodak Park facility in Rochester, New York since 1891. This facility is a large, integrated manufacturing plant for photographic film, papers, and photoprocessing chemicals. The plant covers more than 2000 acres and contains nearly 200 major manufacturing buildings. Currently, more than 22,000 people work at Kodak Park. Located in the southwest portion of Kodak Park is an non-hazardous industrial solid waste landfill known as the Weiland Road Landfill (WRL) which has been in operation since the 1940's. Currently this landfill receives only construction and demolition debris, but in the past this facility has received a variety of wastes, some of which would be classified as hazardous wastes pursuant to current regulations. The total approximately 45 acre site of WRL is roughly divided into three areas with only "Area 1" being currently active. [2] [Footnote 2: See attached Figure 2 (See hard copy of Comment FLEP-00182 for Attachments)] Areas 2 and 3 of the landfill have been previously closed and are currently being utilized primarily as

recreation facilities and parking lots, respectively. From the inception of WRL, until 1991 it was common practice for Kodak to dispose of spent fluorescent lamps in the landfill. Because of the photographic activity of mercury, these lamps were collected as a separate waste stream at Kodak Park. They were generally placed in the landfill in their original corrugated cardboard packing containers which were subsequently crushed by the weight of the succeeding layers and landfill cover. While there is no exact data on the total number of fluorescent lamps placed in the landfill in the early years, we have conservatively estimated that there are between 3 and 4 million of them in the landfill. We have estimated that the equivalent of 124,000 four-foot fluorescent lamps were placed in the landfill in 1991 alone. As part of the monitoring program for WRL, Kodak has done extensive sampling and analysis of groundwater in the vicinity of the landfill. Hydrogeological studies have shown that the groundwater at the landfill is flowing toward the north and northwest. A series of monitoring wells have been installed both upgradient and downgradient of WRL. [3] [Footnote 3: Well locations are noted on the attached Figure 2 (See hard copy of Comment FLEP-00182 for Attachments)] During 1992 and 1993, six rounds of sampling from the monitoring wells were done with most of the samples analyzed for volatiles, semivolatiles, and total metals, including mercury. Complete metal analysis data is provided as Appendix 1 to these comments. The mercury determinations were done by the aggressive technique of Cold Vapor/Flame Atomic Absorption Analysis. Despite the known presence of a large number of mercury-containing lamps in the landfill, none of the mercury determinations in this extensive data set exceed the New York State groundwater standards or the federal maximum contaminant level (MCL) for mercury in drinking water (0.002 mg/L). In many determinations mercury was not found to be present above the detection limit of the sophisticated analytical technique used for these analyses. In the cases where it was found to be present, the extremely low levels were detected in both the upgradient and downgradient wells. Kodak believes that this data provides an accurate picture of leaching to groundwater from this landfill. To the extent that it is similar to many other landfills around the country, the disposal of mercury-containing lamps does not appear to pose a significant threat to human health or the environment. As

previously noted, Kodak has discontinued placement of fluorescent tubes in the WRL, and would not be disposing of them in this facility even if they are exempted from hazardous waste management under the current proposal. However, we believe that this data supports that which has been cited by the Agency suggesting that mercury is less mobile in landfills than previously thought, and that it may not leach from landfills above the drinking water MCL.

RESPONSE

The Agency appreciates the commenter's submission of data on mercury concentrations at a landfill containing large amounts of spent fluorescent lamps. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. The Agency published a Notice of Data Availability on July 11, 1997 (62 FR 37183). This notice presented data collected by the Agency and an assessment of potential mercury emissions from the management of hazardous waste-containing lamps under several regulatory approaches.

The Agency believes that management controls under RCRA are needed to minimize the release of mercury from lamps into the environment. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule is less stringent than full Subtitle C management standards).

