United States Environmental Protection Agency
Office of Solid Waste Washington, D.C. 20460
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Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)

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List of Exhibits

List of Abbreviations and Acronyms

ANPRM	Advanced Notice of Proposed Rulemaking
BDAT	Best Demonstrated Available Technology
BIF	Boiler and Industrial Furnace
BRS	Biennial Reporting System
BTU	British Thermal Unit
CAMU	Corrective Action Management Unit
CBI	Confidential Business Information
CFR	Code of Federal Regulations
CKRC	Cement Kiln Recycling Coalition
CMBST	Combustion treatment standard (40 CFR 268.42)
CWA	Clean Water Act
EDC	Ethylene dichloride
EDF	Environmental Defense Fund
EPA	U.S. Environmental Protection Agency
ETC	Environmental Technology Council
FR	Federal Register
HSWA	Hazardous and Solid Waste Amendments of 1984
HWIR	Hazardous Waste Identification Rule
HWTC	Hazardous Waste Treatment Council
LDRs	Land Disposal Restrictions
MACT	Maximum Achievable Control Technology
MTRs	Minimum Technological Requirements
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standard
OCDD	1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin
OCDF	1,2,3,4,6,7,8,9- Octachlorodibenzofuran
POTW	Publically Owned Treatment Works
PVC	Polyvinyl chloride
RCRA	Resource Conservation and Recovery Act of 1976
RCRIS	Resource Conservation and Recovery Act Information System
RMERC	Mercury retorting treatment standard (40 CFR 268.42)
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
tons	Short tons (2,000 pounds)
TSDR	Treatment, storage, disposal, and recycling
TU	Temporary Unit
UTS	Universal treatment standard
VCM	Vinyl chloride monomer

1. INTRODUCTION

This document presents the capacity analysis that the U.S. Environmental Protection Agency (EPA) conducted to support the land disposal restrictions (LDRs) for newly-listed chlorinated aliphatics production wastes. EPA is listing as hazardous two wastes from chlorinated aliphatics production, and is concurrently setting LDR treatment standards for these wastes. EPA conducts capacity analyses for all newly identified hazardous wastes to evaluate the need for national capacity variances from the land disposal prohibitions.[1] The capacity analysis provides estimates of the quantities of wastes that will require alternative commercial treatment prior to land disposal as a result of the LDRs, and estimates alternative commercial treatment capacity available to manage wastes restricted from land disposal. The verbatim capacity-related public comments on the proposed rule and the detailed response to those comments are provided in *Response to Public Comments; Final Listing Determination for Chlorinated Aliphatics Industry Wastes* in the docket for today's rule. Excerpts from this document are included as Appendix G; Appendix G is limited to comments and responses relevant to the capacity analysis such as modifications to the UTS and F039 treatment standards, the appropriateness of treatment standards for one waste (K175), and requests for a national capacity variance of a waste proposed for listing (K173).

This background document, which presents the capacity analyses conducted for the promulgation of LDR standards for newly-listed chlorinated aliphatics production wastes (K174 and K175), is organized into four sections as described below:

- **Section 1: Introduction.** Provides background, general methodology, and a summary of the analysis.

- **Section 2: Available Treatment Capacity.** Describes the detailed methodology and data used to assess available commercial capacity for hazardous waste treatment applicable to these wastes.

- **Section 3: Required Capacity for Newly Listed Chlorinated Aliphatics Production Wastes.** Describes the detailed methodology and data used to assess required treatment capacity for newly listed chlorinated aliphatics production wastes.

- **Section 4: Capacity Analysis Results.** Describes the results of the capacity analysis by comparing available treatment capacity (Section 2) with required treatment capacity (Section 3).

[1] The LDRs are effective when promulgated unless the Administrator grants a national capacity variance from the otherwise applicable date and establishes a different date (not to exceed two years beyond the statutory deadline) based on "…the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment will be available" (RCRA Section 3004(h)(2)).

1.1 LEGAL BACKGROUND

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, set priorities for hazardous waste management. Land disposal, which had been the most widely used method for managing hazardous waste, is now the least preferred option.[2] Under HSWA, EPA must promulgate regulations restricting the land disposal of hazardous wastes according to a strict statutory schedule. As of the effective date of each regulation, land disposal of wastes covered by that regulation is prohibited unless (1) the waste meets the treatment standards that have been established, or (2) it can be demonstrated that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous.

Under the LDR program, EPA must identify levels or methods of treatment that substantially reduce the toxicity of a waste or the likelihood of migration of hazardous constituents from the waste [RCRA §3004(m)]. Whenever possible, EPA prefers to define treatment in terms of performance (i.e., maximum acceptable concentrations of hazardous constituents in the treated waste or residuals), rather than in terms of specific treatment methods, and thus provide the regulated community with flexibility in complying with the LDRs. EPA's standards are generally based on the performance of the best demonstrated available technology (BDAT) for that waste, as documented by treatment data collected at well-designed and well-operated systems using that technology, or are based on data derived from the treatment of similar wastes that are as difficult or more difficult to treat. For the newly-listed chlorinated aliphatics production wastes, numerical treatment standards are being finalized with an alternative technology-specific treatment standard for one waste. Additional information regarding the development of treatment standards is found in EPA's Best Demonstrated Available Technology (BDAT) Background Document for Chlorinated Aliphatics Production Wastes – K174 and K175, August 2000.

When finalized, the LDRs are effective on the same date that the hazardous waste listing determinations become effective (typically six months from publication in the Federal Register), unless EPA grants a national capacity variance from the statutory date because of a lack of available treatment capacity [see RCRA Section 3004(h)(2)]. For every waste, EPA considers) on a national basis) both the capacity of commercially available treatment technologies and the quantity of restricted wastes currently sent to land disposal for which onsite treatment capacity is not available. If EPA expects that adequate alternative commercial treatment capacity is available for a particular waste, the land disposal restrictions are effective when the new hazardous waste listings become effective. If not, EPA establishes an alternative effective date based on the earliest date on which adequate treatment capacity will be available or two years, whichever is less. Once the variance expires, the wastes must meet the LDR treatment standards prior to being land disposed.

[2] RCRA defines land disposal "to include, but not be limited to, any placement of such hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave" (RCRA Section 3004(k)).

RCRA also allows generators to apply for extensions to the LDRs on a case-by-case basis for specific wastes generated at a specific facility for which there is not adequate capacity [RCRA Section 3004(h)(3)]. EPA may grant case-by-case capacity variances to applicants who can demonstrate that: (1) no capacity currently exists anywhere in the U.S. to treat a specific waste, and (2) A binding contractual commitment is in place to construct or otherwise provide alternative capacity, but due to circumstances beyond the applicant's control, such alternative capacity cannot reasonably be made available by the effective date (40 CFR 268.5).[3]

HSWA's schedule divided hazardous wastes into three broad categories: solvent and dioxin wastes; California list wastes;[4] and "scheduled" wastes. Exhibit 1-1 summarizes the previous LDR and LDR-related rulemakings and their respective promulgation dates. EPA restricted surface disposed solvents and dioxins from land disposal on November 7, 1986 and deep well injected solvents and dioxins from land disposal on July 26, 1988. The final rule for California list wastes, which was issued on July 8, 1987, covers wastes originally listed by the State of California and fully adopted by HSWA. The "scheduled" wastes consist of all wastes that were identified or listed as hazardous prior to November 8, 1984 but were not included in the first two categories listed above. HSWA's statutory timetable required that EPA restrict one-third of these wastes by August 8, 1988, two-thirds by June 8, 1989, and the remaining third by May 8, 1990. For hazardous wastes that are newly identified or listed after November 8, 1984, EPA is required to promulgate land disposal prohibitions within six months of the date of identification or listing [RCRA Section 3004(g)(4)].

[3] RCRA also allows generators to petition for a variance from treatment standards if the waste cannot be treated to meet LDR standards due to its chemical or physical properties. These variances are known as treatability variances (40 CFR 268.44).

[4] The "California list" comprises the following classes of wastes: liquid hazardous wastes with a pH of less than or equal to 2.0 (acidic corrosive wastes); all liquid hazardous wastes containing free cyanides, various metals, and polychlorinated biphenyls (PCBs) exceeding statutory concentration levels; and all wastes (liquid, sludge, or solid) containing halogenated organic compounds (HOCs) in concentrations greater than or equal to specified statutory levels.

Exhibit 1-1. Summary of Land Disposal Restrictions and Related Rulemakings

Rulemaking	Federal Register Notice	Promulgation/ Proposal Date
Solvents and Dioxins (surface disposed)	51 *FR* 40572	November 7, 1986
Solvents and Dioxins (deep well injected)	53 *FR* 28188	July 26, 1988
California List (surface disposed)	52 *FR* 25760	July 8, 1987
California List (deep well injected)	53 *FR* 30908	July 26, 1988
First Third Rule	53 *FR* 31138	August 8, 1988
First Third Rule (deep well injected)	54 *FR* 25416	June 7, 1989
Second Third Rule	54 *FR* 26594	June 8, 1989
Third Third Rule	55 *FR* 22520	May 8, 1990
Newly Listed Wastes and Hazardous Debris (Phase I) Land Disposal Restrictions; Final Rule	57 *FR* 37194	August 18, 1992
Interim Final Rule for Vacated Treatment Standards	58 *FR* 29860	May 24, 1993
Land Disposal Restrictions Phase II - Universal Treatment Standards, and Treatment Standards for Organic Toxicity Characteristic Wastes and Newly Listed Wastes (Phase II); Final Rule	59 *FR* 47980	September 19, 1994
Land Disposal Restrictions Phase III - Decharacterized Wastewaters, Carbamate Wastes, and Spent Potliners; Final Rule	61 *FR* 15566, 15660	April 8, 1996
Emergency Revision of the Land Disposal Restrictions (LDR Phase III) Treatment Standards for Listed Hazardous Wastes from Carbamate Production; Final Rule	61 *FR* 43924	August 26, 1996
Emergency Extension of the K088 Capacity Variance (Phase III - Final Rule)	62 *FR* 1992, 62 *FR* 37693	January 14, 1997, July 14, 1997
Treatment Standards for Wood Preserving Wastes, Paperwork Reduction and Streamlining, Exemptions from RCRA for Certain Processed Materials, and Miscellaneous Hazardous Waste Provisions (Phase IV - Final Rule)	62 *FR* 25998	May 12, 1997
Clarification of Standards for Hazardous Waste Land Disposal Restriction Treatment Variances (Final Rule)	62 *FR* 64504	December 5, 1997
Organobromine Production Wastes; Identification and Listing of Hazardous Waste; Land Disposal Restrictions; et al.; Final Rule	63 *FR* 24596	May 4, 1998
Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters, Final Rule	63 *FR* 28556	May 26, 1998

Exhibit 1-1. Summary of Land Disposal Restrictions and Related Rulemakings		
Rulemaking	**Federal Register Notice**	**Promulgation/ Proposal Date**
Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Petroleum Refining Process Wastes; Land Disposal Restrictions for Newly Identified Wastes; et al.; Final Rule	63 *FR* 42110	August 6, 1998
Hazardous Remediation Waste Management Requirements (HWIR-Media); Final Rule	63 *FR* 65874	November 30, 1998
Hazardous Waste Management System; Identification and Listing of Hazardous Waste: Inorganic Chemical Manufacturing Wastes; Land Disposal Restrictions for Newly Identified Wastes; and CERCLA Hazardous Substance Designation and Reportable Quantities; Proposed Rule	65 *FR* 55684	September 14, 2000

1.2 CAPACITY ANALYSIS METHODOLOGY

In evaluating the need for national capacity variances, EPA estimates the quantities of waste requiring alternative commercial treatment as a result of the LDRs and the capacity available at commercial treatment facilities to manage the restricted wastes. By comparing the capacity demand with the available commercial capacity, EPA can identify capacity shortfalls and make determinations concerning national capacity variances. The first step in satisfying the goals of a capacity analysis is to make a "threshold" analysis, which dictates whether a national treatment capacity variance is needed for the two years following promulgation of a waste's LDR treatment standards or is not needed at all. Thus, EPA estimates the required and available commercial treatment capacity for all affected wastes and facilities, but often only to the extent needed to make this threshold analysis. For example, when upper-bound estimates of required capacity are well below lower-bound estimates of available capacity, then generally a variance is not needed and the analysis can stop. Similarly, when lower-bound estimates of required capacity far exceed the upper-bound estimates of available capacity, then often the two-year maximum capacity variance is needed. Results that are between two extremes generally require EPA to conduct further analyses.[5]

This section provides an overview of EPA's methodology in estimating required and available commercial treatment capacity.

[5] EPA also derived estimates of affected facilities and waste quantities for the regulatory impact analysis (RIA). However, the goals of a capacity analysis and an RIA are very different, which often results in reasonable differences in methodologies, data, and results. In contrast to the capacity analysis' focus on required and available capacity during the next two years and its initial focus on threshold determinations, the RIA concentrates on estimating specific potential significant (or dominant) long-term costs and benefits of the LDR treatment standards. Thus, the RIA does not conduct a threshold analysis of treatment capacity. Furthermore, the RIA evaluates affected facilities and wastes over a much longer time frame.

1.2.1 Analysis of Required Commercial Treatment Capacity

Required commercial treatment capacity represents the quantity of wastes currently being land disposed that cannot be treated on site and will consequently need commercial treatment to meet the LDR treatment standards. Required commercial capacity includes the residuals generated by treatment of these wastes (i.e., the quantity of generated residuals that will need treatment prior to land disposal).

EPA identifies the waste streams potentially affected by the LDRs by types of land disposal units, including surface impoundments, waste piles, land treatment units, landfills, underground injection wells, salt dome formations, salt bed formations, and underground mines and caves. Not all of these disposal methods are used for the K174 and K175 wastes; only those land disposal methods reported to be used for these chlorinated aliphatics production wastes (discussed in Section 3.3) are addressed in the capacity analysis.

To assess the type of alternative capacity required to treat the affected wastes, EPA conducts a "treatability analysis" for each waste stream. Based on the waste's physical and chemical form and information about prior management practices, EPA assigns the quantity of affected waste to an appropriate technology (i.e., a technology that can meet the treatment standards). For treatment standards as numerical standards, more than one technology may be applicable. For treatment standards as technology standards, only one technology is applicable. Mixtures of RCRA wastes (i.e., waste streams described by more than one waste code) can present special treatability concerns because they often contain constituents (e.g., organics and metals) requiring different types of treatment. To treat these wastes, EPA develops a treatment train that will effectively treat all waste types in the group (e.g., incineration followed by stabilization of the incinerator ash). In these cases, EPA estimates the amount of residuals that would be generated by treatment of the original quantity of waste and includes these residuals in the quantities requiring alternative treatment capacity.

EPA identifies the quantities of waste requiring alternative treatment on a facility level basis. If the appropriate treatment technology is not available on site, or if adequate available capacity is not present to manage the waste, then the appropriate quantity of waste requiring alternative treatment is aggregated into a national demand for commercial capacity. EPA excludes from the estimates of required commercial capacity those wastes that are managed in onsite treatment systems.

1.2.2 Analysis of Available Commercial Treatment Capacity

The analyses conducted to estimate available commercial treatment capacity focuses on treatment capacity projected to be available for the two years following the effective date of the final rule, starting from the baseline capacity identified from the most recent land disposal restrictions final rule. As shown in Exhibit 1-1, this was the rule finalizing listing determinations and land disposal restrictions for petroleum refining wastes (63 *FR* 42110, August 6, 1998).

Available treatment capacity can be analyzed by grouping facilities into four categories:

(1) commercial - capacity available at facilities that manage waste from any facility;
(2) onsite (private) - capacity available at facilities that manage only waste generated onsite;
(3) captive - capacity available at facilities that manage only waste from other facilities under the same ownership; and
(4) limited commercial - capacity available at facilities that manage waste from a limited number of facilities not under the same ownership.

For capacity analyses, estimates on available capacity reflect available commercial capacity. The determination of available capacity focuses on commercial facilities. Consequently, most estimates of capacity presented in this document represent commercially available capacity.

In order to make a determination whether to grant a national capacity variance for the wastes to be listed in today's rule, EPA analyzed available commercial capacity for alternative treatment technologies capable of meeting the LDR treatment standards. This analysis included estimating the maximum, or design capacity, for appropriate waste management systems, and estimating the amount of waste currently going to these systems (utilized capacity). Available capacity was estimated as the difference between the maximum and utilized capacity values. For today's final rule, EPA analyzed the commercial capacity of combustion (including incineration and reuse as fuel), mercury recovery, hazardous waste stabilization followed by landfilling, and wastewater treatment. These technologies were identified as capable of meeting LDR treatment standards for one or more of the wastes being listed as discussed in Section 2.

1.3 SUMMARY OF CAPACITY ANALYSIS FOR TODAY'S FINAL RULE

On August 25, 1999 (65 FR 46476), EPA proposed to list as hazardous, three wastes from the chlorinated aliphatics manufacturing industry. In today's final rule, EPA is promulgating a decision to list K174 and K175 wastes as hazardous:

- K174: Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the following conditions: (i) they are disposed of in a Subtitle C or non-hazardous landfill licensed or permitted by the state or federal government; (ii) they are not otherwise placed on the land prior to final disposal; and (iii) the generator maintains documentation demonstrating that the waste was either disposed of in an onsite landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in an offsite landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer or ethylene dichloride, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator

and the landfill owner/operator, invoices documenting delivery of waste to landfill, etc.) that the terms of the exclusion were met.

- K175: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.

Today's rule concurrently promulgates treatment standards for these wastes. A summary of the types of treatment standards being promulgated is as follows:

- Modification of UTS/F039: Numerical treatment standards for five octa- and hepta-dioxins and furans are being added to the UTS list (found at 40 CFR §268.48) and the F039 list (40 CFR §268.40).

- Wastewater and nonwastewater forms of K174: Numerical treatment standards are finalized for arsenic, and for forms of octa-, hepta-, hexa-, penta-, and tetra- dioxins and furans. Specifically, EPA is applying existing UTS to these hazardous constituents in K174 wastes. In addition, EPA is specifying combustion (CMBST) as an alternative treatment standard; such a technology-specific standard was previously promulgated for other hazardous wastes including F024. In Section 2, EPA investigates capacity for combustion, namely for incinerators, boilers, and industrial furnaces because such technologies are expected to be used in meeting the K174 treatment standard for dioxins and furans. If necessary, the incinerator ash can be treated to meet numerical treatment standards for metals.

- Wastewater and nonwastewater forms of K175: For nonwastewater forms of K175, EPA is promulgating a treatment standard consisting of the following requirements. The waste must meet a numerical standard of 0.025 mg/L mercury as measured by the Toxicity Characteristic Leaching Procedure (TCLP) mercury. The waste must also exhibit a pH #6.0 when disposed. Finally, this waste must also be macroencapsulated in accordance with 40 CFR 268.45 Table 1 unless the waste is placed in: (1) a Subtitle C monofill containing only K175 wastes that meet all applicable 40 CFR 268.40 treatment standards; or (2) a dedicated Subtitle C landfill cell in which all other wastes being co-disposed are at pH#6.0. For wastewater forms of K175, EPA is promulgating a numerical treatment standard equivalent to the UTS for mercury (0.15 mg/L). Section 2 presents available capacity for stabilization, macroencapsulation, and landfilling in accordance with these requirements, as well as other technologies that potentially can be used to meet the treatment standard.

The potentially required alternative treatment capacity for K174 nonwastewater may be estimated at 5,500 MT (6,100 tons) per year. However, because EPA is finalizing a conditional listing approach for the K174 wastes under which these wastes are not hazardous if disposed of in a Subtitle C or a non-hazardous waste landfill, it is possible that little or no hazardous waste treatment capacity

will be required for this waste. For K175, EPA estimates that up to 120 MT (130 tons) per year may require alternative commercial treatment.

To assess the need for national capacity variances, EPA estimated the quantities of waste requiring alternative commercial treatment as a result of the land disposal restrictions and the capacity available at commercial treatment facilities to manage the restricted wastes. Exhibit 1-2 indicates the quantities of land disposed wastes requiring alternative commercial treatment or recovery capacity as a result of today's final rule. Exhibit 1-2 also indicates whether adequate treatment capacity is available for these wastes. Based on the results of the capacity analysis, EPA is not granting a national capacity variance for wastewater or nonwastewater forms of K174 or K175.

Exhibit 1-2. Newly-Listed Chlorinated Aliphatics Production Wastes: Capacity Analysis Summary

Waste Stream	Quantities Requiring Alternative Capacity (tons/year)	Type of Treatment (A)	Adequate Commercial Treatment Capacity Available?
K174 and K175 Wastewaters	0	—	Yes
K174 Nonwastewaters	0-6,100	Incineration	Yes
K175 Nonwastewaters	130	Stabilization followed by landfilling	Yes
Soil and Debris Contaminated with K174 and K175	Minimal	—	Yes
F039/UTS Nonwastewaters	<200,000 (B)	Incineration	Yes
F039/UTS Wastewaters	<20,000,000 (B)	Wastewater treatment	Yes

(A) Because numerical standards are being finalized, generators may use any method (other than impermissible dilution) to meet the treatment standards. For K174, generators may use the alternative treatment standard of combustion to meet the treatment standard. For K175, the practicality of mercury recovery is discussed in Section 2.4. This table lists the technologies identified as BDAT or otherwise likely to be used in meeting the treatment standard.

(B) These are bounding assumptions and are therefore expressed as 'less than.'

2. AVAILABLE TREATMENT CAPACITY

This section presents EPA's estimates of available commercial treatment capacity for the newly-listed chlorinated aliphatics production wastes. Section 2.1 summarizes the results of EPA's analysis of commercial combustion capacity at incinerators and boilers and industrial furnaces (BIFs). Section 2.2 discusses stabilization capacity, including mercury waste stabilization upon which the numerical standards for K175 wastes are based. Section 2.3 discusses landfilling capacity. Section 2.4 summarizes the results of EPA's analysis of the available commercial capacity for mercury recovery or retorting (e.g., RMERC). Section 2.5 discusses wastewater treatment capacity.

2.1 COMMERCIAL HAZARDOUS WASTE COMBUSTION CAPACITY

EPA is finalizing numerical treatment standards, based on universal treatment standards, for nonwastewater forms of K174. Combustion was used to develop universal treatment standards for all of the organic constituents in the wastes which are to be included in 40 CFR 268.40 for K174. Additionally, an alternative combustion treatment standard of CMBST (as defined in 40 CFR 268.40 and 268.42) is being promulgated to eliminate the need for dioxin analysis. If specific combustion units are used to treat K174, (i.e., those operating under Part 266 Subpart H, permitted under 40 CFR Part 264 Subpart O, or those operating under Part 265 Subpart O which have obtained a demonstration of equivalent treatment under 268.42(b), then the combustion residues would not have to be monitored for compliance with numerical limits for dioxins and furans. The specified units were shown to effectively destroy the dioxin and furan congeners. However, if K174 wastes are treated using this alternative, the combustion residues must still be monitored for all other organic and metal constituents in K174. Combustion, therefore, represents one treatment technique that can be used to achieve the K174 treatment standards.

In assessing the available treatment capacity for combustion, EPA compiled data for hazardous waste incinerators, which have the sole purpose of destroying hazardous wastes, and for boilers and industrial furnaces (BIFs), which have the dual purpose of destroying hazardous wastes and deriving energy from the waste that can be then used for other industrial processes. A summary of the methodology and data is provided below.

2.1.1 Methodology and Data

EPA has estimated current available commercial combustion capacity by using the results of industry data provided in the early 1990s, and subsequently subtracting required combustion capacity due to promulgation of land disposal restrictions of the Phase I through IV wastes, and other listed wastes.

In 1993, the Hazardous Waste Treatment Council (HWTC) and the Cement Kiln Recycling Coalition (CKRC) surveyed their membership to obtain data on combustion capacity, which was then submitted to EPA. Subsequent to the original HWTC survey, members also received a supplemental questionnaire regarding the burning of soils. In 1994, the Environmental Technology Council (ETC)

submitted updates to the HWTC Survey from its members.[6] Survey responses received from incinerators are classified as confidential business information (CBI). Following the receipt of the original surveys, EPA reviewed the data submitted by each facility to evaluate the completeness, consistency, and accuracy of the information. EPA identified and reconciled data gaps and anomalies by contacting the respective HWTC or CKRC coordinators and the individual facilities in question.[7]

The data contains facility information (e.g., location, EPA identification number of burner, number of units currently on-line), unit specific information (e.g., type of incinerator/kiln unit, operating hours per year, types of hazardous waste feed systems, types of hazardous waste burned in 1992), and waste-type specific information (e.g., tons of hazardous waste burned in 1992, average hazardous waste feed rate, maximum practical capacity, maximum permit capacity). To preserve the confidentiality of the survey and updated data, only aggregated results for these CBI data are provided.