DCN FLEP-00182

COMMENTER Eastman Kodak Company

SUBJECT DATA1

COMMENT The conditional exclusion is the regulatory option which is most commensurate with the risk to the environment posed by these devices. Mercury-containing lamps do not "pose a substantial present or potential hazard to human health or the environment"

[4] [Footnote 4: RCRA Section 1004(5)] even when improperly disposed. As noted in the data provided by the Agency, and supported by Kodaks experience described above, the mercury from electric lamps is not leaching out of even unsophisticated landfills at a significant rate. This containment will be assured even more by the requirement of the conditional exclusion to recycle them or to dispose than only in well-engineered municipal solid waste (MSW) landfills.

RESPONSE

The EPA emphasizes its belief that management controls under RCRA are needed to minimize the release of mercury from lamps into the environment. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. For these reasons, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet most of the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

DCN FLEP-00186

COMMENTS Building Owners or Managers Assn. Int.

SUBJECT DATA1

COMMENT OPTION 1: CONDITIONAL EXCLUSION According to the National Electrical Manufacturers Association (NEMA), lighting products are estimated to account for only .2% of the total mercury released to the environment. By other studies which EPA cited in this proposed rulemaking, the extremely low level of mercury from lamps that leaches into the environment clearly warrants a lessening of the regulatory requirements for lamp disposal.

RESPONSE

The Agency appreciates the comments submitted by the commenter on the proposed rule. The Agency notes that it does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of

mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. The Agency published a Notice of Data Availability on July 11, 1997 (62 FR 37183). This notice presented data collected by the Agency and an assessment of potential mercury emissions from the management of hazardous waste-containing lamps under several regulatory approaches.

The Agency believes that management controls under RCRA are needed to minimize the release of mercury from lamps into the environment. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release. Therefore, today's rule adds hazardous waste lamps to the universal waste rule. This rule allows the Agency to set specific management standards to minimize potential emissions but also to reduce other regulatory burdens of the hazardous waste program.

Regarding the disposal of hazardous waste lamps, today's rule specifies that universal waste destination facilities (i.e., facilities that treat, dispose, or recycle universal waste) are subject to all applicable Subtitle C requirements for hazardous waste treatment, storage, and disposal facilities and must receive a RCRA permit for such activities.

DCN FLEP-00189

COMMENTS National Aeronautics and Space Admin.

SUBJECT DATA1

COMMENT There is insufficient data regarding the concentration of mercury in landfill leachate and gas. Leachate is not routinely tested for mercury and gas is rarely tested at all. Existing data suggests that the mercury content of leachate currently average 0.002 mg/L. That number is approximately 170 times EPA's surface water standard and 1000 times the level causing problems in many lakes. There will also be a significant release to the environment before reaching any landfill from broken lamps being discarded with normal refuse.

RESPONSE

The Agency appreciates the commenter's submission of data addressing issues pertaining to mercury-containing lamp management and agrees that significant potential exists for mercury emissions during storage and transport of hazardous waste lamps. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest

that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. For these reasons, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

DCN FLEP-00191

COMMENTER Utility Solid Waste Activities Group

SUBJECT DATA1

COMMENT b. Tetra Tech Groundwater Modeling Results Confirm EPA

Findings In addition to the overwhelming and existing record evidence, USWAG has generated supplemental technical data that further confirms that the management of mercury-containing lamps in MSWLFs is fully protective of human health and the environment. Attached to these comments is a report prepared by Tetra Tech, Inc., entitled "Information on Fate of Mercury from Mercury-Containing Lamps Disposed in Landfills" (the "Tetra Tech Report" or "Report") (Attachment B) [See hard copy of Comment FLEP-00191 for Attachments]. The objectives of the Report were to (1) compile available data on emissions from mercury-containing lamps, (2) generate additional data regarding air emissions from broken lamps, and (3) conduct air and groundwater modeling to assess potential environmental impacts from the disposal of mercury-containing lamps in MSWLFs. Report at 1. The Report's modeling of groundwater impacts was based on existing TCLP results for mercury-containing lamps and MYGRT, a two-dimensional solute transport model for groundwater. Report at 20. The characteristics for MSWLFs used in the modeling were based on an EPA report characterizing MSWLFs in the United States (EPA Report EPA/530-SW-90-042). *Id.* The modeling results reaffirmed EPA's findings that the management of mercury-containing lamps in MSWLFs is protective of human health and the environment. In short, the Tetra Tech Report found that the predicted concentrations of mercury at downgradient drinking water wells located at a distance of 150 meters from the MSWLF,