The information received from facilities participating in these surveys does not lend itself to simple summation and tabulation of results because facilities sometimes differed in their approach to reporting quantities burned or burning capacity. Incineration systems can generally accept multiple waste forms (e.g., pumpable sludges and aqueous liquids) and accepting larger amounts of one waste form may reduce the capacities for others. In responding to the HWTC survey (and ETC updates), facilities sometimes grouped waste types for their capacity-related responses. For example, if a feed system can accommodate both liquids and pumpable sludges, a facility may report a capacity for both forms grouped together. To address this interchangeability of waste forms, EPA's LDR capacity analysis accommodated the reported waste groupings (e.g., one capacity estimate for liquids and pumpable sludges combined).

A second issue also relating to the interchangeability of waste forms required more extensive consideration. In the HWTC survey (and ETC update), some facilities reported the maximum combustion capacity for individual waste forms that together exceed the reported overall capacity of the unit. As a result, summing these individual capacities results in a total capacity that far exceeds what a facility may practically accommodate. EPA developed the following algorithm to address this situation.

The waste apportionment algorithm focuses on three primary variables: the quantity of waste burned during the year, the maximum practical capacity of the unit, and the available capacity for burning hazardous waste. The available capacity for a waste form (e.g., aqueous liquids, dry solids) is obtained by taking the difference between the quantity of the form burned (hazardous and non-hazardous waste) and the maximum capacity for the waste form. EPA's approach assumes that a facility will not stop burning non-hazardous waste if it is currently burning non-hazardous waste but all

[6] In 1994, HWTC became the Environmental Technology Council (ETC). ETC provided EPA with a 1994 update to the commercial incinerator survey.

[7] Background Document for Capacity Analysis for Land Disposal Restrictions Phase II – Universal Standards, and Treatment Standards for Organic Toxicity Characteristic Wastes and Other Newly Listed Wastes. Volume 1: Capacity Analysis Methodology and Results, Chapter 2. U.S. EPA. August 1994. (In docket for 59 *FR* 47980, September 19, 1994.)

unutilized capacity will be used for hazardous waste. Difficulties arise, however, because facilities report maximum capacities for each waste form without regard to capacity accounted for by other waste forms. Consequently, the sum of maximum capacities for all waste forms may exceed the total capacity. In these cases, EPA distributed the total maximum hazardous waste capacities reported by each facility to individual waste forms based on burning practices. The utilization rate for each waste form was calculated by dividing the larger of the quantity of hazardous waste burned or total waste burned for that waste form by the sum of the quantities burned for all waste forms. A new maximum hazardous waste capacity for each waste form was then calculated by multiplying the utilization rate for that waste form by the maximum practical capacity for the incineration unit as a whole. If the calculated maximum capacity for a waste form exceeded the reported value for that form, EPA used the reported value. In this case, the difference between the calculated and reported value was then redistributed to other waste forms using a hierarchy based on the types of wastes in this rule for which capacity has historically been most limited relative to demand. EPA used the following order for redistributing capacity:[8]

(1) Soils;
(2) Bulk Solids;
(3) Containerized Solids;
(4) Nonpumpable Sludges;
(5) Pumpable Sludges;
(6) Compressed Gases;
(7) Non-aqueous Liquids; and
(8) Aqueous Liquids.

Cement kiln capacity for hazardous waste is limited by air emission limits (e.g., BIF limits under 40 CFR 266 Subpart H), feed system limitations (e.g., particle size and viscosity limits), and product (i.e., cement clinker) quality considerations. For instance, cement quality considerations may require that wastes burned in cement kilns have a heating value of at least 5,000 BTU/lb to ensure adequate temperatures in the kiln. (Comments received by EPA in the past, however, indicate that some kilns accept wastes below this heating value.) Incineration capacity is also limited by air emission limits and other permit limits (such as heat release limits), and feed system limits. EPA has taken these limitations into account in its estimates of available commercial combustion capacity.

Once the baseline[9] available combustion estimates were calculated using the above methodology (i.e., based on information received from the facilities participating in the HWTC and CKRC surveys conducted in 1993 and updates by ETC in 1994), EPA subtracted the required combustion capacity for any previously regulated wastes that are not accounted for in the data received from the incinerators or BIFs (e.g., LDR Phase I wastes under variance, LDR Phase II , III, and IV

[8] ibid, page 2-10 to 2-12 to see example.

[9] "Pre-Baseline" available combustion capacity estimates are presented in Exhibit 2-1 (i.e., estimates prior to accounting for LDR Phase I, II, III, IV wastes, and recently listed petroleum refining process wastes).

wastes, and recently listed petroleum refining wastes)[10] to derive the available combustion capacity for the proposed dye and pigment manufacturing wastes. The capacity required for Phase II, III, and IV wastes, and newly listed petroleum refining process wastes were not reflected in the estimates of utilized capacity because the Phase II, III, and IV rules, and Listing/LDR rule for petroleum refining process wastes were not in effect when the estimates were submitted to EPA. In addition, some Phase I wastes (F037 and F038 in particular) were under a variance for at least part of the period of time for which EPA received capacity estimates.

Also, when EPA finalized the LDR Phase IV rule, EPA conducted additional analysis by developing assumptions to account for the uncertainty associated with the age of the bulk of the data (which are now several years old) and assessing the potential trends in combustion capacity over the next two years. This additional analysis primarily involved three activities: (1) updating available capacity where possible using facility-specific CBI submitted by Rollins Environmental Services (RES) in 1996 as a public comment to the LDR Phase IV proposed rule[11], (2) applying assumptions where necessary to obtain a range of overall available capacity, and (3) researching potential impacts of finalized maximum achievable control technology (MACT) standards (64 FR 52827, September 30, 1999) which affects cement kilns, lightweight aggregate kilns, and incinerators burning hazardous waste.[12] Facilities have three years to comply with MACT requirements, so impacts on the industry (such as facility shuts downs, or modifications in technology used to meets standards) may not be realized in the immediate future. It is assumed that EPA's estimate of 435,000 tons/year of available sludge/solid combustion capacity (detailed below) for the treatment of chlorinated aliphatics wastes will apply for the near future.

2.1.2 Available Combustion Capacity

Exhibit 2-1 summarizes EPA's estimates of "pre-baseline" available commercial hazardous waste combustion (incinerators and BIFs) capacity by waste form. This exhibit also provides summarized estimates of available capacity by two broad categories of waste physical forms: (1) liquids and (2) sludges/solids. The following analysis has focused on the availability of capacity only for solids/sludges because the newly listed chlorinated aliphatics production wastes are expected to fall entirely within this broad category of physical forms.

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[10] LDR Phase I Final Rule: 57 *FR* 37194, August 18, 1992; LDR Phase II Final Rule: 59 *FR* 47980, September 19, 1994; LDR Phase III Final Rule; 61 *FR* 15566, April 8, 1996; LDR Phase IV Final Rules: 62 *FR* 25998, May 12, 1997 and 63 *FR* 28556, May 26, 1998; Listing and LDR Final Rule for Petroleum Refining Process Wastes: 63 *FR* 42110, August 6, 1998

[11] Background Document for Land Disposal Restrictions - Wood Preserving Wastes (Final Rule): Capacity Analysis and Response to Capacity-Related Comments, April 1997, pages 4-7 to 4-12.

[12] Industry petitioners challenged portions of this rule as they related to the effective date of the MACT standards; the rule promulgated that some facilities would have to cease burning hazardous waste two years following promulgation of the rule while other facilities could continue burning hazardous waste for three years as long as they were in compliance of MACT standards following this date. A court decision was issued July 25, 2000 (Chemical Manufacturers Association versus EPA (No. 99-1326). However, an EPA *Federal Register* Notice interpreting the results of the decision has not yet been issued.

Exhibit 2-1. Pre-Baseline Available Commercial Hazardous Waste Combustion Capacity Summary

Waste Form	Incinerators			BIFs			Total Available (1000 tpy)
	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	
Liquids (aqueous)	190	92	51	NA	NA	NA	92
Liquids (non-aqueous)	346	159	54	NA	NA	NA	159
Reported as All Liquids (aqueous & non-aqueous)	82	56	31	1,548	702	55	759
Reported as Liquids & Pumpable Sludges Grouped	32	20	38	236	49	79	68
Pumpable Sludges	116	66	43	37	12	68	78
Nonpumpable Sludges	32	17	47	5	1	72	18
Reported as Solids & Nonpumpable Sludges Grouped	53	38	27	35	11	69	49
Bulk Solids	133	70	47	25	18	30	88
Dry Solids	NA	NA	NA	49	39	20	39
Containerized Solids	231	102	56	146	106	28	208
Compressed Gases	5	3	43	NA	NA	NA	3
Soils	169	157	7	NA	NA	NA	157
TOTAL LIQUIDS	650	327	50	1,785	751	58	1,078
TOTAL SOLIDS & SLUDGES	734	450	39	298	187	37	638
TOTAL	1,390	780	44	2,083	938	55	1,718

Notes:

1. This pre-baseline capacity summary is based on survey data compiled during 1993 and 1994. For details of capacity for individual combustion units) incinerators and BIFs) refer to U.S. EPA's "Background Document for Capacity Analysis for Land Disposal Restrictions Phase III-Decharacterized Wastewaters, Carbamate and Organobromine Wastes, and Spent Potliners (Final Rule)", February 1996, Chapter 2.
2. Although estimates of available capacity for today's final rule are based on this capacity summary, the final values include adjustments for the additional capacity required due to Phases II, III and IV LDR rules. Details of adjustments are provided in the text.

As shown in Exhibit 2-1, the available sludge/solid commercial combustion capacity) prior to accounting for the capacity required due to the Phase I through IV rules) is 638,000 tons/year.[13] Post-Phase I and II, but pre-Phase III and IV, data obtained from one major treater, RES, through comments and subsequent submissions of CBI, as well as extrapolation of these data to all other combustion data, were used to update this pre-baseline estimate and to simultaneously account for Phase I and II wastes. The result is approximately 489,000 tons/year of available pre-Phase III and IV capacity,[14] with a range between about 410,000 to 568,000 tons/year.[15] For the Phase III wastes, EPA estimated that the relevant required sludge/solid combustion capacity is 4,600 tons/year. Therefore, the overall pre-Phase IV combustion capacity for sludges/solids is estimated at 484,000 tons/year; between about 406,000 to 564,000 tons/year. In the Phase IV rulemaking for wood preserving wastes, EPA estimated that approximately 9,000 tons/year of non-liquid/nonwastewater combustion capacity is required for wastes from wood preserving operations.[16] Thus, EPA estimates that approximately 475,000 tons/year (397,000 to 555,000 tons/year) of combustion capacity is available to treat wastes restricted from land disposal by the remainder of the Phase IV rulemaking. In the Phase IV rulemaking for TC metal and mineral processing wastes, EPA estimated that approximately 32,000 tons/year (8,800 to 52,000 tons/year) of combustion capacity is required.[17] Finally, as a result of the August 6, 1998 finalizing listing and LDR standards for four newly listed petroleum refining wastes (K169-K172), approximately 8,000 tons/year of sludges of combustion capacity is required.[18] Thus, EPA estimates that approximately 435,000 tons/year (337,000 to 538,000 tons/year) of combustion capacity is available to treat the newly identified chlorinated

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[13] EPA summed the available capacity of "pumpable sludges" (78,000 tons/year), "nonpumpable sludges" (18,000 tons/year), "solids and non-pumpable sludges" (49,000 tons/year), "bulk solids" (88,000 tons/year), "dry solids" (39,000 tons/year), "containerized solids" (208,000 tons/year), and "soils" (157,000 tons/year).

[14] To calculate this quantity, EPA first developed separate estimates of available combustion capacity for RES facilities and non-RES facilities. EPA determined the pre-baseline capacity available at non-RES facilities by subtracting the pre-baseline combustion at RES facilities from the pre-baseline estimate of national sludge, solid, and soil combustion available capacity, and then subtracting an estimate of the non-RES share of wastes restricted from land disposal due to the Phase I and II rulemakings. EPA then added this result to the estimated increase in RES available capacity to estimate the total pre-Phase III available capacity for incinerators and BIFs. Because most of the information used in these calculations is CBI, EPA can not disclose the details in this document.

[15] Because of the age of the data used and the uncertainties of the various assumptions used, EPA developed a "best estimate" and a range of available combustion capacity values. EPA's best estimate is based on a calculation of the current percentage of the Phase I and Phase II wastes that RES is combusting. The range was calculated by assuming that RES is combusting a lesser percentage than the best estimate (lower end), or is burning a greater percentage than the best estimate (upper bound).

[16] Background Document for Land Disposal Restrictions - Wood Preserving Wastes (Final Rule), Capacity Analysis and Response to Capacity-Related Comments, April 1997, page 3-13

[17] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 3.6.10, page 3-28. April 1998.

[18] U.S. Environmental Protection Agency. Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Petroleum Refining Wastes (Final Rule). Section 3.3, page 3-15. August, 1998.

aliphatics wastes. Even though soil and debris contaminated with wood preserving wastes[19] would utilize some combustion capacity, there is still more than adequate combustion capacity to treat the much lesser volume of newly listed chlorinated aliphatics wastes (Section 3 presents an estimate of the quantity requiring alternative treatment).

Since the baseline combustion capacity data were several years old, some combustion facilities have closed, others have opened, and others have made process changes affecting their capability and capacity to treat hazardous wastes.[20] Much of this information is industry proprietary in nature and cannot be quantified in this report. In addition, several facilities that had proposed expansion of thermal capacity have now abandoned their proposals.[21] Difficulties in permitting make it highly unlikely that other combustion units could be brought on-line in the near-term (i.e., within two years). Recent industry publications indicate that the public continues to oppose nearly every proposed hazardous waste management facility, and state and local legislative bodies continue to pass restrictive siting laws or permitting moratoriums. As a result, many project sponsors have already, or may eventually, find the process too costly.[22] Therefore, the available combustion capacity is expected to remain relatively steady through the year 2001.

2.1.3 Alternative Data Source Used in Estimating Combustion Capacity

To update or substantiate the estimates identified in Section 2.1.2, EPA used more current data obtained from the RCRA Information System (RCRIS), the 1997 Biennial Reporting System (BRS), and the 1995 BRS. This analysis identifies hazardous waste combustion facilities that are commercial and operational as of May 1999. For each facility, the maximum practical capacity is calculated as the amount of hazardous waste that could be handled by a facility, given constraints of a calendar year, work shifts, and permits. Utilized capacity is identified as the amount of hazardous waste that was actually managed (i.e., the quantity managed in 1997 according to the 1997 BRS). No additional analysis was conducted to account for wastes for which the effective date of land disposal restrictions was after this date.

A description of the data and methodology are presented in Appendix E, and results are summarized here. There were 48 commercial combustion facilities in the nation with a combined maximum practical capacity of 2.8 million tons per year. Less than 1.3 million tons per year of the capacity was being utilized, leaving a total available capacity of almost 1.6 million tons per year.

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[19] Note that the two-year capacity variance for soil and debris contaminated with wood preserving wastes which was effective from May 12, 1997 (62 *FR* 25998) has expired.

[20] Background Document for "Capacity Analysis for Land Disposal Restrictions–Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule), April 1998," page 2-15 to 2-17.

[21] "Commercial Hazardous Waste Management Facilities: 1997 Survey of North America," *The Hazardous Waste Consultant*. March/April 1997.

[22] ibid.

The total available capacity for the combustion of liquids and pumpable sludges is approximately 0.9 million tons per year. Of this capacity, approximately 0.3 million tons per year comes from incineration and 0.6 million tons per year comes from energy recovery. The total capacity for the combustion of solids and non-pumpable sludges is approximately 0.7 million tons per year.

2.1.4 Dioxin-Containing Waste Treatment Capacity

EPA is promulgating treatment standards for dioxins and furan congeners in today's rule because the basis for listing K174 includes dioxin and furan congeners. EPA is also finalizing an alternative treatment standard for K174, so that combustion residues would not have to be analyzed for dioxin/furan constituents if managed in the same types of units as presently allowed for F024 wastes (monitoring of other constituents such as arsenic would still be required). During the public comment period for the chlorinated aliphatics proposed rule, ETC requested that an alternative treatment standard of combustion (CMBST) be finalized in recognition of the limited laboratory capacity and the excessive costs of dioxin analysis (in a similar manner as the F024 treatment standards).

Combustion units must be in compliance with the standards in Part 264 Subpart O or Part 266 Subpart H, or operate as interim status incinerators which have made a specific demonstration that they operate in a manner equivalent to a Part 264 or Part 266 combustion unit. Combustion facilities accepting K174 are expected to meet the same requirements as facilities accepting any other (non-dioxin containing) hazardous waste. EPA evaluated facilities that treat F024 wastes, because such wastes similarly must meet the "CMBST" requirement. EPA's analysis of 1997 BRS data show that 13 facilities accepted F024 wastes from offsite sources in 1997 and subsequently combusted the wastes using incineration, fuel blending, or energy recovery.[23]

In addition, EPA has previously established treatment standards for other dioxin and furan-containing wastes. For such wastes, treatment using combustion has been required, or treatment standards have been established based on BDAT using combustion. These dioxin-containing wastes include the following:

- F020 to F023 and F026 to F027 (various chlorinated benzene and chlorinated phenol wastes). The basis for listing includes chlorinated dioxins and furans. Numerical treatment standards for dioxins and furans are established. Additional requirements for these wastes are presented in 40 CFR Part 264 Subpart O.

- F032 (wastewaters from wood preserving processes using or previously using chlorophenolic formulations). The basis for listing includes tetra-, penta-, hexa-, and hepta-chlorinated dioxins and furans. Numerical treatment standards for dioxins and furans are

[23] Facilities conducting incineration of F024 included Ensco (El Dorado, AR), Laidlaw (Coffeyville, KS), Clean Harbors (Kimball, NE), Safety Kleen (Deer Park, TX), Dow Chemical (Freeport, TX), and Waste Technologies Industries (East Liverpool, OH). Facilities conducting energy recovery were Hercules Cement (Independence, KS), Rhone-Poulenc (Baton Rouge, LA), Lone Star Industries (Cape Girardeau, MO), and Lafarge Corporation (Paulding, OH). Facilities conducting fuel blending included Advanced Environmental (Morrow, GA), Hazmat (Kansas City, MO), and Greenway Environmental (Haskell, OK).

established based on combustion, with an alternative technology-specific standard of combustion.

- Certain dioxins and furans have UTS. The numerical standards for F020 to F023, F026 to F027, and F032 are identical to the UTS.

Whereas the combustion of F020 to F023 and F026 to F027 is required to be conducted to achieve 99.9999 percent destruction and removal efficiency (see 40 CFR Part 264 Subpart O), today's rule does not require such additional standards for K174 wastes. Commenters to the proposed Wood Preserving LDR rule stated that only one incinerator in the US (Laidlaw [formerly Aptus], Coffeyville KS) is licensed to accept dioxin and furan wastes, and its available capacity is less than 6,600 tons/yr for non-PCB wastes.[24]

However, similar destruction efficiency is not required for F032. As stated in the Wood Preserving Wastes Capacity Analysis Background Document, EPA did not require the combustion of F032 wastes to achieve 99.9999 percent destruction and removal efficiency. Therefore, facilities could combust F032 wastes at any RCRA facility regulated under 40 CFR Part 266 or 264, Subpart O without having to monitor the concentrations of dioxins and furans left behind in the combustion residues. In addition, facilities could combust F032 wastes in combustion devices regulated under CFR Part 265, Subpart O units, provided the residues meet the applicable standards for each regulated dioxin or furan constituent, or make a demonstration that their combustion is at least equivalent to that required of permitted incinerators or Part 266 BIFs, in which case these interim status incinerators would also have the option of not monitoring for dioxins in combustion residue. Land disposal restrictions for F032 were finalized in May 1997, indicating that for at least part of the year the treatment standards were in effect. Using the 1997 BRS, eight facilities reported managing F032 waste using incineration in 1997.[25]

The final treatment standards for K174 wastes are similar to the requirements for treating F032 waste, in that numerical standards are finalized (rather than required combustion in an incinerator achieving 99.9999 percent destruction and removal efficiency). The alternative treatment standard of combustion also is not required to achieve 99.9999 percent destruction and removal efficiency, and is therefore expected to provide additional flexibility for facilities to accept and treat the waste. Although EPA does not quantify the percentage of the available combustion capacity that is able to treat K174 waste, EPA expects that a significant percentage of the capacity identified in Section 2.1.2 would be available. At least 17 facilities are expected to provide combustion capacity for treating K174 wastes. These 17 facilities represent the eight facilities accepting F032 waste and the 13 facilities accepting F024 wastes that were identified above, after considering overlap.

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[24] U.S. EPA. Background Document for Land Disposal Restrictions -- Wood Preserving Wastes (final rule). April 1997, page 4-14.

[25] These facilities are Ensco (El Dorado, AR), Laidlaw (Coffeyville, KS), LWD (Calvert City, KY), Clean Harbors (Kimball, NE), Waste Technologies Industries (East Liverpool, OH), Safety Kleen (Roebuck, SC), Chemical Waste Management (Port Arthur, TX), Laidlaw (Clive, UT).

2.2 AVAILABLE STABILIZATION CAPACITY

Stabilization treatment involves mixing the waste with a binding agent that is designed to reduce the leachability of metals from the waste. Stabilization is a primary conventional commercial treatment technology for listed hazardous wastes, particularly for nonwastewaters containing metals, including mercury, in an inorganic waste matrix.

In its development of BDAT, EPA presents data from Clever et al. (1985) and Bishop et al. (1999) (see bibliography for complete citations) suggesting that solubility of mercury sulfide is pH dependent, and above pH 6.0 mercury leaches at levels above the UTS for mercury. As a result, any technology (such as stabilization) must result in the pH of the waste to below 6, and the waste to exhibit less than 0.025 mg/L mercury TCLP (EPA is also restricting disposal of K175 to units in which disposal of wastes with pH greater than 6 is prohibited, an aspect that is discussed in Section 2.3 below).

Borden Chemicals currently uses stabilization to treat its waste. According to the facility, it applies sodium sulfide within an optimum pH range of 3.5 to 5.0 to stabilize the waste before sending the waste to a Subtitle C landfill. In 1998, sulfide-stabilized K175 sludge from Borden Chemicals was sampled for analysis of the mobility of mercury in these wastes (Bishop et al., 1999). Although the maximum TCLP mercury concentration found in EPA's record sampling data (see Table C-2 in Appendix C) shows the waste to exhibit the toxicity characteristic for mercury, historical TCLP data show that the waste is variable with some measurements less than the nonwastewater UTS of 0.025 mg/L TCLP and other measurements above the TC limit of 0.2 mg/L.

Additional testing by Bishop (1999) was conducted using different leaching fluids than used in the TCLP. The waste generated a leachate containing 0.0058 mg/L mercury (i.e., less than UTS) when subject to a controlled constant pH test leaching at pH 6. In constant pH leaching tests at higher pH values (8 and 10), the mercury concentration in the leachate exceeded the toxicity characteristic criteria. Borden's treatment process may be highly variable based on the wide range of pH values and leaching values obtained. Nonetheless, EPA expects that the process can be optimized to meet the lower numerical treatment standard using existing technology, as evidenced by the existing data especially at the lower pH.

If offsite stabilization capacity is required, EPA expects that sufficient commercial treatment capacity exists to treat K175 using stabilization. This conclusion is reached by identifying facilities that treat mercury-containing wastes (as discussed in Section 2.2.1) and facilities conducting stabilization in general (as discussed in Section 2.2.2).

2.2.1 Facilities Treating Mercury Wastes Using Stabilization

Due to land disposal restrictions, wastes that exhibit the toxicity characteristic for mercury and contain greater than 260 mg/kg of mercury must be treated by RMERC; treatment using alternative technologies such as stabilization is not allowed. Therefore, information regarding facilities treating

mercury wastes is limited to (1) facilities treating high mercury wastes before these LDRs took affect, and (2) facilities that currently accept 'low mercury' wastes for stabilization.

In November 1999, the Environmental Technology Council (ETC) provided comments on the chlorinated aliphatics proposed rule. ETC's comments referenced and reiterate the statements made in support of mercury stabilization technologies in the June 1993 "Petition For Rulemaking to Amend 40 C.F.R. Part 268 To Establish Alternative BDAT Treatment Standard For D009 Mercury Wastes Containing Greater Than 260 mg/kg Mercury," by the Hazardous Waste Treatment Council (later known as ETC). While the data presented in the petition do not demonstrate treatment of mercury wastes to less than 0.025 mg/L TCLP mercury, they claim that with minor modifications to this stabilization technology K175 mercury wastes containing 1 to 2 percent mercury can be treated to 0.025 ppm TCLP mercury.

This petition referenced other documents that provided waste treatment data for mercury wastes, including a petition filed by CyanoKEM Inc. in April 1993 ("Petition For Emergency LDR Rulemaking Requesting an Alternative BDAT Standard for D009 Mercury Wastes Containing Greater Than 260 ppm Mercury." CyanoKEM presented data from 1991 using chemical stabilization technology to treat inorganic mercury salts. This involves a step-wise mercury oxidation followed by sulfide precipitation. CyanoKEM states that the resulting mercuric sulfide product is then stabilized by conventional solidification and/or stabilization agents. ETC's 1999 comments also reference ETC's 1990 comments to EPA on the Third Third Rulemaking in Docket No. F-89-LD12-FFFFF. These comments included the results of mercury stabilization testing data from member companies.