the regulatory compliance point for purposes of the TC, under all scenarios were far below the mercury MCL of 0.002 mg/L. Report at 27. This result included modeling from scenarios involving both silty and sandy aquifers. Id. at 28 (Table 4-2). The Report found that the arrival time for the maximum concentrations of mercury at the receptor well "are longer than 40,000 years for the sandy formation and longer than 1 million years for the silty formation." Id. The Report explains that these lengthy travel times are consistent with the behavior of mercury in the natural environment, where ionic mercury is known to strongly sorb to soil. Id. The Report's conclusions are fully consistent with other literature data regarding the fate of mercury in MSWLFs, including recent leachate monitoring tests from landfills in Minnesota and EPA's evaluation of mercury contamination at over 90 Superfund sites, where groundwater concentrations of mercury in all cases were less than the MCL for mercury of 0.002 mg/L.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule represents a significant cost reduction over Subtitle C management requirements for generators, collectors, and transporters, yet ensures that lamps are recycled or disposed of in an environmentally protective manner at Subtitle C hazardous waste facilities.

DCN FLEP-00201
COMMENTS WMX Technologies, Inc.
SUBJECT DATA1

COMMENT The quantity of lamps assumed to be disposed in landfills each year (250 million pounds) is relatively insignificant in comparison to the 1 million tons of household hazardous waste and the 180 million tons of municipal waste landfilled each year. U.S. EPA studies have demonstrated that landfilling mercury-containing lamps presents little risk to human health or the environment. Available information indicates that mercury does not leach or otherwise escape from municipal landfills that meet Subtitle D standards.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

DCN FLEP-00218

COMMENTS Louisiana Dept. of Environmental Quality

SUBJECT DATA1

COMMENT 7. On the subject of EPA's source inventory: EPA's estimates of fossil fuel contributions to US mercury emissions seem to be based solely on coal combustion. Other sources, possibly significant ones, have come to our attention during the remediations at production sites and gas pipelines. Most of the mercury we have encountered during site remediations in

Louisiana consists of elemental mercury spilled from flow metering equipment, but operators in Louisiana and elsewhere have seen indications that oil and natural gas carry elemental mercury in concentrations large enough to create corrosion problems and to deposit visible quantities at certain locations in the production train. One report estimates, on the basis of measurements of Sumatran wells, that Southeast Asian gas wells produce 200,000 kilograms of mercury per year. North American natural gas contains some of the lowest mercury concentrations reported, some three to four orders of magnitude below Sumatran concentrations. But these estimates are more than fifteen years old, and drillers are now producing from much deeper deposits. (One report suggests that deeper wells tend to yield more mercury.) See "Considerations for Mercury, in LNG Operations", W. W. Bodle and R. Serauskas; IGT, Proceedings of the 6th International Conference on Liquefied Natural Gas; Kyoto, Japan; April 1980.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues related to mercury emissions. The Agency considered other additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

DCN FLEP-00256

COMMENTS Ford Motor Company

SUBJECT DATA1

COMMENT Mercury in Landfill Leachate The Agency has requested data on leachate from industrial landfills. Attachment 3 contains a summary of 1993 data from the analysis of leachate from two landfills operated in the early 1970s, which received both municipal and industrial wastes.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues

pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN FLEP-00262

COMMENTS OG&E Electric Services

SUBJECT DATA1

COMMENT Further, Agency studies have indicated that the impact of mercury found in municipal solid waste landfill leachate on groundwater is negligible and that no significant human exposure to mercury is likely to result from leachate contamination of groundwater resources (See "Management of Used Fluorescent Lamps: Preliminary Risk Assessment", Research Triangle Park, Docket No. FLEP-SO019). Finally, a Swiss study of landfill gas from four municipal solid waste landfills, which the Agency considers comparable to those found in the United States, has indicated that the estimated amount of mercury from mercury-containing lamps annually released in landfill gas is less than 0.00001 percent of the total municipal solid waste mercury input entering the landfills. For illustrative purposes, the Agency has stated that the estimated amount of mercury from mercury-containing lamps emitted by landfills is very small (0.00003 million metric tons (Mg)), when compared to the mercury from lamps that is emitted by municipal waste combustors (3.0 Mg) (See 59 FR 38292, July 27, 1994).