The documentation provided by ETC and CyanoKEM support the technical feasibility of using stabilization as a treatment option for meeting the numerical LDR treatment standard for K175, and showing that such services were commercially available prior to the LDRs taking effect for D009 wastes. In addition, EPA analyzed 1997 BRS data to show that several commercial facilities accepted wastes exhibiting the toxicity characteristic for mercury (D009), and treated these wastes using stabilization (presumably these were 'low mercury' wastes). A list of other facilities that conduct stabilization of D009 wastes, as identified in the 1997 BRS database, is presented in Table A-3 in Appendix A. This list of facilities was cross referenced to estimates of stabilization capacity from the Background Document for Capacity Analysis for Land Disposal Restrictions - Phase IV.[26] Capacity estimates, based on 1995 Biennial Reporting System (BRS) data, were available for the majority of the facilities identified as potentially being able to accept mercury wastes for stabilization. Combined, the 23 facilities have more than one million tons of stabilization capacity.[27] It should be noted that these

[26] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 2.1. April 1998.

[27] The 23 facilities are as follows: Chemical Waste Management, Inc.; Clean Harbors of Braintree, Inc.; Clean Harbors of Connecticut, Inc.; CWM Chemical Services, Inc.; Dynecol Incorporated; Environmental Services of Idaho; Heritage Environmental Services, Inc.; Laidlaw Environmental Services, Clive, UT; Laidlaw Environmental Services, Waynoka, OK; LWD Sanitary Landfill, Inc.; Peoria Disposal Company, Inc.; Republic Environmental Systems, PA;, Burlington Environmental, Inc., Takoma; Burlington Environmental, Kent;, Chemical Waste Management, LA; Chemical Waste Management, IN; Chemical Waste

facilities may treat a large number of wastes, so all of the estimated capacity may not be available solely for the stabilization of mercury waste.

2.2.2 General Capacity Information Regarding Commercial Stabilization

In analyzing alternative treatment capacity for stabilization for the chlorinated aliphatics production wastes, EPA built on the capacity analysis conducted for the Third Third LDR rule. This analysis was based on data contained in the May 1990 TSDR Capacity Data Set.[28] The TSDR Capacity Data Set contains results from the National Survey of Hazardous Waste Treatment, Storage, Disposal and Recycling Survey (the TSDR Survey). The TSDR Survey was administered in 1987 to 2,500 facilities and was designed to provide comprehensive information on current and planned hazardous waste management, and practices at RCRA-permitted and interim status treatment, storage, recycling, and disposal facilities. The TSDR Survey collected projections of capacity changes from 1986 through 1992.

Following the original TSDR Survey, EPA updated the TSDR Capacity Data Set for critical technologies based on confirmation of planned capacity changes and other information received since the survey (e.g., comments on proposed rules). Updated information was obtained by contacting facilities and verifying critical projected capacities reported in the TSDR Survey. A key part of this analysis was a review of Biennial Reporting System (BRS) data for the proposed rule for Phase IV wastes.[29]

To estimate the available stabilization capacity for treatment residuals derived from the newly identified chlorinated aliphatics wastes, the capacity demand for previous LDR rules was subtracted from the available stabilization capacity estimated from the TSDR Capacity Data Set and updates. The available stabilization capacity from the TSDR Survey and updates was 3,125,000 tons per year. EPA estimated in the Third Third rulemaking that the capacity required as a result of the Third Third and previous LDR rules was 1,921,000 tons per year. Furthermore, the capacity required for Phase I was 77,000 tons per year, for Phase II wastes was 0 tons per year,[30] and for Phase III wastes was 0 tons

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Management of the NW; City Environmental, Inc.; Envirocare of Utah; Michigan Disposal Waste Treatment Plant; Perma-Fix Treatment Services, Inc.; Republic Environmental Systems, OH; and US Ecology, Inc.

[28] U.S. EPA, *Commercial Treatment/Recovery Data Set*, pages. 37-45, 54-57, 91-95 May 1990.

[29] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 2.1. April 1998.

[30] EPA believes that stabilization may be required to treat underlying hazardous metal constituents in some Phase II organic TC wastes after combustion but that the actual amount of combustion residuals requiring stabilization capacity is a small fraction of available capacity.

per year.[31] For the Phase IV rule for TC metal and mineral processing wastes, EPA determined that most of the newly identified wastes are already meeting the Phase IV treatment standards, or will require relatively minor modifications to existing treatment systems, and thus little additional commercial stabilization capacity will be needed. Furthermore, even if some capacity is required as a result of the Phase IV rule, EPA expects that the high elasticity of stabilization capacity (i.e., the little time needed to develop additional stabilization capacity) will more than counter this required capacity.

EPA does not know how many of the above facilities are able to accept mercury sulfide wastes specifically, so there is some uncertainty as to an exact capacity for K175. EPA estimates that there is at least eight million tons per year of fully available commercial stabilization capacity (i.e., not specific to mercury-containing wastes) based on data in the 1995 BRS (PS Form).[32] (The PS form contains information on the utilized and maximum capacity of the facility's waste treatment system.) EPA expects some of this capacity is capable of accepting mercury-containing wastes, or can be easily modified to do so.

2.3 AVAILABLE LANDFILLING CAPACITY

Landfilling in Subtitle C units typically represents a "baseline" management method for compliance with Subtitle C requirements. Under a capacity variance, a generator would be able to dispose of their hazardous waste in a Subtitle C without additional treatment. Therefore, analysis of landfill capacity is not typically a factor in EPA's consideration of whether to grant a national capacity variance. Also, in general, there is sufficient Subtitle C landfill capacity for disposal of hazardous wastes or treatment residues (see Appendix E for available capacity for hazardous waste landfills).

However, as one of several treatment standards proposed for K175, EPA proposed that the waste be treated such that it has a pH #6.0, and (if landfilled) that the waste be co-disposed with similar pH wastes (i.e., #6.0). Two comments were received regarding this aspect of the proposed standard, from Borden Chemicals (the generator of K175) and from ETC.

Commenters did not indicate the existence of any technical difficulties in meeting the additional pH requirement for the waste. Furthermore, they did not provide any data or information on the issue of available monofill disposal capacity for this waste or landfill co-disposal with similarly acidic (pH 6.0 or less) wastes.

Borden indicated they could ensure that their generated waste had a pH #6.0, but that "the assurance of co-disposal with similar pH material is not possible given the relatively small quantity of

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[31] EPA believes that stabilization may be required to treat underlying hazardous metal constituents in some Phase III wastes after combustion but that the actual amount of residuals requiring stabilization capacity is a small fraction of available capacity.

[32] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 2.1. April 1998.

VCM-A filter cake and the large overall quantity of waste received" (CALP-00006). ETC stated that they are supportive of a pH restriction, but that "the pH limit of 6.0 may be overly restrictive given that EPA's leachate evaluations at this pH indicated levels of 0.0058 mg/liter. The pH restriction should be set relative to the level needed to demonstrate leachate concentrations under 0.025 mg/liter" (CALP-00015).

As a result of these concerns, EPA investigated whether landfills operate in a manner similar to that described in the proposed rule. Generally, each landfill contains multiple cells, one or more of which are active at one time. EPA has communicated with hazardous waste landfill operators who indicated that both their generated leachate and the disposed wastes are typically alkaline in nature.[33] Therefore, although a designated cell or unit for low pH wastes only does not currently exist, owners of commercial landfills can and at some point will create a special cell based on customer's needs, compliance conditions, and contract negotiation.[34].

EPA understands from one stakeholder that facilities with hazardous commercial landfill capacity may not have sufficient volumes of similarly acidic wastes to make it cost-effective to designate an entire unit or cell for disposal of only low pH wastes. As an alternative to a 'low pH' landfill or cell, Borden Chemicals identified macroencapsulation as an alternative. We have therefore adopted the alternative that allows land disposal in other types of landfill cells following macroencapsulation of the waste (assuming the waste meets other applicable standards, such as the required mercury concentration and pH 6.0 or less for the waste). Based on a discussion with a hazardous waste management facility,[35] we find that macroencapsulation of K175 waste can be made readily available for K175 waste. EPA notes that the encapsulation treatment standard is based on the debris alternative treatment requirements, and therefore, any facility that is currently treating debris for compliance with the debris alternative treatment standard also represents a possible waste management alternative for K175. In its communications with landfill operators, EPA found commercial facilities who indicate that they could accept K175 waste for encapsulation and subsequent disposal (see Appendix F).

EPA's final treatment standard for nonwastewater forms of K175 includes restricting disposal of K175 wastes to land placement where: (1) the waste must meet a numerical standard of 0.025 mg/L TCLP mercury and the waste must exhibit a pH #6.0 when disposed; and (2) the waste must be macroencapsulated in accordance with 40 CFR 268.45 Table 1 unless the waste is placed in: (a) a Subtitle C monofill containing only K175 wastes that meet all applicable 40 CFR 268.40 treatment standards; or (b) a dedicated Subtitle C landfill cell in which all other wastes being co-disposed are at pH#6.0. Based on the above discussion and analysis, EPA expects at least some facilities to be able to meet these landfill and/or encapsulation requirements.

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[33]See phone logs in Appendix F for more detail about the telephone conversations with Chemical Waste Management and other hazardous waste landfills.

[34]See phone logs in Appendix F.

[35]See phone log in Appendix F: phone communication with Carl Carlson, Chemical Waste Management Inc.

For K174 wastes, EPA is finalizing a conditional listing approach for the wastes under which these wastes are not hazardous if disposed of in a Subtitle C or a non-hazardous waste landfill. Therefore, for facilities disposing this waste in a landfill, no alternative management is required.

2.4 AVAILABLE MERCURY RECOVERY CAPACITY

As one of several treatment standard alternatives proposed for K175, EPA proposed the technology-based treatment standard, RMERC, for nonwastewater forms of K175 with greater than 260 mg/kg total mercury (64 FR 46476, August 25, 1999). RMERC, as described in 40 CFR §268.42, is the retorting or roasting of mercury in a thermal processing unit capable of volatilizing mercury from the waste at high temperatures and subsequently condensing the volatilized mercury for recovery. Mercury is collected as pure metal, reducing the mercury concentration in the treatment residual compared to that in the untreated waste. Retorting is typically operated as batch processes in a closed vessel (usually under negative pressure or strong vacuum) without introducing air from outside the vessel.[36]

As identified in Section 3 of this report, one facility, Borden Chemicals in Geismar, LA, generates K175 waste. In public comments to the proposed rule, they claimed that retorting of the waste may be impractical due to technical difficulties and other logistical and practical barriers. Specifically, Borden Chemicals cited the following difficulties in its comments:

- The 500 ppm by weight permitting exclusion limit on organic compounds listed in 40 CFR 261, Appendix VIII could cause facilities not to accept a waste they view as high in organics to protect their permit exemption status.

- The permitting exclusion provision for 'recoverable' levels of metals, though not clearly defined in the regulations, could cause facilities not to accept a waste with low levels of mercury to protect their permit exemption status.

- Since the sludge contains 10,000 ppm mercury, or 1 percent, at most, a facility could decide not to accept a waste it views as having a poor mercury yield because it would not be economically beneficial to store and treat it if they could alternatively treat wastes with higher levels of mercury.

- Retort facilities may have permitting concerns regarding mercuric chloride or sulfides that could keep them from accepting the sludge.

This section identifies information on mercury retorting facilities, with emphasis on their ability to treat wastes similar to Borden's and in regard to the above points. To collect this information, EPA used permitting and facility operational status information available in the Resource Conservation and

[36] Most commercial facilities conduct retorting rather than roasting. Roasting refers to a process, usually operated continuously, where air is introduced to decompose some mercury compounds.

Recovery Information System (RCRIS) and the 1997 Biennial Reporting System (BRS) database, to identify RMERC facilities that accept industrial wastes. This information was supplemented with information from previous EPA facility visits or contacts, Internet searches, and telephone contacts to selected facilities in February and March 2000 (phone logs are included as Appendix B). EPA previously identified many facilities potentially accepting mercury-containing wastes in its preparation of its 1998 report entitled "Waste Specific Evaluation of RMERC Treatment Standard," which is available in the public docket for the Advanced Notice of Proposed Rulemaking "Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards," (May 28, 1999; 64 *FR* 28949).

2.4.1 Identification of Potential Vendors Conducting Mercury Recovery

Mercury recovery data are limited, for various reasons, to the extent that EPA can only identify the potential universe of mercury treatment facilities for K175 waste subject to today's rule. First, facilities conducting mercury recovery have no data on treatment of the newly identified K175 wastes. Second, the universe of commercial mercury treatment at facilities is dynamic due to changing State and Federal requirements as well as public awareness of mercury issues. As a result, available data sources, such as the Biennial Reporting System, would not identify newer facilities because they can be several years old. Other facilities are difficult to identify due to their small size and/or because their metal recovery operations are exempt from some RCRA permitting requirements. In addition, there are facilities, such as Mercury Recovery Services, Inc. (MRS) described below, that operate and/or design mobile or temporary units capable of mercury treatment of contaminated soils and industrial wastes at a customer site.[37] Finally, some facilities conduct RMERC operations but limit their raw materials to fluorescent lamps or other discarded consumer products; EPA expects such facilities would be unlikely to accept K175 for many of the reasons described by Borden. (We have identified facilities which were found to treat many types of mercury wastes from the available data sources; information on facilities researched but seem unlikely to be able to treat K175 is also provided in Appendix B.)

EPA identified the following facilities that accept mercury containing industrial wastes and could potentially treat K175 wastes using RMERC:

- Bethlehem Apparatus (Bethlehem, PA and Hellerton, PA)
- Drug and Laboratory Disposal, Inc. (Plainwell, MI)
- Mercury Refining Company (renamed Mercury Waste Solutions) (Albany, NY).
- NSSI (Houston, TX)
- Salesco Systems USA (Phoenix, AZ)
- Mercury Recovery Services (New Brighton, PA)
- SepraDyne Corporation (Denton, TX)
- Mercury Waste Solutions (Union Grove, WI)

[37] A description of the services provided by Mercury Recovery Services, Inc. (MRS) of New Brighton, PA may be found online at http://www.mrs-inc.com/.

A brief description of each facility follows which is based on information gathered from RCRIS and BRS databases, EPA site visits, telephone contact, and online company websites. Available information in some cases confirm and in other cases does not support the claims made by Borden; such information differs on a facility-specific basis. Nevertheless, because none of the facilities actually treat the subject waste it is difficult to assess whether they could overcome some of the acknowledged obstacles. A query of the 1997 BRS database identifies these and other facilities that conduct mercury retort. This table is presented as Table A-2 of Appendix A. Telephone contacts for all facilities (when conducted) are presented in Appendix B.

Bethlehem Apparatus Co., Inc, Hellertown and Bethlehem, PA

Based on the 1998 RMERC report,[38] this facility manages D009 and U151 wastes including mercury oil sludges, mercury sulfide, mercury sulfate, and other mercury-containing solids. According to the facility's 1996 waste analysis and recycling plan, the facility is conditionally exempt from Part 266 Boiler and Industrial Furnace requirements by not accepting waste with 40 CFR Part 261 Appendix VIII organic compounds in excess of 500 ppm, and only accepting wastes with heating values above 5,000 BTU/lb on a case-by-case basis. This facility was cited in the chlorinated aliphatics proposed rule as possibly being able to treat K175, although with some difficulties to overcome (64 FR 46521, August 25, 1999).

A facility representative indicated that the facility currently accepts other industrial sludges with water and wastes containing chloride for retort, for example, a mercurous chloride (HgCl) waste, calomel. The facility operates a batch process, so that residues from waste treatment could be segregated from other residues generated from processing of other (e.g., characteristic) wastes. The representative speculated that a pretreatment process would be conducted prior to retorting of the subject waste (although additional information on the waste would be required to better identify the techniques). One possibility for this waste is to convert the mercuric chloride ($HgCl_2$) in the waste to mercurous chloride, then use the same process used to treat calomel. Permitting issues for such a pretreatment system were not identified by the facility as a concern.

Mercury Refining Co., more recently Mercury Waste Solutions, Inc., Albany, NY

The facility has a permit to store hazardous waste, but no RCRA permit to treat wastes because the facility conducts recycling operations in a RCRA-exempt manner. As such, the facility must comply with the conditional exemption requirements for Boiler and Industrial Furnaces (BTU and total organic limits on incoming wastes). A facility representative indicated that they could accept mercuric sulfide sludge for retort as long as the sludge did not also contain more than 500 ppm organics.

[38] U.S. EPA. Waste-specific Evaluation of RMERC Treatment Standard. 1998. Supporting document for August 25, 1999 proposed rule.

Drug and Laboratory Disposal, Inc., Plainwell, MI

RCRIS and BRS data identified the facility as RCRA permitted to store and treat hazardous waste. However, the types of treatment indicated (e.g., tank treatment and shredding) is inconsistent with retorting or mercury recovery activities. Based on the 1998 RMERC Report, the facility was identified as retorting very small quantities (0.02 tons) of mercury waste in 1995.

A telephone conversation with a Drug and Laboratory Disposal, Inc. representative confirmed that it is a RCRA facility but does not conduct mercury retort. Instead, it uses chemical means to treat hazardous wastes. They work with mercury retort facilities, such as Mercury Waste Solutions, Inc. and Bethlehem Apparatus, by using chemical treatment to reduce the components of a mercury-containing waste that make it undesirable for retort before sending the pretreated waste to another facility for thermal mercury recovery.

NSSI/Recovery Services, Inc., Houston, TX

Data in RCRIS show that the facility is RCRA-permitted to store and treat hazardous waste from offsite generators. Based on the 1998 RMERC Report, the facility is the only retorting operation capable of treating radioactive mercury wastes and indicates that organometallics are accepted.

This facility operates a continuous retorting system. The facility did not identify any technical obstacles to accepting the waste. However, they rarely, if ever, accept listed hazardous wastes due to the derived-from rule impacts on its treatment residue; because it operates continuously, treatment of a listed waste would result in a possibly much larger quantity of treatment residue carrying the hazardous waste code.

Salesco Systems USA, Phoenix, AZ

A company representative indicated that the facility can accept sludge containing mercuric sulfide, aside from permit restrictions related to the handling of wastes from Superfund sites (which do not apply in this case). With regard to the quantity of mercury in the waste (1 percent) and the organics content, Salesco Systems indicated that they would not have problems accepting the K175 sludge. To prepare a mercury waste high in organics for retort, the representative speculated that they might first use an adsorption process to separate the mercury from the organics and follow this by retort on the column to recover mercury.

Mercury Recovery Services, Inc. (MRS), New Brighton, PA

MRS specializes in the removal and recovery of mercury from soils and industrial and mining wastes and by-products. MRS uses a patented Mercury Removal/Recovery Process, a medium-temperature thermal process that has been used on a commercial scale to recover metallic mercury for reuse from wastes such as wastewater treatment sludge and K106. MRS offers mobile and fixed site equipment (i.e., set up on a customer site). The mobile units have a throughput capacity

of 4 tons per day. EPA has no information that indicates specifically whether or not the company would accept K175 wastes.

SepraDyne Corporation, Denton, TX

SepraDyne is a private resource recovery and industrial processing company offering modular processing units for recovery of mercury (i.e., set up on a customer site). Information is not available to better assess if the company would accept K175 wastes. SepraDyne uses a technology that combines high vacuum and indirect heat in a rotating retort. Wastes successfully treated include wastewater treatment sludge from a copper smelter. Vaporized mercury is recovered as elemental mercury in a low temperature condenser for eventual sale (Hawk et al., 1998).

Mercury Waste Solutions, Union Grove, WI

This facility conducts recycling of mercury containing wastes, and has been in operation since 1995. Wastes accepted include fluorescent lamps and mercury-containing products such as switches and thermometers, as well as contaminated soil and liquids. EPA has no information that indicates specifically whether or not the facility would accept K175 wastes. Database information indicated that the company has interim permit status for hazardous waste storage.

Other Mercury Treatment Vendors

Several other facilities were researched but available information indicated that the facilities conduct mercury treatment other than RMERC. These include the following:

- Universal Dynamics Limited has at least eight offices in the U.S. and Canada, one of which is in Bellingham, WA. The company develops technology for improving industrial process quality and productivity. They conceptualized and installed a nonthermal mercury recovery system, patented as REMERC™ (commercialized by Universal Dynamics under the name REMERC™), for Georgia-Pacific Corporation of Bellingham, WA (a chlor-alkali facility using mercury cell technology).

- Pioneer Chlor-Alkali, Inc., was granted its petition for a site-specific determination of equivalent treatment (DET) for the use of REMERC™ (described above) to treat its K106 wastes. The granting of the petition allows Pioneer to use REMERC™ to treat high mercury K106 wastes as long as they meet a 0.20 mg/L TCLP mercury numerical standard. After treatment to this standard Pioneer may dispose of the K106 wastes in a RCRA subtitle C landfill.

- Environmental Enterprises, Inc. (EEI) of Cincinnati, OH uses Therm-O-Detox® technology to recover mercury in metallic form from a variety of mercury containing wastes including solutions and various mercury compounds. A batch thermal desorption rotary system

under high vacuum volatilizes, collects and condenses metallic mercury. EEI claims to have mercury recycling capacity of over 4,000 tons of waste per year.

2.4.2 Discussion

Based on analysis of the above facility-specific information, the following observations, difficulties, or limitations are noted below:

- Borden's K175 waste has under 500 ppm of 40 CFR Part 261 Appendix VIII organics (see Appendix C for data). Therefore, facilities could potentially accept the waste and maintain their 'metals recovery' exclusion.

- D009 wastes with greater than 260 ppm (or 0.026 percent) are presently required to be retorted for mercury recovery. The level of mercury in Borden's waste (about 1 percent) is well above this level, and at least one facility (Salesco, Phoenix AZ) indicated during a telephone conversation (Appendix B) that a waste with 1 percent mercury represents a sufficient concentration for recovery.

- It was confirmed that some facilities (such as NSSI and Mercury Refining Company as identified in Appendix B) have regulatory impediments, but no apparent technical impediments, to accepting the waste.

- Some facilities (such as Burlington Environmental Inc. and EI Dupont De Nemours, both described in Appendix B) currently handle wastes that are dissimilar to K175 and therefore it is unlikely that they would be willing to accept the waste.

- Some facilities (such as Bethlehem Apparatus Corporation, NSSI, Mercury Refining Company, and Drug and Laboratory Disposal as described in Appendix B) handle various wastes with characteristics similar to K175, but not any single volume of wastes having all of the characteristics, and therefore each site would need to develop a treatment strategy to address the K175 wastes.

High concentrations (greater than 1 percent) of mercury sulfide, compared to other forms of mercury in wastes, create special considerations for RMERC. For example, retorting of K106 (which also contains mercuric sulfide) results in the recombining of elemental mercury condensed from the fuming process with available sulfide ions. Additives are needed to prevent recombination. Land disposal restrictions for K106 are currently promulgated as RMERC, but initially drew negative public comments disputing the effectiveness of RMERC for this waste, arguing it was not demonstrated (U.S. EPA, "Final Best Demonstrated Available Technology (BDAT) Background Document for Mercury Containing Wastes D009, K106, P065, P092, and U151," May 1990). Difficulties of mercury sulfide treatment were also documented in the EPA "Waste Specific Evaluation of RMERC Treatment Standard" 1998 report. Presently, several chlorine production facilities effectively manage their sulfide-

containing K106 in onsite RMERC units, demonstrating the applicability of RMERC for this mercury sulfide waste. Still, there is uncertainty in the ability of RMERC to effectively treat K175.

In response to Borden Chemical's assertion that the 500 ppm limit for Appendix VIII organics will keep their waste from being accepted by retort services, EPA recognizes that in general the presence of organic material could make treatment more difficult. However, EPA also points out that while K175 waste contains 2.3 percent organics, it contains less than 100 ppm 40 CFR Part 261 Appendix VIII organics which is well within the limit. EPA lacks evidence from Borden Chemicals that the sludge contains levels of Appendix VIII organics higher than this, so EPA believes K175 will be far enough below the 500 ppm limit, and that it is unlikely that the waste will be refused by treatment facilities on this basis.

Based on the above information, there is uncertainty regarding whether K175 can be successfully treated using RMERC technology. Because a numerical treatment standard is being finalized for mercury in K175 wastes, facilities can use any method (other than impermissible dilution) in meeting the standard. Mercury recovery, therefore, represents one potential method.

By examining the 1995 BRS, EPA found that approximately 3,200 tons of mercury containing waste was retorted in 1995 (includes both commercial and captive facilities) ("Waste Specific Evaluation of RMERC Treatment Standard," July 1998, EPA). Most of this quantity is represented by D009, in the form of inorganic solids. Table A-1 in Appendix A presents the BRS data used and presented in the 1998 RMERC report. EPA does not have a current estimate of nationwide RMERC capacity available, so EPA's assessment of available capacity for K175 will carry some uncertainty. However, EPA was able to identify capacity for select facilities to make inferences about available capacity. EPA cross-referenced the facilities identified by this report as facilities that potentially could accept K175 waste with mercury recovery capacity estimates for the same facilities from the Draft Background Document for Capacity Analysis for LDR Restrictions-Phase IV (1998).[39] According to the 1998 background document, two facilities identified in this analysis, Bethlehem Apparatus Company and Mercury Refining Company, have a combined mercury recovery capacity of more than 1,000 tons.

2.5 AVAILABLE WASTEWATER TREATMENT CAPACITY

Wastewater forms of K174 and K175 may require commercial treatment . EPA estimated available wastewater treatment capacity for the Phase IV rule.[40] In 1991, EPA's Office of Water developed the Waste Treatment Industry Questionnaire to collect information on centralized wastewater treatment capacity. The information collected during this effort represents 1989 data and includes maximum and available treatment capacity. Approximately 40 million tons (9.7 billion gallons)

[39] US EPA. Draft Background Document for Capacity Analysis for Land Disposal Restrictions — Phase IV: Toxicity Characteristic Metal Wastes and Newly Identified Mineral Processing Wastes (Final Rule). April 1998.

[40] U.S. EPA. Background Document for Land Disposal Restrictions -- Wood Preserving Wastes (final rule). April 1997. Pages 2-6 through 2-10.

of wastewater treatment capacity are available each year at 65 facilities. In addition, there are 11 additional treatment facilities that were not included in this estimate because they did not supply the requested capacity information. By assigning the average available capacity of 638,000 tons per year to each of the non-reporting facilities, EPA estimates a total available commercial wastewater treatment capacity of more than 47 million tons each year. According to data collected for the Third Third rulemaking, the capacity is in the form of many types of treatment such as biological, metal treatment, etc.

EPA used the 1991 BRS to confirm this estimate of available wastewater treatment capacity. Specifically, the PS form of the 1991 BRS contains information on the utilized and maximum capacity of the facility's waste treatment system. EPA found the total available wastewater treatment capacity reported in the BRS at facilities representing approximately 90 percent of the total operational capacity reported in the Waste Treatment Industry Questionnaire.[41] According to the 1991 BRS, these facilities had 33 million tons (7.9 billion gallons) of available capacity. Adjusting this estimate to reflect the fact that it represents an estimated 90 percent, rather than 100 percent, of the total operational capacity, approximately 37 million tons of available wastewater treatment capacity are available. This estimate compares favorably to the estimate of 47 million tons obtained from the Office of Water data.

[41] Specifically, the estimate includes all aqueous organic and/or inorganic treatment systems.

3. REQUIRED CAPACITY FOR CHLORINATED ALIPHATICS PRODUCTION WASTES

3.1 INTRODUCTION

This section describes the required treatment capacity for the newly listed K174 and K175 chlorinated aliphatics production wastes. The overall purpose of this analysis is to estimate the new demand for commercial Subtitle C treatment and recovery capacity resulting from the final listing of these hazardous wastes and simultaneous promulgation of land disposal restrictions. The quantity of K174 and K175 estimated to require commercial offsite treatment capacity as a result of this analysis is then compared to the national estimate of available Subtitle C commercial treatment capacity (presented in Section 2). In its promulgation of final LDR standards for these wastes, EPA uses data from the capacity analysis to assess the need for a national capacity variance from the LDRs as specified in RCRA 3004(h)(2).

This capacity analysis incorporates data and information on K174 and K175 generation and management collected during the EPA industry study of chlorinated aliphatics production wastes. Section 3.1 contains information on the processes generating K174 and K175. Section 3.2 describes the data sources used in estimating the quantities of K174 and K175 generated and managed. Section 3.3 presents EPA's assessment of the quantities of K174 and K175 potentially requiring commercial treatment. Sections 3.4 to 3.7 describe other aspects of the capacity analysis. Section 3.8 discusses the wastes that are impacted by revisions to F039 and UTS treatment standards.

3.1.1 Background

Information on the regulatory background of the K174 and K175 wastes, the processes that generate the wastes, and the regulatory definitions of these wastes is presented here. Specifically, regulatory background for K174 and K175 is presented in Section 3.1.1, industry overview is provided in Section 3.1.2, and a description of the processes generating the wastes are presented in Section 3.1.3.

Regulatory Background of Previous Solid Waste Regulations Affecting Industry

EPA previously promulgated a series of listings that apply to the chlorinated aliphatics industry in previous investigations in the 1980s. Many of the same facilities affected by these hazardous waste listings are likely affected by the final rule. These listings are associated both with general chlorinated aliphatics production processes and with the production of specific chlorinated aliphatic chemicals. These wastes, listed as hazardous in 40 CFR §261.31 and 261.32, are as follows:

- F024: Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five,

with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in §261.31 or §261.32.)

- F025: Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.

- K016: Heavy ends or distillation residues from the production of carbon tetrachloride.

- K018: Heavy ends from the fractionation column in ethyl chloride production.

- K019: Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.

- K020: Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.

- K028: Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.

- K029: Waste from the product steam stripper in the production of 1,1,1-trichloroethane.

- K030: Column bottoms of heavy ends from the combined production of trichloroethylene and perchloroethylene.

- K095: Distillation bottoms from the production of 1,1,1-trichloroethane.

- K096: Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane

The F-listed wastes were promulgated on December 11, 1989, and the K-listed wastes were promulgated on November 12, 1980. In addition to these listed hazardous wastes, there are a number of chlorinated aliphatics chemicals that are listed hazardous wastes when they are discarded, off-specification, container residues, or spills (U and P list wastes). Finally, a number of chlorinated aliphatic compounds are part of the toxicity characteristic; solid wastes containing these constituents above TC levels are hazardous wastes. These constituents are as follows:

- D019 Carbon tetrachloride
- D022 Chloroform
- D028 1,2-Dichloroethane

- D029 1,1-Dichloroethylene
- D033 Hexachlorobutadiene
- D034 Hexachloroethane
- D039 Tetrachloroethylene
- D040 Trichloroethylene
- D043 Vinyl chloride

The F024 listing, which covers a variety of process wastes from the manufacture of chlorinated aliphatics, specifically excludes two waste streams addressed in today's listing determination: wastewaters and wastewater treatment sludges (note that the listing determination includes both list and no-list decisions). In 1984, HSWA amended RCRA by instituting explicit new hazardous waste management requirements, including land disposal restriction (LDR) schedules for all listed hazardous wastes (Solvents and Dioxins, California List, First Third, Second Third, and Third Third). Congress directed EPA (through HSWA) to investigate wastes generated by the chlorinated aliphatics production industry [RCRA Section 3001(e)(2)]. In 1989, the Environmental Defense Fund (EDF) sued EPA, in part, for failing to meet the statutory deadlines of Section 3001(e)(2) of RCRA (EDF *vs*. Browner; Civ. No. 89-0598 D.D.C.). To resolve most of the issues of the case, EDF and EPA entered into a consent decree, which was approved by the court on December 9, 1994 and has been amended subsequently to revise dates. The consent decree sets out an extensive series of deadlines for promulgating RCRA rules and for completing certain studies and reports. Paragraph 1.m of the consent decree obliges EPA to promulgate a final listing determination on or before September 30, 2000 for wastewaters and wastewater treatment sludges generated from the production of chlorinated aliphatics (specifically, from the production of the same chlorinated aliphatics products specified in the F024 listing). The final K174 and K175 wastes include those studied as a result of the consent decree.

Chlorinated Aliphatics Wastes Listing

The wastes listed under 40 CFR Part 261 in today's rule are as follows:

- K174: Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the following conditions: (i) they are disposed of in a Subtitle C or non-hazardous landfill licensed or permitted by the state or federal government; (ii) they are not otherwise placed on the land prior to final disposal; and (iii) the generator maintains documentation demonstrating that the waste was either disposed of in an onsite landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in an offsite landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer or ethylene dichloride, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator

and the landfill owner/operator, invoices documenting delivery of waste to landfill, etc.) that the terms of the exclusion were met.

- K175: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.

It is important to note that an individual facility generating wastewater treatment sludge from the production of ethylene dichloride or vinyl chloride monomer may not necessarily be required to manage the waste as hazardous, due to the conditional listing. In fact, the vast majority of K174 waste presently generated would not require management as a hazardous waste under this conditional listing, as further described in Section 3.3.

3.1.2 Chlorinated Aliphatics Industries Overview

For the purposes of the current listing investigation, EPA defined "chlorinated aliphatic" as it had previously in the F024 listing. Specifically, a chlorinated aliphatic is defined as any organic compound characterized by straight-chain, branched-chain, or cyclic hydrocarbons containing one to five carbons, with varying amounts and locations of chlorine substitution. Hydrocarbons are organic compounds composed solely of the atoms hydrogen and carbon. Aliphatics occur where the chemical bonding between carbon atoms are single, double, or triple covalent bonds (not aromatic bonds). Cyclic aliphatic hydrocarbons included in this class consist of alkanes, alkenes or alkadienes, and alkynes. For an aliphatic to be chlorinated, the hydrogen atoms in the "aliphatic hydrocarbon" have been chemically replaced with chlorine atoms, at different positions and also in multiple positions. It should be noted that while the F024 and F025 definitions are limited to wastes generated from the production of chlorinated aliphatics by free radical catalyzed processes, EPA did not limit the current industry study to free radical catalyzed processes.

Chlorinated aliphatics products and intermediates were reported by industry from EPA's RCRA 3007 survey response (see Section 3.2.1). Following this most recent EPA data collection, additional facilities have closed while others have opened or increased capacity. Chlorinated aliphatic production volumes have increased significantly over the past several years. This trend of increasing production capacity is expected to continue in future, keeping total facility capacity in line with demand for chlorinated aliphatic products. Detailed discussion concerning chlorinated aliphatics production facilities is presented in EPA's Listing Background Document for the Chlorinated Aliphatics Industry Listing Determinations (1999). The effect of these changes on future waste generation was not investigated.[42]

Chlorinated aliphatics production facilities are primarily located in and around the petroleum industry along the Gulf Coast. The majority of these locations are fully integrated petrochemical

[42] Significantly, Borden Chemicals and Plastics (Geismar, LA) is expanding their acetylene-based VCM production process, a process generating K175. This is the only facility that generates K175 in the U.S. F-99-CALP-0006, Comments by Borden Chemical.

processing facilities in which chlorinated aliphatic wastewaters are co-managed with non-chlorinated aliphatic wastewaters creating a "non-dedicated" wastewater sludge. There are a number of facilities whose wastewater treatment systems manage only chlorinated aliphatics wastewaters; for the purpose of this report these treatment systems, and resulting sludges, are termed “dedicated”.

Chlorinated aliphatics production involves the production of both chlorinated products and intermediates. A chlorinated aliphatic “intermediate” is a chemical which is produced and consumed onsite in a chlorinated aliphatic process; a chlorinated aliphatic “product” is a chemical which is either sold or shipped off site or is consumed onsite in a non-chlorinated aliphatic process. For example, vinyl chloride monomer (VCM) consumed onsite in the manufacture of polyvinyl chloride (a polymer) is considered a product, while ethylene dichloride (EDC) consumed during the manufacture of VCM is considered an intermediate. The most significant chlorinated aliphatic product is VCM. This is most often produced using the balanced process, with EDC as an intermediate and/or co-product (i.e., the “EDC/VCM balanced process”).

3.1.3 Processes Generating Chlorinated Aliphatics Wastes

Chlorinated aliphatics are produced using several different production processes. The Listing Background Document identifies more than 20 different chemicals produced which are ‘chlorinated aliphatic’ products or intermediates. However, K174 and K175 wastes are produced only from the production of two of these products or intermediates. Specifically, K174 can be generated from the production of EDC/VCM using the balanced process, and K175 can be generated from production of VCM using the acetylene process. Facilities that do not use these processes do not generate the listed hazardous wastes. The EDC/VCM balanced process (which can generate K174) is the single most common process investigated in this industry. Conversely, there is a single U.S. facility (Borden Chemicals) which manufactures VCM using the acetylene process (which can generate K175). These two processes are discussed below. Characterization data for K174 and K175 are included in Appendix C.

Generic EDC/VCM Production Using the Balanced Process

Manufacture of EDC and VCM is the most common process in the chlorinated aliphatics industry. This process is used by 16 facilities. EDC/VCM manufacture accounts for the vast majority of the chlorinated aliphatics industry market share.

The balanced process consists of three primary reaction steps: 1) direct chlorination of ethylene to produce EDC, 2) thermal cracking of EDC to produce VCM and hydrogen chloride (HCl), and 3) oxychlorination of ethylene and HCl from thermal cracking to produce additional EDC. Prior to thermal cracking, the crude EDC undergoes purification. Typically EDC is manufactured as an intermediate in the subsequent manufacture of VCM. However, in some cases EDC is manufactured onsite and sent offsite as product or purchased from an offsite source and used onsite to manufacture VCM.

Following the manufacture of VCM, many facilities consume VCM on-site as an intermediate in the manufacture of polyvinyl chloride (PVC), however, this polymerization reaction was not investigated in the course of the Industry Study because it does not involve the manufacturing of 'chlorinated aliphatic' chemicals identified in the consent decree.

Wastes produced during the EDC/VCM production process are mainly generated from distillation and purification processes, scrubbers used during start-up/shut-down, washings, phase separation, rainwater, and equipment washdowns.

Two process wastewater streams are commonly formed from the manufacture of crude EDC. The most common process wastewater consists of water generated as by-product from the oxychlorination reaction, that is separated from the organic EDC phase; this aqueous phase also includes other wastewaters from caustic washing of wet crude EDC and removal of water from wet EDC. In addition, a second process wastewater that may be generated periodically consists of various scrubber waters generated during start-up/shut-down operations. These two process wastewater streams, along with steam stripped drainage wastewaters generated from equipment washdown and rainwater in the process areas are commonly commingled prior to management.

Wastewater treatment sludges are generated from the treatment EDC/VCM wastewaters. These sludges may be classified as K174. Sludges are generally dewatered using either plate-and-frame filter presses or belt filter presses and dewatered sludge is temporarily stored in roll-off containers prior to onsite or offsite transportation and management.

VCM Production Using the Acetylene Process (VCM-A)

Production of vinyl chloride monomer based on acetylene is less common than the aforementioned EDC/VCM balanced process using ethylene as feedstock. In fact, EPA's industry study identified only one chlorinated aliphatics facility (Borden Chemicals and Plastics; Geismar, LA) using the acetylene-based process. The quantity of VCM that can be produced from this process accounts for approximately 2 percent of the nationwide 1998 capacity of VCM production (www.chemexpo.com, "Vinyl Chloride Product Profile").

This process uses acetylene and anhydrous hydrogen chloride as raw materials in a hydrochlorination reaction to produce vinyl chloride monomer. The basic process chemistry is shown below.

$$CH/CH + HCl \quad ! \quad CH_2=CHCl$$

In the Borden process, acetylene (C_2H_2) from the onsite acetylene plant is first purified to remove water. Following drying, the acetylene is mixed with anhydrous hydrogen chloride (HCl) and flows through tubular catalytic reactors. Once in the reactors, the acetylene and HCl combine to form VCM (C_2H_3Cl). Mercuric chloride supported on activated carbon is used as the catalyst in all

reactors. The reactor products are sent to a phase separator. The liquid phases, consisting primarily of VCM, are forwarded to purification. The vapor phases are recycled to the reactor steps.

VCM purification consists of a series of distillation columns. Through this series of columns, the following compounds are recovered:

- Unreacted HCl and acetylene, which are recycled back to the reactors.
- Purified VCM, which is sold as a product.
- "Heavy ends" from the process. These are combusted onsite.

The only wastewater generated from this process is rainwater and other padwater collected from the process area. Due to the presence of residual mercuric chloride catalyst from catalyst change-outs on the process pad, the padwater (containing mercury) is forwarded to a separate sodium sulfide treatment system prior to being discharged under an NPDES permit.

Mercury sulfide wastewater treatment sludge is generated from the treatment of the process area padwater. This sludge is dewatered prior to temporary storage onsite in a container. This waste would be classified as K175.

3.2 DATA SOURCES

3.2.1 RCRA §3007 Questionnaire

EPA developed an extensive questionnaire under the authority of §3007 of RCRA for distribution to the chlorinated aliphatics production industry. The purpose of the RCRA §3007 Questionnaire was to gather information about solid and hazardous waste management practices in the U.S. chlorinated aliphatics production industry. EPA used this information to determine whether certain waste streams should be managed as hazardous under RCRA and added to the list of hazardous wastes under 40 CFR 261. The questionnaire included sections requesting information with respect to:

- Corporate and facility information
- Types of chlorinated aliphatic products and chlorinated aliphatic intermediates manufactured at the facility
- Types of processes at the facility
- Solvent use during the manufacturing process
- Specific production processes; as well as residuals generated
- Residuals characterization
- General residual management information
- Specific onsite residual management information
- Source reduction efforts, and
- Signed certification.

EPA found that 27 facilities manufactured chlorinated aliphatics in 1992, when the survey was distributed. The completed surveys were reviewed for completeness and data were entered into a relational data base. An exhaustive engineering review of each facility's response was conducted, resulting in follow-up letters and/or telephone calls to facility representatives seeking clarifications, corrections, and additional data where needed.

EPA suspended activity on this listing determination project for two and a half years between the fall of 1993 and spring of 1996. Upon resuming the listing determination activities in 1996, EPA initiated a review of data collected prior to the work stoppage. EPA contacted facility representatives to gather information regarding the current status of chlorinated aliphatics production operations. Ultimately, in June of 1997 EPA sent requests for updated data (for calendar year 1996) regarding consent decree wastes generated by each facility. Data from these responses were similarly reviewed and entered into a database. Based on the updated information, two chlorinated aliphatics manufacturers ceased operations, leaving a total of 25 chlorinated aliphatics production facilities operating as of 1997. As identified in Section 3.1.3, only 16 of the facilities produce EDC and/or VCM and therefore potentially generate K174 or K175.

Key data used from the survey results for the capacity analysis included: the names of facilities producing EDC and/or VCM, and quantities of wastewater treatment sludge produced and the site-specific management methods employed. Additionally (as described in Section 3.3.1), one facility was known to generate wastewater treatment sludge but no quantity was available. For this case, additional survey data employed included the quantities of wastewaters generated and treated onsite for the purpose of estimating sludge generation at this particular site.

3.2.2 Record Sampling and Site Visits

EPA initiated field activities with a series of engineering site visits. The primary purpose of the site visits was to gather first-hand information about production processes, as well as waste generation, management, and characterization data for each of the consent decree wastes. To fulfill these objectives, EPA selected 16 facilities for site visits prior to record sampling. These facilities were selected in order to obtain the most representative sampling of all chlorinated aliphatics processes, and to examine dedicated wastewater treatment units, when possible. EPA selected three of these facilities for familiarization samples, collecting a total of 15 samples to assess the effectiveness of the laboratory analytical methods for the analysis of the actual residuals of concern.

Upon completion of the familiarization sampling and analysis effort, EPA initiated record sampling and analysis of the two consent decree wastes (wastewaters and wastewater treatment sludges) from twelve facilities. EPA collected 52 samples (41 wastewaters and 11 wastewater treatment sludges). A portion of the wastewater samples were used in characterizing wastewaters, and portions of the wastewater treatment sludge samples were used in characterizing K174 and K175 wastes. These sampling and analysis data were used in the capacity analysis to identify potential treatment difficulties identified by public commenters to the proposed rule.

3.2.3 Biennial Reporting System

Data from the 1997 Biennial Reporting System were used to evaluate available onsite treatment capacity. BRS data contains onsite treatment or management practices for hazardous wastes generated by chlorinated aliphatics manufacturers. As discussed in Section 3.3.2 below, all chlorinated aliphatics manufacturers potentially generating K174 were investigated to determine if they had onsite hazardous waste incinerators, then assessed to determine if they reported burning wastes similar in form to K174 sludges.

The 1997 BRS data were also used to check if commercial treatment facilities combusted wastes similar in composition to the listed K174 wastes. Specifically, commercial facilities were investigated to determine how wood preserving waste F032 was commercially managed. Land disposal restrictions for F032 were finalized in May 1997, and therefore would have been effective for part of the reporting year. As identified in Section 2.1.4, F032 and the newly listed K174 wastes include dioxins and furans as the basis for listing (40 CFR Part 261 Appendix VII). Facilities that would accept F032, therefore, may similarly accept K174 as well.[43]

3.3 METHODOLOGY, ASSUMPTIONS, AND PRELIMINARY RESULTS

In conducting the capacity analysis for K174 and K175 chlorinated aliphatic production wastes, EPA estimated the quantities and evaluated the physical and chemical characteristics of the wastes that will require hazardous waste commercial treatment and/or recovery as a result of LDRs. The method that EPA developed for the K174 and K175 chlorinated aliphatic production wastes capacity analysis is comprised of three steps:

1. Estimate the annual quantity of K174 and K175 generated. Information on waste generation and current management practices (treatment, storage, disposal, and recycling) of K174 and K175 was collected in the RCRA 3007 surveys described in Section 3.2 of this report, Data Sources.

2. Estimate annual quantity of waste currently meeting LDR standards. Many facilities already manage their waste, onsite or offsite, using methods that would likely satisfy the LDR treatment standards. These management methods differ for each of the wastes. Management methods were determined using the RCRA 3007 surveys described in Section 3.2 of this report. The quantity being managed in this fashion can be subtracted from the required commercial treatment capacity.

3. Estimate annual quantity with onsite treatment or recovery availability. Many facilities have appropriate onsite treatment technologies that can result in all, or most, of the facility's

[43] LDR treatment standards for F024 wastes (generated from chlorinated aliphatics production) include a combination of a technology-specific standard of combustion, and numerical treatment standards for organic and inorganic constituents. On the other hand, LDR treatment standards for F032 explicitly identify dioxins/furans in a similar manner as being finalized for K174. For this reason the F032 data were evaluated.

generated waste volume being managed onsite and not requiring commercial treatment capacity. This assessment was made using sources such as BRS, described in Section 3.2 of this report.

The results of these three steps determine how much offsite commercial capacity is required to manage K174 and K175. Exhibit 3-1 summarizes the results of this analysis. The derivation of the quantities presented in Exhibit 3-1 is discussed in the subsequent sections.

Exhibit 3-1. Generation and Management Practices of K174 and K175 Wastes Following Effective Date of LDRs (quantities are averages, in tons, using 1996 data)

Waste Stream	(1) Annual Quantity Generated	(2) Annual Quantity Currently Meeting LDR Standards [a]	(3) Annual Quantity with Onsite Treatment/ Recovery Availability [b]	(4) Annual Quantity Requiring Commercial Treatment [c]
K174 Nonwastewater	6,100	20	0	6,100
K175 Nonwastewater	130	0	0	130

Quantities of K174 and K175 wastewaters are negligible. All quantities are rounded.

a. Quantity in which current management practice is assumed to meet LDR standards.

b. Estimated quantity of wastes that could be managed onsite, but are not (such as management in incinerators).

c. Estimated quantity requiring offsite commercial treatment. Equals column 1 minus column 2 minus column 3.

EPA's capacity analysis is similar for each of the newly listed wastes. For both K174 and K175, EPA evaluated the total quantity of such sludge actually generated by the facilities. For K174, EPA initially proposed two regulatory options for listing. In the first contingent listing option, only K174 waste that is not landfilled would have met the listing criteria. In the second option, all of the K174 waste would have been listed as hazardous. In the final listing determination, EPA has selected the first contingent listing option, as it was proposed. Therefore, this capacity analysis considers only the contingent option that is being finalized today.[44]

For K175, only one facility was found to generate this waste. This facility's waste is generated from wastewaters segregated from other processes (i.e., prior to headworks). This quantity was used in the capacity analysis for determining required treatment capacity.

It is important to note that, for these analyses, if any facility undergoes waste minimization activities by modifying physical plants or incorporating units to separate the wastes and deem the wastes more amenable to recovery, the quantity requiring treatment will decrease. Therefore, if

[44] Wastewater treatment systems at chlorinated aliphatics facilities may receive wastewaters from the production of more than one product class. The total quantity of sludge generated, and reported, by industry was used in the capacity analysis to identify quantities of K174. This is sometimes different than the quantities that EPA used in its other analyses. For example, in the risk assessment EPA categorized those EDC/VCM sludges generated solely from treatment of wastewaters generated from the production of chlorinated aliphatics as "dedicated," while those sludges generated from wastewaters derived both from chlorinated aliphatic production processes and other facility processes and sources are "non-dedicated." US EPA Risk Assessment Technical Background Document for the Chlorinated Aliphatics Determination. July 1999.

generating facilities continue waste minimization efforts following the promulgation of the final rule, then the quantity of hazardous waste requiring treatment would decrease (if the wastes are listed as hazardous). Such waste minimization activities include modifying wastewater treatment processes (to segregate chlorinated aliphatic production wastewaters from other wastewaters, for example), volume reduction activities (e.g., more efficient sludge dewatering), or activities to make the waste more amenable to recovery.