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that

landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,¹⁰ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices). It also discusses inputs for estimating the energy savings from using high-efficiency T8 lamps, and the effects on mercury emissions from electric utilities.

DCN FLEP-00272

COMMENTS Detroit Edison Company

SUBJECT DATA1

COMMENTS Regarding groundwater impacts of disposal of waste mercury containing lights, the EPA concludes, "preliminary data and analysis suggest at this time that mercury in municipal solid wastes is not being readily released by leaching processes that typically occur in the MSW landfill environment. This indication is also supported by controlled leaching studies of high-concentration mercury-containing wastes co-disposed with municipal waste." (59 Fed Reg at 38291) This conclusion is supported by data provided by USWAG (see Tetra Tech Report entitled "Information on Fate of Mercury from Mercury-Containing Lamps Disposed in Landfills"). It is generally understood that until very recently, almost all mercury containing lamps have been disposed of in municipal waste landfills. Regarding air emissions from disposal of waste mercury-containing lamps, again the EPA's own record demonstrates that mercury landfill gas emissions attributable to the disposal of mercury-containing bulbs is exceedingly small when compared to other sources (see 59 Fed. Reg. at 38292). Again, the USWAG Tetra Tech Report provides significant support to this conclusion and includes data on the lack of significance of releases from the breakage of bulbs in the process of disposal in a municipal waste landfill.

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. EPA is particularly concerned about potential emissions during storage and transport and thus is setting specific management standards to control potential emissions.

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule represents a significant cost reduction over Subtitle C management requirements for generators, collectors, and transporters, yet ensures that lamps are recycled or disposed of in an environmentally protective manner at Subtitle C hazardous waste facilities. It is the Agency's belief that the universal waste rule will help minimize releases of mercury to the environment from hazardous waste lamps.

DCN FLEP-00301

COMMENTS Minnesota Pollution Control Agency/MOEA

SUBJECT DATA1

COMMENT 9. Mercury Contamination is a National Environmental Problem. Mercury levels have more than tripled since the Industrial Revolution. Mercury levels are increasing at a rate of about 1.5 to 1.7 percent per year. Up to 75 percent of the mercury now cycling in the environment is due to pollution. Mercury products as a category may rival the emissions from the

burning of fossil fuels. There are over 1500 lakes in 38 states with fish consumption advisories. Loons, eagles, otters, and mink consume large quantities of fish. Because mercury is a persistent and bioaccumulative neurotoxin, it is a particularly insidious toxin for predators, who rely on speed and coordination to obtain food. As mercury contamination increases, economic impacts will be realized by the commercial fishing and tourism industries. The MPCA believes that the environmental threat posed by mercury's toxicity is second only to dioxin.

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule represents a significant cost reduction over Subtitle C management requirements for generators, collectors, and transporters, yet ensures that lamps are recycled or disposed of in an environmentally protective manner at Subtitle C hazardous waste facilities. It is the Agency's belief that the universal waste rule will help minimize releases of mercury to the environment from hazardous waste lamps.

DCN FLEP-00301

COMMENTS Minnesota Pollution Control Agency/MOEA

SUBJECT DATA1

COMMENT B. Landfill Leachate. We also have concerns about mercury in landfill leachate. EPA acknowledges that it has very little data on the actual behavior of mercury in landfills and requests any data that may be available. In the proposal, EPA states that it has collected landfill leachate data that indicates mercury may not leach. [Note 16: "Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics." EPA/530-SVV86038. U.S. EPA.