3.3.1 K174 Wastes

Because the physical characteristic of K174 is a sludge, EPA expects K174 to be generated in nonwastewater form; no commenters provide generation and treatment data for wastewater forms of K174. Therefore we determine that the quantity of wastewater forms of K174 (e.g., resulting from treatment of K174 sludge) is zero and would therefore not require alternative commercial treatment. Even if wastewater forms of K174 are generated, sufficient wastewater treatment capacity is available (See Section 2.5) to treat the wastewater and meet LDR standards.

EPA evaluated the quantity of K174 requiring offsite commercial treatment using the three step process described in Section 3.3. First, EPA estimated the quantity of K174 generated annually. Second, EPA estimated how much of this quantity was already managed in a manner consistent with the land disposal restrictions. Third, EPA estimated the potential onsite treatment capacity for this sludge. Results are summarized in Exhibit 3-3 later in this section.

EPA relied on the waste management information presented in Exhibit 3-2 in evaluating the required capacity. Exhibit 3-2 lists all 13 facilities reporting the generation of EDC/VCM sludges in 1996, or from public comments to the 1999 proposed rule.[45] Exhibit 3-2 further describes which of these facilities are likely to generate K174 based on the most recently available management practice information. Management practice is significant because as promulgated, the waste would not be hazardous (or subject to LDRs) if managed in a Subtitle D or Subtitle C landfill. EPA used data from the 1997 RCRA survey, summarized in Exhibit 3-2, to determine that only three facilities would generate a hazardous waste under this option (assuming that the management practices conducted in 1996 are conducted now). One facility reported management by incineration (Condea Vista/Westlake, LA), and a second reported land treatment (Georgia Gulf/Plaquemine, LA) in 1996. These two facilities generated a total of 1,770 metric tons (1,950 tons) of K174 waste in 1996.[46] Management at a third facility (Shell Deer Par, TX) is described below.

[45] In Section 3.1.3, 16 facilities were identified as producing EDV/VCM using the balanced process, while Exhibit 3-2 shows only 13 facilities generating EDC/VCM sludges. The discrepancy is due to facilities who do not generate the sludge or did not provide information on waste generation and management.

[46] These quantities, as well as all quantities presented in Exhibit 3-2, refer to the total quantity of sludge generated by the facility in which EDC/VCM wastewaters contribute to the sludge composition. This is different than the lower quantities used in EPA's risk assessment, which 'isolated' the contributions from EDC/VCM production.

Exhibit 3-2. Summary of Waste Management Practices for K174 and EDC/VCM Sludges

Facility	Quantity Generated (MT) (Based on 1996 Survey Data)	Waste Management Practice (based on 1996 Survey Data)	Meets Final Listing Definition?	Onsite Incineration Conducted? (Based on BRS) [a]	Commercial Incineration Needed?
Borden Chemicals and Plastics, Geismar, LA	2,904	Offsite NH landfill	No	–	–
Dow Chemical, Freeport, TX	77,850	Onsite NH landfill Onsite Haz. landfill	No	–	–
Dow Chemical, Plaquemine, LA	11,100	Onsite NH landfill	No	–	–
Formosa, Baton Rouge, LA	700	Offsite NH landfill	No	–	–
Formosa, Point Comfort, TX	3,688	Offsite NH landfill	No	–	–
The Geon Company, LaPorte, TX	1,804	Offsite NH landfill	No	–	–
Georgia Gulf, Plaquemine, LA	1,750	Onsite land treatment	Yes	No	Yes
Occidental Chemical, Convent, LA	500	Offsite NH landfill	No	–	–
Occidental Chemical, Deer Park, TX	442	Offsite Haz. landfill	No	–	–
Oxymar, Gregory, TX	1,605	Offsite NH landfill Offsite Haz. landfill	No	–	–
PPG Industries, Lake Charles, LA	2,200	Offsite NH landfill	No	–	–
Condea Vista Chemical Company, Westlake, LA	18	On- and offsite Haz. incin.	Yes	N/A	No
Shell Chemical Company, Deer Park, TX [b]	3,820	N/A	Yes	No	Yes
TOTALS	108,381		3 facilities	2 facilities	2 facilities, 5,570 MT

Data Source: RCRA §3007 Questionnaire for the Chlorinated Aliphatics Industry update (1996 data), as reported in Tables 4-8 and D-2 of 'Listing Background Document for the Chlorinated Aliphatics Listing Determination (proposed rule),' July 1999.

a. Onsite incinerator availability information is from 1997 BRS. 'No' indicates facility did not report the onsite incineration of any solids or sludges in 1997.

b. This facility manages VCM process wastewater from the OxyVinyls Deer Park facility in a surface impoundment. The volume of generated sludge was estimated using data in the Economics Background Document. Calculations from Exhibit C-2 present the median ratio of sludge quantity to wastewater quantity, for all facilities supplying such data. This ratio (0.041%) was applied to Shell's total wastewater treatment throughput of 9.3 million metric tons (based on Shell's public comment CALP-00011 to the proposed rule).
NH: Non-Hazardous; Haz: Hazardous

In public comments to the proposed rule, one facility reported managing wastewaters from EDC/VCM production in a surface impoundment (Shell, CALP-00011). An EDC/VCM production facility (Oxyvinyl, Deer Park Texas) pipes its wastewater to Shell (also in Deer Park Texas), where the wastewater is mixed with other non-chlorinated aliphatics related waters and managed in biological treatment surface impoundments. In its public comments, the Shell facility did not report the quantity of sludge generated, but did report the quantity of wastewater managed in the impoundment, both the total quantity and the quantity from Oxyvinyl only. EPA estimated the sludge quantity using Shell's total wastewater throughput of 9.3 million metric tons per year and a ratio of 0.041 percent (this represents the quantity of sludge generated per quantity of wastewater throughput). This percentage is derived from sludge and wastewater quantities from 13 facilities, and represents the median quantity as indicated in the 'Economics Background Document' for the 1999 proposed rule.[47] Applying this percentage to the quantity of wastewater reported to be generated results in an estimated annual generation quantity of sludge from Shell Deer Park of 3,820 MT (4,200 tons). This is shown in Exhibit 3-2. For the capacity analysis, EPA assumed that any quantity of sludge generated by the Deer Park facility (estimated as 3,820 MT or 4,200 tons) might also require offsite commercial treatment in order to meet the LDR standards.

The Condea Vista facility conducting hazardous waste incineration is expected to be able to continue this practice following promulgation of the rule. Only 20 metric tons (22 tons) are presently managed by incineration and would not require further treatment or alternative management. The 1,750 metric tons (1,925 tons) that are land treated would require alternative treatment in order to meet the final LDR standards. Based on the Questionnaire update and 1995 BRS data, the Georgia Gulf facility does not have an onsite incinerator or landfill. Therefore, the 1,750 metric tons (1,925 tons) generated by this facility might require offsite commercial treatment in order to meet the LDR standards.

EPA's capacity analysis for the K174 contingent management option is presented in Exhibit 3-3. The Georgia Gulf facility could avoid a hazardous designation of the waste, and reduce industry-wide required treatment capacity to 3,820 MT (4,200 tons), by sending the waste to a Subtitle D or Subtitle C landfill since under the promulgated rule the waste would not be subject to listing or LDRs if managed this way. The Shell facility could also avoid a hazardous waste designation by converting its surface impoundment system to a tank system, or discontinuing treatment of the Oxychem VCM wastewater. The facility may remove K174 waste in the impoundment before the effective date of the new listing and therefore may not be subject to LDR requirements. Therefore, total quantity which requires alternative treatment to meet LDRs may be little to none for this facility.

[47] Exhibit C-2 of EPA's July 1999 'Economics Background Document: Proposal by the USEPA to List Wastewaters and Wastewater Sludges from Chlorinated Aliphatic Chemical Manufacturing Plants as RCRA Hazardous Waste Codes K173, K174, K175.'

Exhibit 3-3. Capacity Analysis Summary for Nonwastewater Forms of K174	
Step in Methodology	**Quantity, MT (and tons)**
1. Annual Quantity Generated	5,600 MT (6,100 tons)
2. Annual Quantity Currently Meeting LDR Standards	20 MT (22 tons)
3. Annual Quantity that Could be Managed Using Onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	5,600 MT (6,100 tons)

While only the three facilities identified above are expected to generate K174, other EDC/VCM production facilities would generate solid wastes. For these other facilities, the sludges would still remain subject to existing solid and hazardous waste requirements. For example, four facilities reported managing sludges from VCM production as a characteristic or listed waste in EPA's 1997 survey.[48] Each of the facilities would continue to be subject to the existing D, F, and K listings as applicable and would not require any changes in management as a result of this final rule. Further, additional facilities may find that they generate characteristically hazardous wastes in the future that would require alternative treatment to meet UTS; if the waste was not landfilled it would simultaneously carry the K174 waste code as well. EPA emphasizes that such treatment would be required due to treatment standards associated with the UTS. Because the K174 treatment standards are a subset of UTS, EPA therefore anticipates no additional need for alternative treatment capacity in the future, even if facilities change their management practices to comply with other solid and hazardous waste requirements.

3.3.2 K175 Wastes

K175 is generated in nonwastewater form (i.e., a sludge); no comments provided generation and treatment data for wastewater forms of K175, therefore we determine that the quantity of wastewater forms of K175 (e.g., resulting from treatment of K175 sludge) is zero, and would therefore not require alternative commercial treatment. Even if wastewater forms of K175 are generated, sufficient wastewater treatment capacity is available (see Section 2.5) to treat the wastewater and meet LDR standards.

Only one facility reported generating K175: Borden Chemicals and Plastics in Geismar, LA, at a rate of 120 metric tons/year (130 tons/year). The waste is generated from wastewaters resulting from the change-out of mercury chloride catalyst from the chlorinated aliphatics production process, as well

[48] Based on information from the Listing Background Document for the proposed rule, these four facilities are Occidental/Oxymar, Gregory, TX (its 625 MT (690 tons) of sludge is managed as an 'F and K' waste in a Subtitle C landfill); Occidental, Deer Park, TX (its 442 MT (490 tons) of sludge is managed as a 'K' waste in a Subtitle C landfill); Dow Chemical, Freeport TX (it reports managing waste as a 'D' waste in a Subtitle C landfill, however it did not report generating any waste in the reporting year), and Condea Vista, Westlake, LA (its 18 MT (20 tons) of sludge is managed as a 'D' waste in a hazardous waste incinerator and was already included in the K174 capacity analysis).

as other process area streams such as runoff and leaks. The wastewater is treated with sodium sulfide to generate a mercury sulfide waste. EPA collected a single sample of this wastewater treatment sludge during its record sampling activities. Analysis determined that the sludge had very high levels of mercury (9,200 ppm of total mercury; 0.26 ppm of mercury by the TCLP). The TCLP concentration exceeds the maximum concentration for the Toxicity Characteristic (0.2 ppm -- D009). The sludge from the single generator of K175 is currently managed at a hazardous waste landfill in Carlyes, Louisiana[49] (from EPA, Stabilization and Testing of Mercury Containing Wastes, March 31, 1999; and site visit report for Borden Chemicals in Geismar Louisiana).

For nonwastewater forms of K175, EPA is promulgating a treatment standard consisting of the following requirements: 0.025 mg/L TCLP mercury; a pH #6.0; and the waste must be macroencapsulated in accordance with 40 CFR 268.45 Table 1 unless the waste is placed in: (1) a Subtitle C monofill containing only K175 wastes that meet all applicable 40 CFR 268.40 treatment standards; or (2) a dedicated Subtitle C landfill cell in which all other wastes being co-disposed are at pH#6.0. Borden's present management method would not comply with these standards, because the waste was found to exhibit TCLP mercury above 0.025 mg/L (as shown in Appendix C), the hazardous waste landfill present used for the disposal of this waste generates leachate with a pH greater than 9 (64 FR 46511, August 25, 1999), and macroencapsulation is not known to be presently conducted prior to disposal.

The Borden Chemicals facility does not have alternative onsite capacity. Specifically, although Borden may be able to adjust their process to generate a waste that would exhibit lower levels of TCLP mercury at the identified pH, it does not have an onsite landfill to allow for the disposal of the waste onsite.

In conclusion, the entire quantity of K175 presently generated, 120 MT (130 tons), would require alternative disposal in a landfill where the disposal of wastes in excess of pH 6.0 is prohibited. This quantity may also require alternative treatment such that the waste would exhibit TCLP mercury concentrations below the numerical limit being finalized. The findings of the capacity analysis for newly listed hazardous waste K175 are summarized in Exhibit 3-4.

Exhibit 3-4. Capacity Analysis Summary for K175

Step in Methodology	Quantity, MT (and tons)
1. Annual Quantity Generated	120 MT (130 tons)
2. Annual Quantity Currently Meeting LDR Standards	0
3. Annual Quantity that Could be Managed Using Onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	120 MT (130 tons)

[49] In 1988 the Louisiana DEQ determined the waste was not hazardous, and therefore not subject to many RCRA regulations (including land disposal restrictions for D009). Despite the nonhazardous designation, it is sent to a hazardous waste landfill for disposal.

3.4 CONTAMINATED SOIL AND DEBRIS

In addition to the production wastes generated from chlorinated aliphatics manufacturers on a routine basis, EPA also considered the quantity of contaminated soil and debris present at these facilities. For soil and debris contaminated with the newly listed wastes, EPA is finalizing its decision to not grant a national capacity variance. EPA believes that the majority of contaminated soil and debris can and will be managed onsite and therefore would not require substantial offsite commercial treatment capacity. Therefore, EPA is not granting a national capacity variance to hazardous soil and debris contaminated with the newly listed wastes covered under this rule.

EPA believes that a number of factors will help maintain adequate LDR treatment capacity for soil and debris contaminated with newly listed wastes. First, it is possible to treat and/or manage hazardous waste without triggering LDR treatment standards. For LDR standards to be triggered, contaminated soil must be removed from the land (i.e., generated) and managed in a manner constituting land disposal. If the contaminated soil is not removed from the land via excavation (e.g., in-situ treatment), then the LDR standards will not be applied to these wastes. In addition, if hazardous soil is excavated, LDR standards will only apply if the subsequent management is considered "land disposal" for the purposes of the LDR program. If a contaminated soil is managed within an area of contamination (AOC), even if it is "removed from the land" within such an area, the soil would not be considered generated, and the LDR treatment requirements do not apply. (For more information, see the most recent EPA guidance, a March 13, 1996 EPA memo titled, "Use of the Area of Contamination Concept During RCRA Cleanups." (Available from the RCRA Hotline, or http://www.epa.gov/rcraonline or http://www.epa.gov/epaoswer/hazwaste/ldr/guidance.html.)

Contaminated soil can also be managed onsite through the use of a corrective action management unit (CAMU) and temporary unit (TU). This allows an area of land at a facility to be designated a CAMU and receive remediation wastes without triggering LDR standards or minimum technological requirements (MTRs). This rule was finalized on February 16, 1993 (58 *FR* 8659) and is codified in 40 CFR Part 264 Subpart S. On August 22, 2000 (65 FR 51080), EPA proposed amendments to the CAMU standards. If finalized, the proposed amendments would modify the types of waste that may be managed in CAMUs, the design standards that apply to CAMUs, the treatment requirements for wastes placed in CAMUs, information submission requirements for CAMU applications, responses to releases from CAMUs, and public participation requirements for CAMU decisions.[50] However, the CAMU would still be exempt from LDR and MTR standards.

Additionally there are new technologies becoming available to treat contaminated soil and debris that still might require further treatment. According to U.S. EPA's Capacity Analysis Background Document for Phase IV Wastes (U.S. EPA, 1998), currently there are 108 venders using innovative treatment technologies to treat contaminate soils onsite. These innovative treatment technologies being used include soil vapor extraction, thermal desorption, ex-situ bioremediation, in-situ

[50]On May 14, 1993, a petition for review was filed with the U.S. Court of Appeals for the District of Columbia Circuit. Environmental Defense Fund v. EPA, No. 93–1316 (D.C. Cir.). The proposed amendments are part of an EPA settlement with petitioners on the CAMU litigation. The current Part 264/265, Subpart S regulations are still in effect until the rule is finalized.

bioremediation, soil washing, solvent extraction, dechlorination as well as other innovative treatment technologies.[51]

Second, for those contaminated soils for which the LDRs are triggered, recent EPA action will decrease demand for BDAT treatment capacity. Specifically, in the final Phase IV LDR rule (63 *FR* 28556, May 26, 1998), EPA promulgated alternative LDR treatment standards (10 times the universal treatment standard (UTS) or 90 percent reduction) for soils contaminated with hazardous wastes. EPA believes that these less stringent treatment standards will increase the availability of capacity to treat soil contaminated with newly proposed inorganic chemical production wastes. EPA recognizes that implementation of the alternative soil treatment standards probably will not be immediate because States are not required to adopt less stringent RCRA rules and because there will be some time between the selection and actual implementation of remedial treatment technologies. Nevertheless, EPA believes that these alternative treatment standards will provide another viable option for facilities with contaminated soils to comply with LDR requirements.

Third, the LDRs also provide flexibility in selecting treatment methods for debris contaminated with the proposed inorganic production wastes. EPA previously identified 17 different treatment methods as BDAT for hazardous debris; these methods fall into one of three categories; extraction (e.g., abrasive blasting, liquid or vapor phase solvent extraction, thermal desorption), destruction (e.g., biodegradation, chemical oxidation, thermal destruction), or immobilization (e.g., macroencapsulation or microencapsulation). 57 *FR* 37194 (August 18, 1992). Hazardous debris that has been treated using one of the specified extraction or destruction technologies and that does not exhibit a hazardous waste characteristic after treatment, is no longer a hazardous waste and need not be managed in a Subtitle C facility. Hazardous debris contaminated with a listed waste that has been treated by one of the specified immobilization technologies is still a hazardous wastes and must be managed in a Subtitle C facility (see 40 CFR 268.45 (c)). The hazardous debris rule also gives generators the option of treating the debris to the waste-specific treatment standards for the waste contaminating the debris, although the treated debris must then continue to be managed as a hazardous waste. EPA believes that this flexible approach for contaminated debris helps ensure adequate treatment capacity for these materials.

Fourth, the LDR program allows facilities to petition EPA to modify LDR requirements. If necessary, a facility can apply for a case-by-case extension or a treatability variance to manage or treat these soil and debris wastes.

Finally, given the current state of uncertainty surrounding certain pending EPA and Congressional actions, LDR treatment capacity for contaminated media is likely to remain adequate for at least the next few years. Until the CAMU litigation is resolved, there may continue to be some degree of unwillingness by hazardous waste generators to initiate voluntary remedial activities under the flexible approach authorized by the CAMU rule. Moreover, several bills are pending in Congress that would amend RCRA to provide EPA and the States with greater flexibility with respect to LDR

[51] US EPA Background Document for Capacity Analysis for Land Disposal Restrictions - Phase IV: Toxicity Characteristic Metal Wastes and Newly Identified Mineral Processing Wastes (Final Rule). Pages E-50 through E-72 April 1998.

treatment requirements for contaminated media. This uncertainty over regulatory requirements, in turn, has contributed to a decrease in the demand for commercial treatment for contaminated media.

3.5 MIXED RADIOACTIVE WASTES CONTAMINATED WITH K174 AND K175

EPA identified no quantity of K174 and K175 destined for treatment as mixed radioactive wastes. EPA is not granting a national capacity variance for mixed radioactive wastes or for soil and debris contaminated with mixed radioactive wastes.

3.6 UNDERGROUND INJECTED WASTES

EPA identified no quantity of K174 and K175 that is presently managed by underground injection. EPA is not granting a national capacity variance for underground injected wastes.

3.7 OTHER REGULATIONS RELEVANT TO K174 AND K175

Each of EPA's major program offices has long-standing regulatory controls that apply to the chlorinated aliphatics industry. Some of the more significant programs with some relevance to OSW's land disposal restrictions include the following:

- The Clean Air Act's National Emission Standards for Hazardous Air Pollutants (NESHAPs) for organic hazardous air pollutants from the synthetic organic chemical manufacturing industry at 40 CFR Part 63 include the following regulations:
  - Subpart F, which applies to any plant which produces ethylene dichloride (EDC) via oxychlorination, vinyl chloride monomer (VCM) by any process, or one or more polymers containing any fraction of polymerized VCM and limits the concentration of vinyl chloride to less than 10 ppm in process wastewaters and sets standards for emissions of VCM from a variety of fugitive emission sources.
  - Subpart G, which regulates process vents, storage vessels, transfer operations, and wastewater.
- The Clean Air Act's National Ambient Air Quality Standards (NAAQS), which prescribe limits for SOx, CO, particulates, NOx, and ozone.
- The Clean Water Act sets specific effluent guidelines for discharges to surface waters and POTWs for facilities in the organic chemical, plastic, and synthetic fibers sector, which includes manufacturers of chlorinated aliphatics.
- The Toxicity Characteristic, particularly for chlorinated aliphatic chemicals (e.g., vinyl chloride, D043), in combination with existing K and F hazardous waste listings applicable to chlorinated aliphatics (e.g., F024). There are existing land disposal restrictions (LDR) for such wastes.

EPA is presently pursuing regulatory approaches which may impact facilities manufacturing chlorinated aliphatics and generating K174 and K175. These programs, in part identified from the April 24, 2000 Unified Agenda (www.gpo.gov), are as follows:

- Land Disposal Restrictions; Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards: EPA published an Advanced Notice of Proposed Rulemaking (ANPRM) to solicit data and comments on treatment data that EPA has gathered on the treatment of mercury wastes (May 28, 1999; 64 *FR* 28949). The data and information gathered by this ANPRM process are intended to be used to propose revised treatment standards for some forms of mercury hazardous wastes in a future rulemaking.

- NESHAP for Chlorine Production: EPA is evaluating emissions from facilities engaged in the production of chlorine and sodium hydroxide (caustic). Hazardous air pollutants emitted include mercury. Some of these facilities may be co-located with chlorinated aliphatics producers. A proposed rule is expected to be published November 2000.

- NSPS for Synthetic Organic Chemicals Manufacturing Industry: EPA proposed a rule (September 12, 1994) to develop a new source performance standard to control air emissions of volatile organic compounds from wastewater treatment operations of the synthetic chemical manufacturing industry. The rule is scheduled to be finalized in September 2000. Generators of K174 and K175 would likely be subject to this rule, and because it impacts wastewater treatment operations the quantities of K174 and K175 may be affected although the direction or magnitude of any change in waste quantities is difficult to predict.

The effects of these programs are difficult to assess because they are preliminary. If necessary, EPA will reassess the impacts of these regulations on the LDRs for K174 and K175 waste generation and management when these relevant regulatory programs are further developed or are finalized.

3.8 WASTES SUBJECT TO REVISED UTS AND F039 STANDARDS

In comments to the proposed rule, several commenters expressed concern that EPA did not adequately consider the need for alternative treatment capacity for characteristically hazardous wastes or for F039 wastes. Such additional treatment would be necessary to meet the treatment standards for the five additional dioxin and furan congeners in the final rule. Commenters noted that EPA must consider the potential need for national capacity variances by determining what fraction of the hazardous wastes are required to meet these new requirements, the appropriate means of treatment (if any), and the sufficiency of national treatment capacity for these wastes. Additionally, one commenter was concerned with the ability and capacity of laboratories to analyze wastes for these contaminants due to the high volume of characteristic wastes generated.[52]

[52] In its comments, ETC (CALP-00015, page 13) stated that the "extremely low levels for these five congeners are set at the quantitation limit of Method 8280A. This additional analytical burden will add substantial cost to the management of characteristic wastes. Considering the high volume of characteristic wastes, it will also raise problems

In response to these comments, the universe of wastes that could be impacted by revisions to the F039 and UTS treatment standards were evaluated. First, EPA notes that wastes are impacted by this change if they meet the following conditions: (1) the waste is managed using land disposal; (2) the waste is not already managed in an onsite or offsite treatment system capable of treating dioxins and furans, including hepta and octa congeners; and (3) the five additional dioxin and furan congeners are present at levels above the treatment standards. The effects from some, but not all, of these factors were quantified in identifying upper bound estimates of 6.7 million tons per year of wastewater forms of F039, and 68,000 tons per year of nonwastewater forms of F039, that could potentially be affected by the promulgated changes. For example, this estimate assumes that the five additional dioxin and furan congeners are present at levels above the treatment standards in all wastes, when in fact available leachate characterization data (discussed in Section 3.8.1) indicate that the five new dioxin and furan congeners are present above their treatment standards in only one of 15 samples identified. Additionally, it assumes that F039 is the only waste code present (however, in fact, a waste stream reported in the BRS usually has more than one waste code, i.e., the waste stream has mixed codes reported). It also assumes that all of the wastes are managed using land disposal unless information indicated otherwise. The estimate represents quantities of waste managed using technologies not expected to result in treatment of dioxin and furan congeners to below UTS. Technologies expected to result in adequate treatment of dioxins and furans are discussed in Section 3.8.2.