Office of Solid Waste. Washington, DC. (U.S. EPA 1988.)] A leachate study published in 1988 and based on 1986 and older data is obsolete today. Analytical methods were not as accurate. testing for mercury was usually a random event and not part of a systematic analysis program, and few landfills had the type of leachate collection and management practices that are commonplace today. Throughout the proposal EPA states that mercury is retained or immobilized in solid waste landfills, based largely on computer models and out-dated, isolated, and incomplete studies. EPA also argues that mercury in lamps will remain in the landfill and will not move into leachate in any meaningful quantity. In contradiction to this, the Risk Assessment for the proposal concludes that the mercury may be present in lamps in a soluble form. [Note 17: U.S. EPA 1993.a. Pg. 72.] Also, it is generally believed that the anoxic environment of landfills produces hydrogen sulfide, which precipitates metals including mercury, effectively immobilizing them. This argument may be correct for most heavy metals, but mercury behaves differently in two important ways. First, the bacteria that produce hydrogen sulfide are also the same bacteria that methylate mercury, which is not precipitated efficiently by the sulfide. Second, although one might expect sulfide to precipitate inorganic mercury to form HgS (cinnabar), four MIT scientists have recently shown that instead a poly-sulfide species forms that is water-soluble. [Note 18: Zemacli, J., R. Nlasoii, L. Roberts, and Morel. "The Solubility of Mercury in the Presence of Reduced Sulfur Compounds." Presented at the International Conference on Mercury as a Global Pollutant. Whistler, British Columbia, 1994. (Enclosure 13.) (See hard copy of Comment FLEP-00301 for attachments.)] Based on extremely limited testing, EPA acknowledges that 7 percent of the leachate samples tested had mercury present over the drinking water standard of 0.002 mg/L. This is a significant finding and additional testing across all segments of the nation's solid waste landfill system would reveal a higher concerns Also, according to EPA, the mercury content of landfill leachate averages 0.0008 mg/L. These concentrations sound very low until one realizes that 0.002 mg/L is 2000 nanograms/liter (ng/L), about 170 times more than EPA's own surface water standard [Note 14:U.S. EPA 1993a. Page 49.] (300 times higher than Minnesota's surface water standard), or a thousand times

higher than the concentration (1 to 2 ng/L) that presently causes problems in many lakes. [Note 4:"Strategies for Reducing Mercury in Minnesota." MPCA Mercury Task Force. Minnesota Pollution Control Agency. St. Paul, Minnesota. 1994. (Enclosure 6.)(See hard copy of Comment FLEP-00301 for attachments.)] Mercury that volatilizes from the landfill or the leachate will contribute to the regional burden of atmospheric mercury that contaminates wilderness takes, far away from the source. As noted earlier, total releases of mercury to the environment must be minimized. While the concentration of mercury in leachate from individual landfills is at levels of concern, we are also concerned with the mass of mercury emissions to the environment. Because mercury has a long atmospheric residence time and can be revolatilized even after deposition, the cumulative mass of mercury emissions needs to be minimized. Therefore, while some argue that annual mercury emissions from individual landfills are insignificant, the true impact must be measured based on the cumulative emissions over time, including long after landfill closure.

RESPONSE

The Agency appreciates the commenter's submission of additional data pertaining to mercury-containing lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency acknowledged that it does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes and is therefore adding hazardous waste lamps

to the universal waste rule. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release. The deposition of atmospheric mercury into surface waters, its presence in runoff from soil, or the recycling of mercury from sediment into the water column can result in the accumulation of the metal in many animal species, particularly aquatic organisms. Examples of mercury-related risks include neurotoxicological problems and developmental effects in fetus and adults (e.g., Mad Hatter's disease), and accumulation of the metal in many animal species, particularly aquatic organisms. For example, fish with high levels of mercury in their tissues have exhibited increased mortality, reduced reproductive success, impaired growth, and behavioral abnormalities.