For wastes subject to UTS because they are characteristic wastes (i.e., hazardous waste codes D001 to D043), EPA notes that there is much more variability associated with the waste composition of characteristically hazardous wastes. Nevertheless, many of the same factors noted for the F039 evaluation are relevant here, including whether the waste is managed on the land, if it is already managed in a way that is likely to destroy dioxin and furans, and if the five additional congeners are expected to be the only dioxin and furan congeners present in the waste above UTS. Based on analysis of the available data (given its variability), EPA projects that no more than 13 million tons of wastewater and 130,000 tons per year of nonwastewaters (i.e., in the form of sludges and solids) which are characteristically hazardous wastes would be potentially impacted by the rule finalizing the additional treatment standards for UTS. These quantities represent an analysis of characteristic wastes only (having no overlap with F039 or other waste types).

EPA has previously estimated that approximately 37 million tons per year of commercial wastewater treatment capacity are available, and well over one million tons per year of liquid, sludge, and solid commercial hazardous wastes combustion capacity (up to 650,000 tons per year for solids and non-pumpable sludge based on 1997 BRS data - Exhibit 1 of Appendix E) are available (see Section 2.1.2 and Appendix E for more discussion). These are well above the quantities of wastewater and nonwastewater forms of F039 and wastes subject to UTS potentially requiring treatment even under the screening assumptions described above. As a result, EPA is not granting a capacity variance and is not delaying the effective date for adding these five hepta and octa dioxin and furan congeners to the lists of F039 and UTS.

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with regard to laboratory capacity to analyze these new dioxin and furan congeners as UHCs. Many interferences and analytical matrix problems can be expected as the proposed standards are set at the quantitation limit of the method most commonly available. This could raise substantial disruption to the management of many characteristic wastes."

3.8.1 Dioxin Content of Landfill Leachate

Landfill leachate data from the Office of Water's January 2000 final rule regarding wastewater generated by landfill operators were reviewed.[53] This report presented EPA sampling data of 15 samples from four hazardous waste landfills generating leachate; all 15 samples were analyzed for tetra through octa dioxin and furan congeners. Ten of the 15 samples from hazardous waste landfills contained at least one dioxin or furan congener, and all ten samples contained hepta and octa dioxin and furans. Only one of the ten samples contained tetra, penta, or hexa dioxin and furans (at levels below UTS). This same sample exceeded proposed UTS for OCDD (i.e., the proposed limit is 63 ng/L and the sampled value was 116 ng/L). No other samples showed any levels of dioxin or furans above UTS. In other words, only 10 percent of the samples that were found to contain any dioxin or furan (and less than 7 percent of total samples) exceeded UTS.

All 15 samples would very likely be classified as F039, but there is uncertainty. It should be noted that the quantities considered are derived from waste streams "containing" F039 (i.e., mixed codes of F039 and/or TC with other codes), so the F039 quantities associated with these sampling data should be treated as potential overestimates. For a number of reasons, the universe impacted by the addition of the new congeners could be more narrow than the sampling data may suggest. Of those streams that truly represent F039, only a portion are solely F039. Of those quantities that are F039, only a portion contains dioxin and furans. Furthermore, a portion of those may contain only hepta- and/or octa- dioxin and furans (no tetra, penta, or hexa), and a smaller portion may actually have hepta and/or octa dioxin and furans above UTS. Seven to ten percent may be a high estimate for the proportion of cases in which the five additional dioxin and furan congeners are present above UTS.

EPA also examined sampling data from Industrial D and municipal landfills. These leachates may or may not be classified as F039, depending on whether the landfill contains waste presently classified as hazardous (so the same overestimation considerations apply). Eleven samples of leachate and seven samples of filter sludge, from a total of twelve facilities, were analyzed for tetra through octa dioxin and furan congeners. None of the filter cake residues exceeded the proposed or existing dioxin and furan UTS. One of the leachate samples exceeded the proposed UTS for OCDD (proposed level of 63 ng/L; sampled level of 5,300 ng/kg). This particular sample also showed detectable levels of hexa and hepta dioxins, although at levels below UTS. No other samples showed any levels above the proposed or existing dioxin and furan standards. This Development Document also contained historical data from ash monofills. These data are not summarized here because generated leachate may not meet the definition of F039.

The following conclusions are drawn from these data:

- Hepta and octa isomers of dioxins and furans are typically present in conjunction with lower (i.e., tetra, penta, or hexa) congeners.

[53] US EPA, Development Document for Final Effluent Limitations Guidelines and Standards for the Landfills Point Source Category, EPA-821-R-99-019, January 2000. Available at: www.epa.gov/ostwater/guide/landfills/index.html.

- Hepta and octa isomers may occasionally exhibit concentrations above the F039 treatment standards in leachate. These data may signify some additional impacts; however, because the facility has previously identified dioxins and furans in its waste, it may already have a treatment system in place to treat dioxins and furans.

- Hepta and octa isomers do not exhibit concentrations above the F039 treatment standards in filter cake generated from leachate.

3.8.2 Quantities of F039 Generated and Potentially Impacted

A screening analysis of the 1997 BRS data was conducted to evaluate the potential impacts of adding hepta and octa dioxin and furan congeners to the F039 treatment standards, and to UTS. This analysis included the following steps: (1) identification of the quantity of F039 managed onsite and offsite; and (2) assessment of the management methods to determine if the management method is likely to treat dioxins and furans to levels below UTS, or is not likely to be impacted by the LDRs. Because the BRS does not report specific constituents, constituent concentrations, or detail all management techniques, it is not possible to positively identify these impacts. Additionally, it is assumed that all of the identified wastes contain dioxins and furans above the UTS. As a result of these assumptions, this analysis represents an upper bound of potentially impacted wastes.

Identify Quantity of F039 Managed Onsite and Offsite

Facilities that reported generating F039 wastes in the 1997 BRS were identified. The data were summarized by onsite and offsite management, then by management type. Exhibit 3-5 summarizes the onsite management practices identified from the BRS data. The summary shows the management type and the quantity of waste managed in each manner by all generating facilities (in tons). For technologies determined unlikely to be effective in treating dioxin (and potentially involving land disposal), the quantities were further parsed into wastewater and nonwastewater forms.

Exhibit 3-6 shows the management type and the quantity of waste managed in each manner by all generating facilities (in tons) for wastes sent offsite. Because the quantities in Exhibit 3-6 are much less than the quantities in Exhibit 3-5 (436,000 tons per year offsite management versus 66,000,000 tons per year onsite management), no further analysis was conducted for F039 managed in offsite facilities.

Efficiency of Management Practices in Treating Dioxins

For determining the impacts of adding the five dioxin and furan congeners to the F039 treatment standards, the reported managed systems were reviewed to evaluate whether adding dioxins or furans to the UTS would require an alternative management practice. It was assumed that wastes that are currently managed in CWA wastewater treatment systems would be minimally impacted because these systems are exempt from RCRA and LDRs. Secondly, each practice was evaluated to determine whether dioxins and furans could be treated by the reported management system to concentrations below the treatment standards. Please note that only the management description was considered, and no detailed analyses of specific facilities or streams were conducted.

As a result of this analysis, the following management types were assumed to be minimally impacted by the addition of dioxin/furans and were not considered further in the analysis:

Discharge to surface waters (NPDES) [no land disposal involved; exempt from LDRs]
Biological treatment [represents BDAT for dioxin and furans]
Discharge to sewer/POTW [no land disposal involved; exempt from LDRs]
Carbon adsorption [carbon adsorption is effective in treating a wide range of organics]
Precipitation and carbon adsorption [carbon adsorption is effective in treating a wide range of organics]
Precipitation and biological treatment [biological treatment is BDAT for dioxin and furans]
Incineration – sludges [incineration is BDAT for dioxin and furans]
Incineration – solids [incineration is BDAT for dioxin and furans]
Oxidation and precipitation [oxidation is effective in treating a wide range of organics]
Incineration – liquids [incineration is BDAT for dioxin and furans]
Other recovery [exempt from LDRs]
Evaporation [generates zero or minimal treatment residues]
Energy recovery – solids [exempt from LDRs]
Fuel blending [exempt from LDRs]

The following management types were identified as potentially unable to treat dioxins/furans to UTS, or potentially impacted by the addition of dioxin/furans to UTS:

Deepwell/underground injection
Air/steam stripping
Precipitation
Other organic/inorganic treatment
Aqueous organic treatment
Neutralization
Landfill
Other - known (disposal)
Other - unknown (treatment)
Other - known (treatment)
Transfer facility storage
Stabilization/fixation with cementitious/pozzolanic materials
Phase separation
Surface impoundment
Settling/clarification
Land treatment/application/farming

Underground Injection

Additional analysis was conducted for wastes managed in onsite underground injection systems. The facilities managing these wastes were identified and their underground injection status was reviewed. (See table in Appendix D: F039 Managed in UI/Deepwell.) Seven of the twelve facilities were found to have approved no-migration petitions (based on EPA, "Background Document for

Analysis of the Land Disposal Restrictions Phase IV: Underground Injection Data and Issues, April 1998), managing a total of 4,033,000 tons in 1997. EPA anticipates that these facilities would not be impacted by the changes because they could modify their no-migration petition to include these additional constituents. However, even if this were not possible, there is still sufficient commercial capacity to cover the additional waste quantity.

The remaining five facilities were assumed to not have approved no-migration petitions, managing a total of 796,000 tons per year. EPA assumed that these facilities would require alternative treatment if the concentrations of the additional dioxin and furan congeners exceeded the revised F039 treatment standards.

Data Summary

The waste streams for these management systems were screened and categorized as wastewaters or nonwastewaters based on the reported form code in the BRS. The tables in Appendix D (F039 Form Code Analysis – 15 tables) list form codes for the wastes according to management method. In this analysis, wastes were considered 'wastewaters' if it had a form code in the B1xx and B2xx series, and were considered nonwastewaters if any other form code was used.

In some cases, the reported form code was incomplete, missing, or did not match the list of BRS form codes. In such instances, the waste stream was assumed to be a wastewater in most instances. However, for certain management systems (i.e., landfill, stabilization), the wastes were generally assumed to be nonwastewaters, and any form code that was incomplete, missing, or did not match the list of BRS form codes was assumed to be a nonwastewater.

A total of 67,600 tons per year of nonwastewaters as shown in Exhibit 3-5 are managed in onsite systems where treatment may be inadequate for dioxins (assuming they are present). A total of 6,690,000 tons per year of wastewaters as shown in Exhibit 3-5 are managed in onsite systems where treatment may be inadequate for dioxins (assuming they are present). The wastewater quantity excludes wastes managed by facilities with approved no-migration petitions. These quantities do not account for the fact that not all (probably a minority) of F039 wastes have levels of the five new dioxin and furan congeners less than the finalized numerical treatment standards.

3.8.3 Quantities of Characteristically Hazardous Waste Generated and Potentially Impacted

There are many limitations to estimating the quantity of characteristically hazardous waste that would be subject to the addition of the new dioxin and furan congeners to UTS. First, the wastes are extremely variable and may contain variable levels of dioxin and furan congeners. Second, the volume of characteristically hazardous wastes are very large. Finally, the large number of generators likely result in wide variability in management methods, including land disposal.

EPA did not perform a similar level of analysis as conducted with the F039 analysis. Rather, the results of the F039 analysis were scaled to reflect the larger volumes of characteristically hazardous

wastes generated. The total quantity of characteristically hazardous waste generated in 1995 is 128,000,000 tons based on the BRS, 95 percent of which is wastewaters.[54]

The quantity of toxicity characteristic wastes (128,000,000 tons in 1995) compares to the estimated 66,000,000 tons of F039 generated in 1997 based on BRS. Although the data are from different years, the data indicate that about twice as much characteristically hazardous waste (subject to UTS) is generated than F039. Next, the results of Section 3.8.2 indicate that about 6.7 million tons of F039 wastewaters – 10 percent – are managed in a manner where dioxin and furan treatment would be required, IF one of the five newly finalized dioxins and furan congeners was present above the treatment standards and land disposal occurred. The quantity of nonwastewaters is about 100 times less (68,000 tons).

EPA applied these same percentages to the characteristically hazardous wastes. EPA assumes that about 13 million tons of wastewater and 130,000 tons of nonwastewater is generated in a manner which would require additional treatment for the five additional dioxin and furan congeners (if present).

3.8.4 Analytical Considerations

In its comments, one commenter (ETC) was concerned that the high quantity of characteristic wastes generated, in conjunction with the low treatment standards, would create laboratory capacity difficulties. This is because matrix interferences would add to the cost and time for analysis, in conjunction with the rise in characteristic hazardous wastes that would be analyzed.

EPA's SW-846 Method 8280A is an appropriate method for the analysis of all dioxin and furan congeners identified on the UTS list. All such constituents, including the hepta and octa congeners, can be analyzed using this method. Therefore, if laboratories currently use this SW-846 method to analyze for other dioxin and furan congeners, they are expected to continue to use it for the analysis of the hepta and octa congeners being added to UTS and to F039. EPA does not anticipate that waste volumes subject to treatment standards for F039 or for characteristic wastes would significantly increase because waste generators already are required to comply with the treatment requirements for tetra-, penta-, and hexa- chlorinated dioxin/furan congeners. The volumes of wastes for which additional treatment is needed solely due to the addition of the five new congeners to the F039 and UTS lists is therefore expected to be very small.

The treatment standards for all dioxin and furan congeners are close to the quantitation limit for this method. For example, the method detection limits in water and soil matrices are compared to the existing treatment standards for the tetra through octa dioxin and furans:

- The nonwastewater UTS for tetra through hexa dioxin and furan congeners is 1 ppb. For the hepta dioxin and furan congeners, the UTS being finalized is 2.5 ppb. For the

[54] U.S. Environmental Protection Agency. National Analysis: The National Biennial RCRA Hazardous Waste Report (Based on 1995 Data). EPA530-R-97-036c. August 1997. Exhibits 1-9 and 1-12.

octa dioxin and furan congeners, the UTS being finalized is 5 ppb. These are equal to the respective quantitation limits for Method 8280A.

- The wastewater UTS is 35 ng/L for pentachlorodibenzofurans and for the hepta dioxin and furan congeners. All remaining congeners have a UTS of 63 ng/L. In all cases, these are above the respective quantitation limits which are 10 ng/L for tetra dioxin and furan congeners, 50 ng/L for octa dioxin and furan congeners, and 25 ng/L for all other congeners.

While this analysis supports ETC's observation that the newly-promulgated UTS for octa and hepta dioxin and furan congeners are near their quantitation limits, it also shows that the existing UTS for lower congeners are also near their quantitation limits. Therefore, EPA anticipates that commenters should encounter the same experience in analyzing for these new congeners as they have had in analyzing for the other congeners; EPA is not aware of any widespread difficulties with these standards by laboratories or generators. Additionally, laboratories may make a good faith effort to achieve detection limits that are within an order of magnitude of the treatment standard if circumstances do not allow for lower quantitation (40 CFR 268.40(d)(3)). Therefore, EPA does not anticipate widespread difficulties in the application of these standards from an analytical viewpoint.

In Sections 3.8.2 and 3.8.3, EPA presented a bounding estimate of the total quantity of characteristically hazardous wastes, and F039, that are potentially impacted. These quantities are less than 200,000 tons per year for nonwastewaters and less than 20,000,000 tons per year for wastewaters, if it is assumed that this entire quantity would require analysis to identify if, in fact, the new UTS/F039 treatment standards are being met. These quantities represent only about 10 percent of the total quantity of F039 and characteristically hazardous wastes generated (as stated previously, this is about 6 million tons per year of nonwastewaters and 190 million tons of wastewaters). This analysis provides a rough approximation of the impacts on laboratories: the potential impacts are much smaller than the total universe of characteristic wastes. EPA anticipates that laboratories that analyze for other dioxins and furan congeners already have the capability or are in the practice of analyzing for these additional congeners, Therefore, EPA expects that sufficient laboratory capacity would be available to analyze wastes affected by these changes to UTS and F039.

Exhibit 3-5. Onsite Management of Waste Streams Containing F039 in 1997 Using BRS				
Onsite Management Type	Total (tons)	Not Treat Dioxin (tons)	WW (tons)	Non WW (tons)
Discharge to surface water (NPDES)	52,219,076			
Deepwell/underground injection	4,829,125	4,829,125	4,829,125	
Air/steam stripping	4,060,819	4,060,819	4,060,819	
Biological treatment	1,499,272			
Discharge to sewer/POTW	1,206,868			
Precipitation	510,045	510,045	510,045	
Other organic/inorganic treatment	488,121	488,121	488,121	
Aqueous organic treatment	470,996	470,996	470,996	
Carbon adsorption	166,977			
Precipitation and carbon adsorption	157,626			
Neutralization	152,462	152,462	152,462	
Other - known (disposal)	82,494	82,494	82,494	
Precipitation and biological treatment	81,441			
Landfill	44,464	44,464	108	44,356
Other - unknown (treatment)	38,708	38,708	38,708	
Incineration - sludges	35,861			
Other - known (treatment)	25,533	25,533	6,099	19,434
Incineration - solids	17,296			
Oxidation and precipitation	15,181			
Transfer facility storage	9,861	9,861	9,498	363
Stabilization/fixation with cementitious/pozzolanic materials	3,383	3,383	8	3,376
Phase separation	3,284	3,284	3,284	
Surface impoundment	1,747	1,747	1,747	
Settling/clarification	1,243	1,243	1,243	
Incineration - liquids	1,089			
Other Recovery	785			
Evaporation	164			
Energy Recovery - solids	70			
Land treatment/application/farming	52	52		52
Fuel blending	0.35			
Grand Total	66,124,045	10,722,337	10,654,756	67,581

All quantities are in short tons. Underground injection quantities presented in this table do not distinguish between facilities with approved no-migration petitions.

Exhibit 3-6. Offsite Management of Waste Streams Containing F039 in 1997 Using BRS		
Off-site System	Management Type	Quantity, Short Tons
M081	Biological treatment	133,987
M134	Deepwell/underground injection	61,899
M135	Discharge to sewer/POTW	41,554
M132	Landfill	33,528
M077	Precipitation	29,134
M099	Aqueous organic and inorganic - unknown	21,543
M125	Other - known (treatment)	20,481
M136	Discharge to surface water (NPDES)	19,581
M		14,130
M051	Energy Recovery - liquids	7,473
M041	Incineration - liquids	7,464
M075	Oxidation	5,384
M043	Incineration - solids	4,272
M141	Transfer facility storage	4,102
M111	Stabilization/fixation with cementitious/pozzolanic materials	3,932
M094	Other organic/inorganic treatment	3,298
M085	Aqueous organic treatment	3,033
M129	Other - unknown (treatment)	2,977
M082	Carbon adsorption	2,725
M061	Fuel blending	2,532
M032	Other Recovery	2,206
M013	Secondary Smelting	2,033
M039	Other Recovery (unknown)	1,887
M102	Addition of lime	1,790
M042	Incineration - sludges	1,219
M089	Aqueous organic treatment - unknown	1,138
M119	Stabilization - unknown	1,034
M121	Neutralization	858
M049	Incineration - unknown	345
M078	Other aqueous inorganic	251
M092	Precipitation and carbon adsorption	182
M112	Other stabilization	90
M053	Energy Recovery - solids	50
M011	HTMR	24
M012	Retorting	10
M137	Other - known (disposal)	9
M079	Aqueous inorganic - unknown	4
M072	Cyanide destruction and precipitation	0.46
M052	Energy Recovery - sludges	0.35
M019	Metals Recovery (unknown)	0.34
TOTAL		436,163

4. CAPACITY ANALYSIS RESULTS

This section presents the results of the capacity analysis for alternative commercial treatment of the chlorinated aliphatics production wastes. A brief summary of these results was presented in Section 1 of this document (see Exhibit 1-2). The capacity analysis itself is based on assessment of available treatment capacity (Section 2) and the required capacity for treatment of K174, K175, additional constituents in the F039 treatment standards, and UTS (Section 3). This section compares estimates of required capacity to that commercially available for these newly listed wastes.

EPA is finalizing numerical treatment standards, equivalent to universal treatment standards, to wastewater and nonwastewater forms of K174. EPA is also promulgating an alternative treatment standard of CMBST for treatment of dioxins and furans in K174. For wastewater and nonwastewater forms of K175, EPA is finalizing numerical treatment standards for mercury, with additional restrictions for nonwastewater that the waste is pH#6.0 and is either macroencapsulated prior to land disposal or co-disposed with wastes of similar pH.
disposal is limited to units to which disposal of waste in excess of pH 6 is prohibited. Finally, EPA is adding five dioxin and furan congeners to the lists of UTS and F039.

4.1 K174 WASTES

For K174 wastes, the available data sources indicate that there is no quantity of the wastewater form of K174 that currently exists, and therefore there is no quantity that will require alternative commercial treatment (there is adequate wastewater treatment capacity available should the need for treatment of the wastewater form of K174 arise as shown in Section 2.5). Information available to EPA indicates that up to 6,100 tons of K174 per year could potentially require commercial treatment capacity. However, because EPA is finalizing a conditional listing approach for the K174 wastewater treatment sludges under which these wastes are not hazardous if disposed of in a subtitle C or a non-hazardous waste landfill, it is possible that little or no hazardous waste treatment capacity will be required for this waste.

The numerical treatment standards can likely be met using combustion, as discussed in Section 2.1 (the alternative treatment standard, CMBST, would also require combustion). EPA estimates that the commercially available sludge and solid combustion capacity is at least 300,000 tons per year and therefore sufficient to treat the nonwastewater forms of K174 that would require treatment. Therefore, EPA is not granting a capacity variance for K174 nonwastewaters or wastewaters.

EPA has identified (as a result of public comments) that one facility may generate K174 in a surface impoundment as a result of today's rule. The facility may remove K174 waste before the effective date of the new listing and therefore may not be subject to LDR requirements.[55] The impoundment can also be retrofitted, closed, or replaced with tank systems. If the impoundment continues to be used to actively manage K174 waste, the unit will be subject to Subtitle C

[55] If the waste is actively managed in unretrofitted impoundments (*i.e.*, impoundments not satisfying the minimum technology requirements specified in RCRA sections 3004(o) and 3005(j)(11)) after the effective date of today's rule, it would be land disposed in a prohibited manner.

requirements. In addition, any hazardous wastes that are actively managed in an impoundment (other than wastes removed from an impoundment as part of a one-time removal) after the effective date of today's rule are subject to the land disposal prohibitions.[56] EPA expects that the one facility currently managing chlorinated aliphatic wastewaters in surface impoundments (and which therefore may potential manage EDC/VCM sludges in impoundments after the effective date of today's rule) will cease to do so before the effective date of this rule.

However, this facility (or others) could manage newly-listed K174 in surface impoundments, provided they are in compliance with the appropriate standards for impoundments (40 CFR Parts 264 and 265 subpart K) and the special rules regarding surface impoundments (40 CFR 268.14). EPA notes that those provisions require (by reference) basic groundwater monitoring (40 CFR Parts 264 and 265 subpart F), management, and recordkeeping, but are afforded up to 48 months to retrofit to meet minimum technological requirements (see RCRA § 3005(j)(6)(A)).

4.2 K175 WASTES

For K175 wastes, the available data sources indicate that there is no quantity of the wastewater form of K175 that currently exists, and therefore there is no quantity that will require alternative commercial treatment (there is adequate wastewater treatment capacity available should the need for treatment of the wastewater form of K175 arise, as shown in Section 2.5). For nonwastewater forms of K175, EPA estimates that up to 130 tons per year may require alternative commercial treatment. EPA is finalizing a numerical treatment standard for nonwastewater forms of K175, with additional restrictions regarding waste pH and the disposal environment: either macroencapsulation must be used to isolate the waste or disposal is limited to units to which disposal of waste in excess of pH 6 is prohibited.

Several commenters expressed concerns with regard to permitting requirements and constraints of commercial treatment facilities, including the ability of commercial facilities to accept nonwastewater forms of K175 waste and comply with the proposed land disposal restrictions of RMERC. As discussed earlier, EPA is finalizing a numerical treatment standard for this waste (in conjunction with other pH-related restrictions and macroencapsulation), which has been demonstrated to be achievable using stabilization.

Sufficient commercial stabilization, pH, and macrocapsulation treatment capacity exists to treat and dispose of mercury-containing wastes and to meet the final treatment standards adopted today. In addition, the one facility generating K175 uses a sulfide precipitation technology and therefore may be able to meet the numerical mercury concentration standard upon generation of the waste. Depending on their ability to control pH and to perform on-site macrocapsulation, no other commercial treatment might be necessary prior to off-site hazardous waste landfilling. EPA notes that generators can use any treatment technology (except impermissible dilution) to meet the numerical mercury concentration and pH standards promulgated today. EPA expects that commercial treaters can customize their treatment

[56] See RCRA § 3004(m)(1) "Simultaneously with the promulgation of regulations under subsection (d), (e), (f), or (g) prohibiting one or more methods of land disposal of a particular hazardous waste…promulgate regulations specifying those levels or methods of treatment…"

process to meet the numerical treatment standard and achieve a pH of less than 6. A single landfill facility, by itself, is expected to have excess capacity of well over 130 tons of macroencapsulated waste.[57]

Therefore, sufficient commercial treatment and disposal capacity exists for this newly listed K175 hazardous waste. Additionally, there are facilities discussed in Section 2.4 that are potentially able to treat the newly identified K175 waste by mercury recovery, although it has not yet been demonstrated. For example, two facilities that could potentially treat K175 have a mercury recovery capacity of more than 1,000 tons combined. Therefore, EPA is not granting a national capacity variance from LDR treatment standards for nonwastewater or wastewater forms of K175.

4.3 OTHER CATEGORIES OF WASTES ASSOCIATED WITH NEWLY LISTED WASTES

EPA believes that most soil and debris contaminated with K174 and K175 can and will be managed on-site (if generated) and therefore would not require substantial off-site commercial treatment capacity. As discussed in detail in Section 3.4, if the contaminated soil is not excavated (e.g., in-situ treatment), then the LDRs will not be applied to these wastes. Even if removed, LDRs may not apply if the waste is managed within an area of contamination (AOC), or is managed onsite as a corrective action management unit (CAMU) and temporary unit (TU). Other factors will also limit the demand for commercial treatment capacity for contaminated soil and debris contaminated with these wastes, including the alternative treatment standards promulgated under the Phase IV LDR rule (63 *FR* 28556, May 26, 1998) and the "debris rule" codified in LDR Phase I (57 FR 37194, Aug. 18, 1992).

EPA believes that adequate offsite commercial treatment capacity will be available for contaminated soil affected by today's proposed rule. Therefore, EPA is not granting a national capacity variance for these wastes. However, EPA recognizes that some wastes could possess unique properties that make them more difficult to treat than the wastes on which the standards are based. In such cases, the affected party may petition EPA for a treatability variance per 40 CFR 268.44. In addition, EPA established a new site-specific, risk-based variance for the technology-based alternative soil treatment standards promulgated in Phase IV. This variance can be used when treatment to concentrations of hazardous constituents are greater (i.e., higher) than those specified in the alternative soil treatment standards is shown to minimize short- and long-term threats to human health and the environment. In this way, on a case-by-case basis, risk-based LDR treatment standards approved through a variance process could "cap" the technology-based treatment standards (see 63 *FR* 28606, May 26, 1998). For these newly listed wastes, the affected party may also request a capacity variance extension per 40 CFR 268.5 on a case-by-case basis.

Based on the 1992 RCRA § 3007 questionnaire and the 1997 updated survey responses, there were no data showing underground injection of the newly-listed wastes or indicating that the newly-listed wastes are mixed with radioactive wastes or with both radioactive wastes and soil or debris. EPA did not receive comments indicating that these wastes are underground injected or that they are

[57] See phone log with Chemical Waste Management, Inc. at Lake Charles, LA in Appendix F.

mixed with radioactive wastes or with both radioactive wastes and soil or debris. Therefore, EPA is not granting a national capacity variance for K174 and K175 wastes that might be underground injected, mixed with radioactive wastes, or mixed with both radioactive wastes and soil or debris. LDR treatment standards for K174 and K175 underground injected and mixed wastes (if any exists) will therefore become effective when these listing determinations become effective.

However, EPA recognizes that some wastes could possess unique properties that make them more difficult to treat than the wastes on which the standards are based. In such cases, the affected party may petition EPA for a treatability variance per 40 CFR 268.44. In addition, EPA established a new site-specific, risk-based variance for the technology-based alternative soil treatment standards promulgated in Phase IV. This variance can be used when treatment to concentrations of hazardous constituents are greater (i.e., higher) than those specified in the alternative soil treatment standards is shown to minimize short- and long-term threats to human health and the environment. In this way, on a case-by-case basis, risk-based LDR treatment standards approved through a variance process could "cap" the technology-based treatment standards (see 63 *FR* 28606, May 26, 1998). For these newly identified wastes, the affected party may also request a capacity variance extension per 40 CFR 268.5 on a case-by-case basis.

4.4 AVAILABLE TREATMENT CAPACITY FOR OTHER WASTES SUBJECT TO REVISED UTS AND F039 STANDARDS

EPA evaluated commenter concerns that insufficient capacity would be available to treat F039 and wastes subject to UTS as a result of the addition of the five dioxin and furan congeners to these lists. The addition of these five dioxin/furan congeners may not increase the quantity requiring treatment for the wastes previously regulated under LDR. Also, waste generators must already comply with treatment requirements for tetra-, penta-, and hexa- chlorinated dioxin/furan congeners and additional treatment for five new congeners added to the lists may not be required.

EPA was able to quantify the effects from some, but not all, of the factors affecting the quantity of waste affected, and estimated an upper bound of approximately 6.7 million tons per year of wastewater forms of F039, and 68,000 tons per year of nonwastewater forms of F039, that could potentially be affected by the promulgated changes (this estimate is from waste streams containing F039, and not necessarily are solely F039). For characteristically hazardous wastes affected by UTS, EPA estimated an upper bound of 13 million tons per year wastewater and 130,000 tons per year nonwastewaters (this estimate is from waste streams that are hazardous only because they are characteristic wastes). Only a portion of each estimate may contain five new congeners above UTS levels in F039 or characteristic wastes. For example, these estimates assume that the five additional dioxin and furan congeners are present at levels above the treatment standards in all wastes, when in fact available leachate characterization data indicate that one of 15 samples that were analyzed for tetra- through octa- dioxin and furan congeners had just OCDD exceeding the treatment standard (approximately seven percent of the samples above the treatment standard).

EPA has previously estimated that approximately 37 million tons per year of commercial wastewater treatment capacity are available, and at least 300,000 tons per year of commercial hazardous waste sludge and solid combustion capacity (or see Appendix E - up to approximately 650,000 tons per year of commercial combustion capacity for solids and non-pumpable sludges and up

to approximately 1.5 million tons of commercial combustion capacity for all waste forms based on 1997 BRS) are available. These are well above the quantities of wastewater and nonwastewater forms of F039 and characteristically hazardous wastes subject to UTS potentially requiring treatment even under the screening assumptions described above. For this reason, EPA is finalizing its decision not to delay the effective date for adding these five hepta and octa dioxin and furan congeners to the lists of F039 and UTS.

4.5 CONCLUSION

In summary, EPA is not granting a national capacity variance for nonwastewater or wastewater forms of K174 or K175 being surface-disposed or underground injected. EPA is not granting a national capacity variance for soil and debris contaminated with K174 or K175 wastes. EPA estimates that there are no generated quantities of mixed radioactive wastes contaminated with K174 or K175 or soil and debris contaminated with these radioactive mixed wastes and EPA is not granting a national capacity variance for such wastes. Treatment capacity also will be sufficient to include the addition of certain dioxins and furans to the list of constituents in F039 treatment standards and UTS.

Therefore, LDR treatment standards thus will become effective when the listing determinations become effective for the wastes covered under this rule – the earliest possible date. This conforms to RCRA § 3004(h)(1), which indicates that land disposal prohibitions must take effect immediately when there is sufficient treatment or disposal capacity available for the waste.

Finally, EPA may consider a case-by-case extension to the effective date based on the requirements outlined in 40 CFR 268.5, which includes a demonstration that adequate alternative treatment, recovery, or disposal capacity for the petitioner's waste cannot reasonably be made available by the effective date due to circumstances beyond the applicants' control, and that the petitioner has entered into a binding contractual commitment to construct or otherwise provide such capacity.

5. REFERENCES

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Appendix A. Support Tables for Mercury Waste Analysis

- Table A-1. Quantity of Mercury-Bearing Hazardous Wastes Managed by Retorting in 1995 By Waste Code (Including Both Onsite and Offsite Management), Tons.
- Table A-2. Mercury Retort Facilities Identified By 1997 BRS.
- Table A-3. Facilities Identified by 1997 BRS as Treating D009 Wastes by Stabilization.

Table A-1. Quantity of Mercury-Bearing Hazardous Wastes Managed by Retorting in 1995 By Waste Code (Including Both Onsite and Offsite Management), Tons [a, b]

Waste Type	All Waste Codes	D009	K071	K101	K102	K106	P065	P092	U151
Elemental Mercury[c]	95	94	0	0	0	0	0	0	8
Inorganic Sludges[d]	0	0	0	0	0	0	0	0	0
Inorganic Solids Other Than Soil[e]	3,007	2,724	0	0	0	283	0	0	15
Soil[f]	36	36	0	0	0	0	0	0	0
Lab Packs[g]	36	36	0	0	0	0	0	0	0
Organic Solids[h]	7	7	0	0	0	0	0	0	0
Inorganic Liquids Other Than Waste Liquid Mercury[i]	22	22	0	0	0	0	0	0	0
Total	**3,203**	**2,919**	**0**	**0**	**0**	**283**	**0**	**0**	**23**

Source: "Waste Specific Evaluation of RMERC Treatment Standard," EPA 1998. From 1995 Biennial Reporting System, GM and WR Forms Data. Background Document in RCRA Docket F-1999-MTSP-FFFFF, "Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards," Advanced Notice of Proposed Rulemaking, 64 *Federal Register* 28949 (May 28, 1999).

Table Notes:

[a] - Retorting is defined as BRS system type code M012.

[b] - Columns do not sum to the total for all waste codes because waste streams may carry more than one waste code, resulting in double counting.

[c] - This category is defined as BRS form code B117.

[d] - This category is defined as BRS form codes B501-B516 and B519.

[e] - This category is defined as BRS form codes B303-B316 and B319.

[f] - This category is defined as BRS form codes B301 and B302.

[g] - This category is defined as BRS form codes B001-B004 and B009.

[h] - This category is defined as BRS form codes B401-B407 and B409.

[i] - This category is defined as BRS form codes B101-B116 and B119.

Table A-2. Mercury Retort Facilities Identified by 1997 BRS

Site/Company Name	EPA ID	City	System Type	EPA Hazd Waste Code	Tons
AERC	PAD987367216	ALLENTOWN	M012	D001	0.09
AERC	PAD987367216	ALLENTOWN	M012	D002	1.33
AERC	PAD987367216	ALLENTOWN	M012	D006	2.46
AERC	PAD987367216	ALLENTOWN	M012	D008	2.77
AERC	PAD987367216	ALLENTOWN	M012	D009	812.00
AERC	PAD987367216	ALLENTOWN	M012	D009	0.02
ALPHA OMEGA RECYCLING INC	TXD981514383	LONGVIEW	M012	D003	17.00
BETHLEHEM APPARATUS CO INC	PA0000453084	HELLERTON	M012	D009	92.60
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D001	0.01
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D002	2.97
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D003	0.01
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D004	0.10
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D006	0.22
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D007	0.07
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D008	6.69
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D009	122.00
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	D011	3.13
BETHLEHEM APPARATUS CO INC	PAD002390961	HELLERTOWN	M012	U151	4.67
CWM CHEMICAL SERVICES, L.L.C.	NYD049836679	MODEL CITY	M012	D009	0.001
DYNECOL INCORPORATED	MID074259565	DETROIT	M012	D002	0.02
DYNECOL INCORPORATED	MID074259565	DETROIT	M012	D009	1,330.00
DYNECOL INCORPORATED	MID074259565	DETROIT	M012	D009	7.28
DYNECOL INCORPORATED	MID074259565	DETROIT	M012	U151	2.36
ENVIRONMENTAL MANAGEMENT, INC.	OKD982293334	GUTHRIE	M012	D009	0.15
JASON INTERNATIONAL	NJD986618759	SEAL BEACH	M012	D009	2.27
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D002	7.10
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D006	0.99
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D007	3.11
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D008	4.00
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D009	376.00
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D009	2.82
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D010	0.05
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	D011	2.07
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	P092	0.06
MERCURY REFINING COMPANY, INC.	NYD048148175	ALBANY	M012	U151	1.64
MERCURY TECHNOLOGIES INTERNATIONAL AND	FLD984262782	WEST MELBOURNE	M012	D006	14.30
MERCURY TECHNOLOGIES INTERNATIONAL AND	FLD984262782	WEST MELBOURNE	M012	D008	28.60
MERCURY TECHNOLOGIES INTERNATIONAL AND	FLD984262782	WEST MELBOURNE	M012	D009	321.00
MERCURY WASTE SOLUTIONS INC	WIR000000356	UNION GROVE	M012	D002	6.83
MERCURY WASTE SOLUTIONS INC	WIR000000356	UNION GROVE	M012	D007	0.02

Site/Company Name	EPA ID	City	System Type	EPA Hazd Waste Code	Tons
MERCURY WASTE SOLUTIONS INC	WIR000000356	UNION GROVE	M012	D009	175.00
MERCURY WASTE SOLUTIONS INC	WIR000000356	UNION GROVE	M012	D009	0.001
RECYCLIGHTS, INC.	MN0000903468	BLOOMINGTON	M012	D002	5.83
RECYCLIGHTS, INC.	MN0000903468	BLOOMINGTON	M012	D006	264.00
RECYCLIGHTS, INC.	FL0000207449	BLOOMINGTON	M012	D008	0.77
RECYCLIGHTS, INC.	MN0000903468	BLOOMINGTON	M012	D008	285.00
RECYCLIGHTS, INC.	FL0000207449	BLOOMINGTON	M012	D009	58.10
RECYCLIGHTS, INC.	MN0000903468	BLOOMINGTON	M012	D009	304.00
RECYCLIGHTS, INC.	MN0000903468	BLOOMINGTON	M012	D011	0.19
SUPERIOR SPECIAL SERVICES, INC.	WID071164032	GREENDALE	M012	D009	1.23

Facilities identified as accepting waste from offsite and managing the waste using retort for metal recovery (M012).

Table A-3. Facilities Identified by 1997 BRS as Treating D009 Wastes by Stabilization

Site/Company Name	EPA ID	City	System Type	EPA Hazd Waste Code	Tons
CHEMICAL WASTE MANAGEMENT, INC.	ALD000622464	EMELLE	M111	D009	15,600.00
LAIDLAW ENV SERVICES(DEER TRAIL) INC.	COD991300484	DEER TRAIL	M111	D009	1,440.00
CLEAN HARBORS OF CONNECTICUT, INC	CTD000604488	BRISTOL	M111	D009	19.50
CLEAN HARBORS OF CONNECTICUT, INC	CTD000604488	BRISTOL	M111	D009	12.10
CLEAN HARBORS OF CONNECTICUT, INC	CTD000604488	BRISTOL	M111	D009	4.20
ENVIROSAFE SERVICES OF IDAHO, INC SITE B	IDD073114654	GRAND VIEW	M111	D009	131.00
PEORIA DISPOSAL CO INC	ILD000805812	PEORIA	M111	D009	0.92
CHEMICAL WASTE MANAGEMENT OF INDIANA LLC	IND078911146	FORT WAYNE	M111	D009	6,950.00
HERITAGE ENVIRONMENTAL SERVICES	IND093219012	INDIANAPOLIS	M111	D009	3,340.00
LWD SANITARY LANDFILL, INC.	KYD985073196	CALVERT CITY	M111	D009	58.70
CHEMICAL WASTE MANAGEMENT	LAD000777201	SULPHUR	M111	D009	42,400.00
CLEAN HARBORS OF BRAINTREE, INC.	MAD053452637	BRAINTREE	M111	D009	6.21
CLEAN HARBORS OF BRAINTREE, INC.	MAD053452637	BRAINTREE	M111	D009	43.30
CLEAN HARBORS OF BRAINTREE, INC.	MAD053452637	BRAINTREE	M111	D009	9.24
MICHIGAN DISPOSAL WASTE TREATMENT PLANT	MID000724831	BELLEVILLE	M111	D009	22,300.00
CITY ENVIRONMENTAL INC.	MID054683479	DETROIT	M111	D009	2,870.00
DYNECOL INCORPORATED	MID074259565	DETROIT	M111	D009	47.50
CITY ENVIRONMENTAL, INC.	MID980991566	DETROIT	M111	D009	1,780.00
US ECOLOGY INC, BEATTY, NV	NVT330010000	BEATTY	M111	D009	47.50
CWM CHEMICAL SERVICES, L.L.C.	NYD049836679	MODEL CITY	M111	D009	6,600.00
REPUBLIC ENVIRONMENTAL SYSTEMS	OHD055522429	BEDFORD	M111	D009	20.60
PERMA-FIX TREATMENT SERVICES, INC.	OKD000402396	TULSA	M111	D009	0.16
LAIDLAW ENVIRONMENTAL SERVICES,INC LONE	OKD065438376	WAYNOKA	M111	D009	11,300.00
CHEMICAL WASTE MANAGEMENT OF THE NW	ORD089452353	ARLINGTON	M111	D009	91.80
REPUBLIC ENVIRONMENTAL SYS PA	PAD085690592	HATFIELD	M111	D009	0.10
WASTE CONTROL SPECIALISTS	TXD988088464	ANDREWS	M111	D009	28.10
ENVIROCARE OF UTAH, INC.	UTD982598898	SALT LAKE CITY	M111	D009	17.00
LAIDLAW ENV. SERVICES (LONE & GRASSY MTN)	UTD991301748	SALT LAKE CITY	M111	D009	88.20
BURLINGTON ENVIRONMENTAL INC TACOMA	WAD020257945	RENTON	M111	D009	20.70
BURLINGTON ENVIRONMENTAL INC KENT	WAD991281767	RENTON	M111	D009	1,140.00
CHEMICAL WASTE MANAGEMENT OF INDIANA LLC	IND078911146	FORT WAYNE	M112	D009	127.00
HAZ-MAT RESPONSE DISPOSAL INC	MOD981123391	KANSAS CITY	M112	D009	1.50
CWM CHEMICAL SERVICES, L.L.C.	NYD049836679	MODEL CITY	M112	D009	569.00
BURLINGTON ENVIRONMENTAL INC KENT	WAD991281767	RENTON	M119	D009	0.003

Facilities identified as accepting D009 wastes from offsite and managing using stabilization (M111, M112, or M119).

Appendix B. Facilities Researched for Mercury Recovery Capacity

B-1. Telephone Logs for Facilities Contacted for Potentially Treating K175 Wastes

B-2. Facilities Researched But Not Contacted Because They Appeared Unlikely to Treat K175 by Mercury Recovery.

B-1. Telephone Logs for Facilities Contacted for Potentially Treating K175 Wastes

Monday, February 7, 2000
Bethlehem Apparatus Corporation, Bethlehem Pennsylvania
Contacted: John Boyle, 610-838-7034
By: John Vierow, SAIC, Reston VA 703-318-4551

According to Mr. Boyle, this company supplies 75 percent of the mercury in the U.S. They operate two facilities in the Bethlehem area, Hellertown and Bethlehem. They currently have hazardous waste storage capacity for 1500 drums at Hellertown and 2000 drums at Bethlehem, and are currently doubling the storage area at the Bethlehem facility. In their comments, Borden's waste volume was described as 40 cubic yards per year. Using a rough conversion factor of 4 drums equals one cubic yard of waste (this would be equivalent to 160 drums), Mr. Boyle estimated that storage would not be a problem for this waste.

They have not obtained a sample of the material so they would have to guess at the approach. I first asked about the 500 ppm limitation of 40 CFR Part 261 Appendix 8 organics, such as vinyl chloride. They currently do not accept wastes over this limit (because they haven't come across such a situation before). In such a case, they would use a two step process. First, they would use pretreatment to drive off the organics. Then the waste could be placed in the retort. He did not believe there would be permit difficulties. If the waste was under 500 ppm, they may or may not conduct this pretreatment; the organics volatilized in the retort would be caught by carbon adsorption later in the process but pretreatment would capture them sooner and eliminate more frequent maintenance and/or a hazardous waste designation of the carbon following the retort.

They currently accept other materials with water content, so the water in the sludge should not present a problem.

They currently accept a mercurous chloride (HgCl) waste, calomel, and use a pretreatment process for that. One possibility for this waste is to convert the mercuric chloride ($HgCl_2$) in the waste to mercurous chloride, then use the same process as the calomel.

Monday, February 7, 2000
Phillips Services, Tequilla, WA
Contacted: Mike Uhlendorf, Materials Management Manager, 425-204-7196
By: John Vierow, SAIC, Reston VA 703-318-4551

Phillips Services (formerly Burlington Environmental) operates three facilities within about ten miles of Kent, Washington. Mr. Uhlendorf is from the corporate office.

Phillips would not manage any material with a mercury content above 260 mg/kg. The facility accepts wastes with lower mercury content for stabilization and land disposal. They do not conduct retorting.

Tuesday, February 8, 2000
NSSI/Recovery Services, Inc., Houston, TX
Contacted: Robert Gallagher, Environmental Manager, 713-641-0391
By: John Vierow, SAIC, Reston VA 703-318-4551

I described the waste material to Mr. Gallagher as a treatment sludge resulting from the sulfide treatment of stormwater generated from a vinyl chloride production process using mercuric chloride catalyst, having one percent mercury, and a D009 waste code.

Mr. Gallagher identified that the facility currently accepts industrial sludges containing mercury, and that such materials are mixed with a drier material to assist in the handling operations. The feed is sent to the facility's continuous retort unit for mercury recovery. Such a procedure would likely be followed here.

With regard to the nonmercury contaminants in the sludge, sulfide would not be a problem because the air pollution controls to the unit can control SO_2. Halogens (present as organics or inorganic chloride) are more of a concern due to the corrosivity on the equipment. They presently accept materials with halogens, however, and overcome this problem by pretreatment. One example is dissolving the waste into a solution, where the mercury can be chemically converted to another form such as a zinc amalgam or a mercury oxide.

They accept almost exclusively D009 wastes for the retort. Even though they are permitted to accept U and P wastes for the retort they work with generators to see if their wastes are more accurately described as D009 because of the regulatory advantages of a characteristic versus a listed waste. If the waste described is listed, they would almost certainly not be willing to accept it. This is because the retort residue currently must meet UTS only (i.e., because the retort processes characteristic wastes only). If it accepted a K-listed waste, then its retort residue would carry the listed code as well. Further, because they use a continuous operation, and because they would likely blend the material with other feeds, they would be unable to segregate the retort residue between that derived from a listed waste and that derived from the characteristic wastes.

Wednesday, February 9, 2000
ENSCO Environmental Services, Dalton, GA
Contacted: Sherry Waldron, Georgia Environmental Protection Division 404-656-2833
By: John Vierow, SAIC, Reston VA 703-318-4551

Ms. Waldron was contacted because she is working on the facility's hazardous waste Part B permit renewal, for the State. Contact with an ENSCO employee was not made.

Ms. Waldron stated that they presently do not have a permit. They applied for a permit renewal last year but this has not been renewed. The reasons are not compliance or remedial action related, but are concerns by the City of Dalton regarding fire code. Ms. Waldron expects that a consent order will be granted in a few weeks allowing them limited storage capability (i.e., less than permitted), and the ability to conduct normal treatment operations. Renewal of the Part B permit is not expected for a year.

The operations described in the permit renewal are stabilization-type processes. Ms. Waldron confirmed that no thermal operations are conducted, and no disposal is conducted. This refers to both hazardous and nonhazardous waste operations.

Information regarding the January 1999 permit renewal was found at:
http://www.gashpo.org/dnr/environ/pubnote/ensco.htm

Thursday, March 9, 2000
Mercury Refining Company, formerly Mercury Waste Solutions, Inc., Albany, NY
Contacted: Scott Taylor, 518-459-0820
By: Takisha Cannon, SAIC, Reston, VA 703-318-4671

I gave Mr. Taylor a brief description of the mercuric sulfide-containing sludge that EPA proposed to list as hazardous waste. I asked Mr. Taylor if his facility does accept or is capable of accepting this type of mercury-containing waste. He indicated that the facility could accept this type of sludge and they have technology to recycle the mercury, but they very rarely see this kind of sludge containing mercuric sulfide.

When asked if the relatively low mercury content of the sludge would deter the facility from accepting the waste, he replied that it would not, and in his opinion 1% is a pretty good amount of mercury. Mr. Taylor stated that while they generally don't turn away wastes based on mercury content, they may turn away waste based on other constituents besides mercury. He indicated that the facility is restricted from accepting waste with over 500 ppm of certain organics.

I asked if the facility has a permit for mercury retorting, and Mr. Taylor indicated that the facility does not because it operates under an exemption. The facility is exempted from industrial permitting requirements for recycling operations with a few restrictions (for example, that they do not take waste with over 500 ppm of certain organics). However, the facility is permitted for storage of mercury (on interim status?).

I also inquired about special considerations of treating sludge, like water content. Mr. Taylor asked if the waste would arrive in drums, and I asked him to assume that it would. He then indicated that they would probably put the drums in the process(or) and heat the sludge enough to evaporate a lot of the water, then bring the heat up high enough for mercury recovery. Essentially, the process would involve using the same equipment for evaporating the water and the rest of the retort process.

Thursday, March 9, 2000
Drug and Laboratory Disposal, Plainwell, MI
Contacted: Ward Walter, 616-685-9824
By: Takisha Cannon, SAIC, Reston, VA 703-318-4671

I provided Mr. Walter with a brief description of the waste EPA proposes to list and informed him that I am a contractor supporting EPA, briefly describing the purpose for the call.

Mr. Walter informed me that Drug and Laboratory Disposal chemically treats mercury and its salts, but they do not retort. [He added that this doesn't mean they are incapable of using retort, they simply do not.]