Simultaneously with the effort to modify the management of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

DCN FLEP-00301

COMMENTS Minnesota Pollution Control Agency/MOEA

SUBJECT DATA1

COMMENT C. Leachate Treated at Wastewater Treatment Facilities. In

Minnesota, mercury levels in leachate are already the limiting factor for treating collected leachate at wastewater treatment facilities. Minnesota's experience has shown that leachate disposal at wastewater treatment plants often causes these plants to exceed mercury discharge standards. At this time, most landfill leachate generated in Minnesota is treated at the Twin Cities Metro Wastewater Treatment Facility. This facility's effluent limits will be reduced in 1996 and it has notified all of its leachate customers that it will likely not accept landfill leachate after that time, even with pretreatment.

Wastewater treatment facilities are subject to strict federal

mercury effluent limits and may be subject to more stringent state and local limits. A small percentage of influent mercury evaporates in wastewater treatment. This percentage depends on the specific facility's design and operation. Approximately 85 percent of mercury influent to wastewater treatment facilities is captured in the sludge. If the sludge is incinerated, 100 percent of the mercury is released to the environment immediately. If the sludge is land applied, the release is slower but nearly as complete; soils retain only about 2 percent of the mercury deposited on them over the long term. [Note 4:"Strategies for Reducing Mercury in Minnesota." MPCA Mercury Task Force. Minnesota Pollution Control Agency. St. Paul, Minnesota. 1994. (Enclosure 6.); Note 19:Engstrom, D.R.,E.B. SA.,aiii. T.A. Heiiiiiii,, M.E. Brigham, and P.L. Brezollik. "Atmospheric Mercury Deposition to Lakes and Watersheds: A Quantitative Reconstruction from Multiple Sediment Cores. In Environmental Chemistry of Lakes and Reservoirs, L.A. Baker, Editor. American Chemical Society. Advances in Chenisay Series. 1994. (Enclosure 14.) (See hard copy of Comment FLEP-00301 for attachments.)] Proposed surface water standards for mercury are being developed for the Great Lakes Basin as part of the Great Lakes Water Quality Initiative. These surface water standards will drive even more stringent effluent standards for wastewater treatment facilities in the Great Lakes Basin. In landfills without leachate collection systems, mercury can make its way directly into the groundwater. As discussed above. mercury levels in landfill leachate have been documented to exceed the MCL/RAL of 0.002 mg/L. Even levels below the MCL/RAL greatly exceed the federal ambient water quality standard of 12 ng/L that is designed to protect against bioaccumulation in aquatic systems. In Minnesota, solid waste facilities have an Intervention Limit of one-fourth of the MCL/RAL, or 0.0005 mg/L.

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury sludges and in landfills. In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps because the Agency does not believe it would be sufficiently protective of human health and the environment. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments

document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes.

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule represents a significant cost reduction over Subtitle C management requirements for generators, collectors, and transporters, yet ensures that lamps are recycled or treated in an environmentally protective manner at Subtitle C hazardous waste facilities. Fewer hazardous waste lamps will be managed in the municipal solid waste stream, therefore reducing the number of lamps going to municipal combustors and landfills and decreasing the potential for lamps to be crushed and/or broken in uncontrolled environments during storage and transport (e.g., dumpsters and garbage trucks).

DCN FLEP-00301

COMMENTER Minnesota Pollution Control Agency/MOEA

SUBJECT DATA1

COMMENT As noted above, solid waste landfills are biological systems and generate methyl mercury. Limited analyses in Minnesota show high concentrations of methyl mercury in condensate from one landfill's gas collection system. Testing at additional landfills may provide similar results. We also reviewed landfill gas studies for information, on mercury. Analytical methods described in these studies commonly relied on boiling prior to analysis, hence evaluation for mercury was not possible with such methods. We found one study [Note 21: "Trace Chemical Characterization of Pollutants Occurring in the Production of Landfill Gas from the Shoreline Regional Park Sanitary Landfill, Mountain View, California." Science Applications, Inc. Prepared for Pacific Gas and Electric and U.S. Department of Energy. USDOE Grant 9DE-FGOI-79CS20291. April 1981.] dating from 1981 that documented the presence of mercury in landfill gas. Landfill gas concentrations of mercury were measured at several places in the gas extraction and purification system. The raw landfill gas contained 0.24 micrograms per cubic meter and daily mercury emissions were estimated to be 1.1 gram. Mercury concentration in the landfill gas condensate was 0.00069 mg/l. It is likely that this study measured only elemental mercury. Other mercury compounds are known to be present in gas and gas condensate. While these levels are low, they are nonetheless noteworthy. They are consistent with other reported values, and

were found years before there was general concern or interest in mercury in solid waste and solid waste facility emissions. Proceedings from a 1985 landfill gas conference [Footnote 22:"Proceedings from the GRCDA 8th International Landfill Gas Symposium." GRCDA. Silver Spring, MD. April 1985. Publication #GLFG-12.] also mention mercury. Rettenberger ("Trace Compounds in Landfill Gas-Consequences for Gas Utilization") observes that mercury is a trace compound of concern and provides a graph of maximum metal concentration in landfill gas vs. temperature. Landfill gas at 10 degrees Celsius may contain 10 milligrams per cubic meter of mercury. Rettenberger notes that actual landfill gas data for metals are not available. Young and Heasman ("An Assessment of the Odor and Toxicity of the Trace Components of Landfill Gas") observed mercury in landfill gas at a maximum concentration of 1.2 micrograms per cubic meter. No additional data is provided in this article. To our knowledge, no one has undertaken an independent and comprehensive study of total mercury emissions (leachate, gas, gas condensate) from landfills that account to climatological factors.

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Therefore, EPA is adding hazardous waste lamps to the universal waste rule in 40 CFR Part 273. In addition, the Agency notes that it has finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLFs) and emission guidelines for existing MSWLFs (61 FR 9905; March 12, 1996). The EPA is planning to propose rulemakings addressing air emissions from industrial and commercial waste incinerators and boilers and additional controls for MSWLFs in the near future.

DCN FLEP-L0001

COMMENTS Environmental Technology Council

SUBJECT DATA1

COMMENT C. Fluorescent Lamps Are a Growing Contributor to the Mercury Environmental and Public Health Problem At those few landfills at which large volumes of fluorescent lamps have been disposed,

direct impacts may be apparent. For example, at the Rock Dump site in Milton, New York, mercury in wetlands at the site exceeded EPA surface water standards by factors ranging from several hundred to 2000, and there was extensive contamination of soil, according to the New York Department of Environmental Conservation. [16] [Footnote 16: Letter from Ward B. Stone, New York Department of Environmental Conservation, to Ms. Helen Goldberger, New York Department of Justice, July 10, 1992, p. 2 (attached) (See hard copy of Comment FLEP-L0001 for attachment).] Further, the volume of mercury that will enter the environment from fluorescent lamps is a growing component of the mercury environmental and public health problem. It is estimated that the volume of mercury entering the municipal solid waste stream from fluorescent lamps will increase by more than fifty percent from 1989 to the year 2000. [17] [Footnote 17: Risk Assessment, p. 78.] Moreover, as mercury in batteries is being reduced by the battery manufacturers, mercury from fluorescent lamps will become a much larger proportion of the mercury in the municipal solid waste stream reaching twenty three percent of the total volume by the year 2000. [18] [Footnote 18: Ibid.]

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency notes that it does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. For these reasons, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

Regarding the disposal of hazardous waste lamps, today's rule specifies that universal waste destination facilities (i.e., facilities that treat, dispose, or recycle universal waste) are subject to all applicable Subtitle C requirements for hazardous waste treatment, storage, and disposal facilities and must receive a RCRA permit for such activities.

DCN SCSP-00040

COMMENTER University of Nevada-Reno

SUBJECT DATA1

COMMENT Phone conversations have indicated that 7 out of 13 fluorescent lamps tested by the National Electric Manufacturers Association failed the TCLP for mercury.

RESPONSE

The Agency appreciates the information on lamp toxicity referenced by the commenter. EPA studies have also determined that the majority of spent lamps fail the TCLP for mercury and, in addition, that some spent lamps fail the TCLP for lead. For this reason, spent lamps that exhibit any hazardous waste characteristic are subject to today's final rule. The final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The Agency has determined that hazardous waste lamps meet the criteria established for designating a material as universal waste. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule standards are less stringent than full Subtitle C management standards).

DCN FLEP-L0001

COMMENTER Environmental Technology Council

SUBJECT DATA1

COMMENT Accordingly, a more relevant measure of the hazardous nature of mercury would be the EPA surface water quality standards, which were established by EPA to protect against bioaccumulation of toxic compounds in surface waters. This standard is 12 nanograms/liter, rather than the 0.2 milligrams/liter level of the TCLP. By this water quality standard, mercury-containing fluorescent lamps that fail the TC pose an even greater hazard to human health and the environment than is implied by the TCLP standard.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to mercury-containing lamp management. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. Although most mercury emissions are associated with combustion, all releases contribute to the mercury reservoirs in land, water and air. In addition, mercury has been shown to be transported in the atmosphere many miles from the source of its release.

DCN SCSP-00186

COMMENTS Nine West Technologies, Inc.

SUBJECT DATA1

COMMENTS Some have argued that there is minimal evidence of mercury emanating from landfills. But recent work (submitted to IES 1993) of Sam Cleary and Robert Berman of the Lawrence Berkeley Laboratories has indicated that mercury can be detected above the surface of landfills. Tests carried out in Florida also indicate that landfills may be a significant source of airborne mercury. Berman and Cleary indicate that recycling is the one method which has potential to keep mercury out of the biocycle.

RESPONSE

The Agency appreciates the commenter's submission of data pertaining to mercury emissions from landfill units. The Agency notes that it has finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLFs) and emission guidelines for existing MSWLFs (61 FR 9905; March 12, 1996). The EPA is also planning to propose rulemakings addressing air emissions from industrial and commercial waste incinerators and boilers and additional controls for MSWLFs.

The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods, although available data from shorter-term studies suggest that mercury can and has been released to groundwater and air. (For a more complete discussion of mercury releases from landfills and fate and transport in groundwater, see the Toxicity Section of this Response to Comments document.) Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded that some management controls are essential for these wastes. While EPA is not requiring handlers of hazardous waste lamps recycle their lamps, the Agency does believe that the universal waste program can encourage recycling by increasing collection and access to large quantities of universal waste.

DCN SCSP-00211

COMMENTS Minnesota Pollution Control Agency

SUBJECT DATA1

COMMENTS At present, instate sources of atmospheric mercury emissions are many. Enclosure 3 is MPCA staff's current list of instate sources of mercury emissions and a current estimate of the relative contribution of mercury emissions from each source. [See hard copy of comment SCSP-00211 for enclosures.]

RESPONSE

The Agency appreciates the commenter's submission of additional data pertaining to mercury emission sources. The EPA notes that, simultaneously with the effort to modify the management

of hazardous waste lamps, the Agency has been actively pursuing regulation of mercury air emissions from a wide variety of other sources. On December 19, 1995, EPA issued a final rule limiting emissions of mercury and other pollutants from large municipal waste combustors (60 FR 65387). Subsequently, on September 15, 1997, EPA issued a final rule setting emission limits for mercury (and other pollutants) for medical waste incinerators (62 FR 48348) (remanded for further explanation, *Sierra Club v. EPA*, 167 F.3d 658 (D.C. Cir. 1999)). In addition, the Agency finalized a rule that sets performance standards for new municipal solid waste landfills (MSWLF) and emission guidelines for existing MSWLF (61 FR 9905; March 12, 1996)). Lastly, on April 19, 1996, the Agency proposed a rule that would limit emissions of various air pollutants including mercury from hazardous waste incinerators, cement kilns, and lightweight aggregate kilns (61 FR 17358, finalized in part, 63 FR 33782 (June 19, 1998)). In the future, EPA is planning to propose two rules to address (1) air emissions from industrial and commercial waste incinerators that burn non-hazardous waste, and (2) boilers that burn hazardous waste.

The Agency also notes that the *Mercury Study Report to Congress* (EPA-452/R-97-003) was released in December, 1997. The report, prepared by the EPA, examines many of the health effects resulting from mercury exposure.