With regard to Borden's claims that the presence of other contaminants will make this sludge hard to accept for retort, Mr. Walter also believes the sulfide will make this sludge difficult to treat. With regard to low mercury content, Mr. Walter added that in light of the difficulties associated with sulfides, there has to be enough mercury to recover to make this process worthwhile. One percent is low.

If chemical treatment is an option, Mr. Walter says that Drug and Laboratory Disposal can do it. It will be at a major expense, but no more so than retort for this sludge. The company handles all kinds of waste (nearly all waste codes, except two that he can think of), but their primary interest is the processing of "unique" wastes. They accept these unique wastes, and they "figure out" how to treat them through chemical means. He indicated that he could not disclose some of their mercury recovery techniques as the information is proprietary.

Mr. Walter indicated that Drug and Laboratory Disposal does send waste to facilities that do retort, some of which we may have contacted already. They send waste to Mercury Waste Solutions, Inc. (in Wisconsin) and to Bethlehem Apparatus. Using chemical processes, they can reduce mercuric waste down to less than 260 ppm, then send it to a retort facility.

He told me to be aware that the type of treatment is also dependent on the source of the waste. Also, BDATs would need to be considered.

When I asked about permit status, Mr. Walter indicated that Drug and Laboratory Disposal is a RCRA facility. The company, which has been in business 24 years, processed 2 million pounds of waste last year. Also, last year they shipped just less than 2,000 pounds of reclaimed mercury which is a substantial amount of mercury in his opinion.

Thursday, March 9, 2000

EI Dupont De Nemours, Orange, TX

Contacted: Steven Schmidt, 409-886-6020 (Note that he was scheduled to transfer to a Dupont facility in Wilmington, DE in two days)

By: Takisha Cannon, SAIC, Reston, VA 703-318-4671

I provided Mr. Schmidt with a brief description of the mercury waste EPA proposes to list.

Mr. Schmidt indicated that the Orange, TX facility is a RCRA facility, and they do have an incinerator. However, they would not take this sludge, first of all, because they do not accept any off-site waste. They are a private company that only uses its incinerator for its products and wastes generated on-site. Anything they do accept from off-site is a Dupont product, not wastes from any other source.

They built their incinerator to handle Dupont products; since they do not make products that generate mercury wastes, they did not design the facility with mercury in mind. They use their incinerator to burn-up wastes. Mr. Schmidt indicated that even if they did have Dupont waste products that contained mercury they would not deal with it there. Mercury waste tends to vaporize and cause "all kinds of problems." [Mr. Schmidt is familiar with the VCM-A process, personally, but the company does not generate the mercuric sulfide-containing sludge.]

Mr. Schmidt suggested that we contact commercial TSDs that would be able to tell us more about how they would handle mercury-containing wastes.

Thursday, March 9, 2000
Salesco Systems USA, Pheonix, AZ
Contacted: David Ashley, 1-800-368-9095 (Note: No direct number, you must call Sales Dept. and be transferred)
By: Takisha Cannon, SAIC, Reston, VA 703-318-4671

I described to Mr. Ashley the type of waste EPA proposes to list. Also offered brief overview of the concerns of one sludge generator.

Mr. Ashley asked if the waste in question would be coming from a Superfund site. Salesco Systems could handle Superfund waste if it originally came from process wastewater, but otherwise they could not. After hearing that this waste (using Borden's scenario as a hypothetical example) would not be coming from a Superfund site, Mr. Ashley was very confident that they could handle the waste.

When asked about the relatively low mercury content of 1%, Mr. Ashley felt that this amount of mercury would not pose any problem for them accepting the waste. He felt that 1% was quite a lot of mercury. Salesco would only be concerned if the content was down to 2 ppm or less. They would prefer not to have it lower than that, but they could probably still handle content as low as 2 ppm.

With regard to dealing with organics, Mr. Ashley contends that the 500 ppm restriction is going to be encountered pretty much across the industry. Nobody is going to try to retort that. That does not mean they will not accept the waste stream. If Salesco takes waste that is too high in organics, they use an M4 process that essentially separates the organics from the mercury. The mercury is absorbed onto a column (similar to ion exchange process), then retort is on the column to liberate the mercury.

As far as the mercury waste being in sludge form, they would drain some water out during the M4 process. The rest evaporates during retort (they have mechanism to capture moisture so it doesn't pollute their system).

When asked about any other special restrictions that would deter them from accepting waste, Mr. Ashley indicated that Salesco asks each potential customer to fill out a detailed profile sheet which helps them determine whether or not mercury waste stream is also radioactive, pyrophoric, highly reactive, etc. They are mainly concerned that there aren't any surprises when they retort the waste, but it seems that the types of concerns brought out by the Borden letter are things Salesco is capable of handling.

Mr. Ashley did ask what kind of waste volume they would be expected to handle. As an example, I used the 40 cubic yards per year (in his estimation about 120 drums per year depending on how they're packed) generated by Borden. He also asked if they would receive the waste all in one slug or in a "dribble." I told him that I couldn't specify this. Mr. Ashley indicated that they could handle this volume of waste, and they would preferably accept it in a dribble.

Additionally , Mr. Ashley indicated that transportation is included in their pricing. Salesco has no problem providing service to this region and sends trucks to the Southeast approximately once every

ten days. With transportation going out there regularly, it is convenient for them to have a steady stream of waste to pick up.

B-2. Facilities Researched But Not Contacted Because They Appeared Unlikely to Treat K175 by Mercury Recovery

Certain facilities (some of which were contacted by phone) indicated that they did not treat mercury waste using retorting. In other cases, the information received from databases and literature searches did not provide conclusive information regarding their ability or willingness to accept or treat wastes similar to K175 (e.g., they appeared to only accept fluorescent bulbs and other mercury-containing consumer products). These facilities are briefly identified below:

- Advanced Environmental Recycling Corp., LLC (AERC) of Allentown, PA principally recycles mercury waste (according to the 1998 RMERC Report). The facility's storage areas, lamp processing areas, and retort areas are currently RCRA permitted. The facility reported recycling D009 wastes including lab packs, spent acid, elemental mercury, mercury contained in manufactured articles, contaminated soil, batteries, mercury salts and (unspecified) compounds, spent carbon, and industrial scrap. No information on Part 266 requirements regarding boiler and industrial furnace permitting is available for this facility. Available information indicates it does not accept mercury-containing industrial waste sludges.

- ENSCO Environmental Services, Dalton, GA is permitted for hazardous waste storage and hazardous waste treatment in containers according to RCRIS data, which indicated also that other storage and treatment areas at ENSCO are no longer operating. Telephone contact with a State representative revealed that the facility actually does not conduct thermal recovery of mercury.

- Green Mountain Power Corp. of Colchester, VT is RCRA permitted to store hazardous waste, but not to treat hazardous waste; based on the 1998 RMERC Report, the facility retorted very small quantities of mercury waste (fluorescent bulbs) in 1995 according to BRS data.

- Recyclights Inc. of Tallahassee, FL is RCRA permitted to store hazardous waste, but not to treat hazardous waste. BRS data indicate that it treats waste in an exempt fashion. Its operations are likely limited to fluorescent lamp recycling.

- Mercury Recycling Inc. of Brisbane, CA, identified as Quicksilver Products Inc. in the RCRIS database is RCRA permitted to store hazardous waste. No information on treatment is available, and it may not be an active facility.

Appendix C. Constituents Present in K174 and K175 Wastes

Certain constituents are finalized as the basis for listing K174 and K175 in 40 CFR Part 261 Appendix VII. In addition, numerical treatment standards are finalized for these wastes, for inclusion in 40 CFR §268.40. The purpose of this Appendix is to describe these constituents and others in the wastes in greater detail, specifically their concentration in the subject wastes and how the contaminant is expected to be present in the waste. Tables C-1 and C-2 present this information. The final definitions of K174 and K175 are presented in Section 3 of this report.

The principal products produced by the chlorinated aliphatics manufacturing industry are ethylene dichloride (EDC) and vinyl chloride monomer (VCM). The principal use of EDC is a chemical intermediate in the production of VCM, while VCM is used in the production of polyvinyl chloride, a widely used polymer. The manufacture of chlorinated aliphatics is within the scope of Standard Industrial Classification (SIC) code 2869 (industrial organic chemicals, not elsewhere classified). Chlorinated aliphatics production corresponds to North American Industry Classification System (NAICS) code 32511 (petrochemical manufacturing) or code 325199 (all other basic organic chemical manufacturing). Polymer production (the end use of VCM) is within the scope of SIC code 2821 (plastics material and synthetic resins and nonvulcanized elastomers). Polymer production corresponds to NAICS code 325211 (plastics material and resin manufacture).

Ethylene dichloride and vinyl chloride monomer are produced in the following series of reactions:

Balanced Process (the predominant process in the industry)

1) direct chlorination of ethylene to produce EDC:

$$CH_2=CH_2 + Cl_2 \rightarrow ClCH_2CH_2Cl$$

2) thermal cracking of EDC (following purification from previous step) to produce VCM and hydrogen chloride:

$$ClCH_2CH_2Cl \rightarrow CH_2=CHCl + HCl$$

3) oxychlorination of ethylene and HCl from thermal cracking to produce EDC:

$$CH_2=CH_2 + 2HCl + \tfrac{1}{2} O_2 \rightarrow ClCH_2CH_2Cl + H_2O$$

The overall reaction from these three steps is the production of vinyl chloride as follows:

$$2\ CH_2=CH_2 + Cl_2 + \tfrac{1}{2} O_2 \rightarrow 2\ CH_2=CHCl + H_2O$$

As shown in the overall reaction, ethylene dichloride is consumed as an intermediate in the reaction to vinyl chloride, and this is the typical case at many facilities. However, in some cases EDC is manufactured onsite and sent offsite as a product or purchased from an offsite source and used onsite

to manufacture VCM. Following the manufacture of VCM, many facilities consume VCM onsite as an intermediate in the manufacture of polyvinyl chloride (PVC).

Acetylene Based Process (less common industry-wide):

$$CH/CH + HCl \quad ! \quad CH_2=CHCl$$

Table C-1. Constituents Present in K174 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
Volatiles				
Acetone	2,000	670	Neither	Lab Contaminant
Allyl chloride (3-Chloropropylene)	8	Not detected	Neither	Reaction by-product
2-Butanone (Methyl ethyl ketone)	120	28	Neither	Not identified
Carbon disulfide	34	7.2	Neither	Not identified
Chloroform	560	32	Neither	Reaction by-product
1,2-Dichloroethane	530	36	Neither	Reaction product
cis-1,3-dichloropropane	Not detected	4 J	Neither	Not identified
2-Hexanone	2.5	Not detected	Neither	Not identified
4-Methyl-2-pentanone	Not detected	4 J	Neither	Not identified
Methylene chloride	43	44	Neither	Reaction by-product
Tetrachloroethylene	18 J	Not detected	Neither	Reaction by-product
Trichloroethylene	2.8 J	Not detected	Neither	Reaction by-product
Vinyl acetate	7	Not detected	Neither	Not identified
Vinyl chloride	15 J	Not detected	Neither	Reaction product
Semivolatiles				
Benzoic acid	190 J	108	Neither	Not identified
Bis(2-chloroethyl)ether	800	12	Neither	Not identified
Bis(2-ethylhexyl) phthalate	5,900 J	Not detected	Neither	Not identified
Hexachlorobenzene	110 J	Not detected	Neither	Reaction by-product
4-Methyl phenol	Not detected	42	Neither	Not identified
Metals				
Aluminum	29,500,000	Not detected	Neither	Not identified
Arsenic	27,000	53	LDR	Not identified
Barium	98,000	Not detected	Neither	Not identified

Table C-1. Constituents Present in K174 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
Cadmium	630	Not detected	Neither	Not identified
Calcium	214,000,000	848	Neither	Not identified
Chromium	287,000	Not detected	Neither	Not identified
Cobalt	10,000	70	Neither	Not identified
Copper	4,080,000	22.3	Neither	Reaction catalyst
Iron	158,000,000	Not detected	Neither	Not identified
Lead	13,000	Not detected	Neither	Not identified
Magnesium	4,040,000	154	Neither	Not identified
Manganese	663,000	12.9	Neither	Not identified
Molybdenum	2,800	0.22	Neither	Not identified
Nickel	120,000	1.3	Neither	Not identified
Potassium	Not detected	9.3	Neither	Not identified
Sodium	9,460,000	Not detected	Neither	Not identified
Vanadium	14,600	Not detected	Neither	Not identified
Zinc	688,00,	4.0	Neither	Catalyst
Dioxins and Furans				
1,2,3,4,6,7,8-HpCDD	0.777	Not detected	Both	Reaction by-product
1,2,3,4,6,7,8,-HpCDF	20.7	0.0011	Both	Reaction by-product
1,2,3,6,7,8,9-HpCDF	13.5	0.0004	Both	Reaction by-product
HxCDDs	(not given)	Not detected	Both	Reaction by-product
HxCDFs	(not given)	0.00007	Both	Reaction by-product
PeCDDs	(not given)	Not detected	Both	Reaction by-product
PeCDFs	(not given)	Not detected	Both	Reaction by-product
TCDDs	(not given)	Not detected	Both	Reaction by-product

Table C-1. Constituents Present in K174 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
TCDFs	(not given)	0.000049	Both	Reaction by-product
1,2,3,4,6,7,8-HpCDD	0.777	Not detected	Both	Reaction by-product
1,2,3,4,6,7,8-HpCDF	20.7	0.0011	Both	Reaction by-product
1,2,3,4,7,8,9-HpCDF	13.5	0.004	Both	Reaction by-product
OCDD	6.48	0.0002	Both	Reaction by-product
OCDF	212	0.099	Both	Reaction by-product

See footnotes following Table C-2.

Table C-2. Constituents Present in K175 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
Volatiles				
Acetone	Not detected	130	Neither	Lab contaminant
Benzene	Not detected	4.9 J	Neither	Not identified
2-Butanone	Not detected	9	Neither	Not identified
Carbon disulfide	Not detected	14	Neither	Not identified
1,1-Dichloroethane	Not detected	43	Neither	Reaction by-product
1,2-Dichloroethane	Not detected	7	Neither	Reaction by-product
trans-1,2-Dichloroethylene	Not detected	3.2 J	Neither	Reaction by-product
Methylene chloride	Not detected	6.6 J	Neither	Reaction by-product
1,1,2-Trichloroethane	Not detected	10	Neither	Reaction by-product
Vinyl chloride	Not detected	7.1 J	Neither	Reaction product
Semivolatiles				

Table C-2. Constituents Present in K175 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
Benzoic acid	Not detected	14 J	Neither	Not identified
Butyl benzyl phthalate	Not detected	7.9 J	Neither	Not identified
Di-n-butyl phthalate	20,000	Not detected	Neither	Not identified
1,2-Dichlorobenzene	2,010 J	Not detected	Neither	Reaction by-product
1,3-Dichlorobenzene	700 J	Not detected	Neither	Reaction by-product
1,4-Dichlorobenzene	960 J	Not detected	Neither	Reaction by-product
Bis (2-ethylhexyl)phthalate	3,400 J	Not detected	Neither	Not identified
Fluoranthene	670 J	Not detected	Neither	Not identified
Pyrene	2,320 J	Not detected	Neither	Not identified
1,2,4-Trichlorobenzene	2,340 J	Not detected	Neither	Reaction by-product
Metals				
Aluminum	626,000	Not detected	Neither	Not identified
Arsenic	3,600	Not detected	Neither	Not identified
Barium	43,000	Not detected	Neither	Not identified
Calcium	1,090,000	417,000	Neither	Not identified
Chromium	15,300	100	Neither	Not identified
Copper	43,500	640	Neither	Not identified
Iron	2,410,000	Not detected	Neither	Not identified
Lead	15,200	Not detected	Neither	Not identified
Magnesium	211,100	2,700	Neither	Not identified
Manganese	14,300	300	Neither	Not identified
Mercury	9,200,000	260	Both	Catalyst
Nickel	27,000	100	Neither	Not identified
Potassium	Not detected	1,600	Neither	Not identified
Sodium	785,000	Not detected	Neither	Not identified
Vanadium	6,700	Not detected	Neither	Not identified

Table C-2. Constituents Present in K175 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
Zinc	445,700	9,500	Neither	Catalyst
Dioxins and Furans				
1,2,3,4,7,8-HxCDF	0.083	Not detected	Neither	Reaction by-product
1,2,3,6,7,8-HxCDF	0.0481	Not detected	Neither	Reaction by-product
1,2,3,7,8,9-HxCDF	0.0192	Not detected	Neither	Reaction by-product
2,3,4,6,7,8-HxCDF	0.0319	Not detected	Neither	Reaction by-product
1,2,3,7,8-PeCDF	0.0288	Not detected	Neither	Reaction by-product
2,3,4,7,8-PeCDF	0.0197	Not detected	Neither	Reaction by-product
2,3,7,8-TCDF	0.0101	Not detected	Neither	Reaction by-product
Total HxCDD	0.0656	Not detected	Neither	Reaction by-product
Total HxCDF	0.3758	Not detected	Neither	Reaction by-product
Total PeCDF	0.1704	Not detected	Neither	Reaction by-product
Total TCDD	0.0038	Not detected	Neither	Reaction by-product
Total TCDF	0.0481	Not detected	Neither	Reaction by-product
1,2,3,4,6,7,8-HpCDD	0.1748	Not detected	Neither	Reaction by-product
1,2,3,4,6,7,8-HpCDF	0.1093	Not detected	Neither	Reaction by-product
1,2,3,4,7,8,9-HpCDF	0.0297	Not detected	Neither	Reaction by-product
Total HpCDD	0.3496	Not detected	Neither	Reaction by-product
Total HpCDF	0.1398	Not detected	Neither	Reaction by-product

Table C-2. Constituents Present in K175 Wastes				
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	Source of Contaminant [C]
	Total (ug/kg)	TCLP (ug/L)		
OCDD	1.44	Not detected	Neither	Reaction by-product
OCDF	0.1005	Not detected	Neither	Reaction by-product

Footnotes for Tables C-1 and C-2:

Common names of dioxin and furan constituents are as follows:

Octachlorodibenzo-*p*-dioxin
Octachlorodibenzofuran
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin
1,2,3,4,6,7,8-Heptachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
All Hexachlorodibenzo-*p*-dioxins
All Hexachlorodibenzofurans
All Pentachlorodibenzo-*p*-dioxins
All Pentachlorodibenzofurans
All tetrachlorodi-benzo-*p*-dioxins
All tetrachlorodibenzofurans

A. Maximum concentrations are based on EPA record sampling activities. Data are provided in Best Demonstrated Available Technology (BDAT) Background Document for Chlorinated Aliphatics Wastes.
B. 'Listing' indicates that it is proposed for inclusion in 40 CFR 261 Appendix VII. 'LDR' indicates that it is proposed for inclusion in 40 CFR 268.40.
C. Source of contaminant in waste is based on engineering judgement.
J – Compound's concentration is estimated.

Appendix D. Supporting Tables for F039 Analysis

The following tables support the F039 analysis presented in Chapter 3 of this report. The following tables are included:

- Summary of F039 managed onsite: Onsite management methods, and quantities, of F039 managed onsite by generators. This information is presented in its entirety in Section 3.

- Summary of F039 managed offsite: Offsite management methods, and quantities, of F039 shipped offsite by generators. This information is presented in its entirety in Section 3.

- F039 managed in underground injection: Names of facilities managing F039 using underground injection. In the analysis in Section 3, this information is cross-referenced with other data to identify if these facilities have no-migration petitions, and therefore would be less likely to be impacted by changes in the F039 treatment standard.

- A series of tables detailing 16 onsite management practices. For each management practice, the physical forms of the waste are identified with associated quantities. This information is used in Section 3 to identify the quantities of F039 wastes likely to meet the definition of a wastewaters or nonwastewater. The management practices presented are as follows:
  - Deepwell/underground injection.
  - Settling/clarification
  - Phase separation
  - Transfer to another facility for storage
  - Other treatment (not known)
  - Other disposal (known)
  - Aqueous organic treatment
  - Precipitation
  - Air/steam stripping
  - Other organic or inorganic treatment
  - Neutralization
  - Landfill
  - Other treatment (known)
  - Stabilization/fixation with cementitious or pozzolanic materials
  - Surface impoundment
  - Land treatment

F039 Managed Onsite Summary, Using 1997 BRS

M-Code	Management Type	Short Tons
M136	Discharge to surface water (NPDES)	52,219,076
M134	Deepwell/underground injection	4,829,125
M083	Air/steam stripping	4,060,819
M081	Biological treatment	1,499,272
M135	Discharge to sewer/POTW	1,206,868
M077	Precipitation	510,045
M094	Other organic/inorganic treatment	488,121
M085	Aqueous organic treatment	470,996
M082	Carbon adsorption	166,977
M092	Precipitation and carbon adsorption	157,626
M121	Neutralization	152,462
M137	Other - known (disposal)	82,494
M091	Precipitation and biological treatment	81,441
M132	Landfill	44,464
M129	Other - unknown (treatment)	38,708
M042	Incineration - sludges	35,861
M125	Other - known (treatment)	25,533
M043	Incineration - solids	17,296
M074	Oxidation and precipitation	15,181
M141	Transfer facility storage	9,861
M111	Stabilization/fixation with cementitious/pozzolanic material	3,383
M124	Phase separation	3,284
M133	Surface impoundment	1,747
M123	Settling/clarification	1,243
M041	Incineration - liquids	1,089
M032	Other Recovery	785
M122	Evaporation	164
M053	Energy Recovery - solids	70
M131	Land treatment/application/farming	52
M061	Fuel blending	0.4
	TOTAL	66,124,045

F039 Shipped Offsite Summary from 1997 BRS

Off-site System Type	Management Type	Short Tons
M081	Biological treatment	133,987
M134	Deepwell/underground injection	61,899
M135	Discharge to sewer/POTW	41,554
M132	Landfill	33,528
M077	Precipitation	29,134
M099	Aqueous organic and inorganic - unknown	21,543
M125	Other - known (treatment)	20,481
M136	Discharge to surface water (NPDES)	19,581
M		14,130
M051	Energy Recovery - liquids	7,473
M041	Incineration - liquids	7,464
M075	Oxidation	5,384
M043	Incineration - solids	4,272
M141	Transfer facility storage	4,102
M111	Stabilization/fixation with cementitious/pozzolanic materials	3,932
M094	Other organic/inorganic treatment	3,298
M085	Aqueous organic treatment	3,033
M129	Other - unknown (treatment)	2,977
M082	Carbon adsorption	2,725
M061	Fuel blending	2,532
M032	Other Recovery	2,206
M013	Secondary Smelting	2,033
M039	Other Recovery (unknown)	1,887
M102	Addition of lime	1,790
M042	Incineration - sludges	1,219
M089	Aqueous organic treatment - unknown	1,138
M119	Stabilization - unknown	1,034
M121	Neutralization	858
M049	Incineration - unknown	345
M078	Other aqueous inorganic	251
M092	Precipitation and carbon adsorption	182
M112	Other stabilization	90
M053	Energy Recovery - solids	50
M011	HTMR	24
M012	Retorting	10
M137	Other - known (disposal)	9
M079	Aqueous inorganic - unknown	4
M072	Cyanide destruction and precipitation	0.5
M052	Energy Recovery - sludges	0.4
M019	Metals Recovery (unknown)	0.3
	TOTAL	436,163

F039 Underground Injected: 1997 BRS

EPA ID	Site/Company Name	City	Management Type	Short Tons
AKD048679682	TESORO ALASKA PETROLEUM CO KENAI REFINE	KENAI	Deepwell/underground injection	44,515
ARD043195429	GREAT LAKES CHEMICAL CORPORATION	EL DORADO	Deepwell/underground injection	750,900
LAD000618256	CECOS INTERNATIONAL INC.	WESTLAKE	Deepwell/underground injection	5,595
MSD008186587	MORTON INTERNATIONAL, INC	Moss Point	Deepwell/underground injection	489,252
OHD020273819	WASTE MANAGEMENT OF OHIO INC	VICKERY	Deepwell/underground injection	6,501
TX0000611251	T H Agriculture & Nutrition Co Inc	Llano	Deepwell/underground injection	1,041
TXD000751172	Green Lake Facility	Bloomington	Deepwell/underground injection	1,094,574
TXD000761254	CHEMICAL WASTE MANAGEMENT	CORPUS CHRISTI	Deepwell/underground injection	4
TXD000838896	CHEMICAL WASTE MANAGEMENT, INC	PORT ARTHUR	Deepwell/underground injection	7,799
TXD001700806	Chocolate Bayou Plant	Alvin	Deepwell/underground injection	2,425,214
TXD008123317	Du Pont De Nemours & Co., E.I.	Victoria	Deepwell/underground injection	3,725
TXR000001016	DSCCI	Corpus Christi	Deepwell/underground injection	6
			TOTAL	4,829,125

F039 Underground Injection

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M134	Deepwell/underground injection	B219	Other organic liquids (Specify in Comments)	2,447,692
F039	M134	Deepwell/underground injection	B113	Other aqueous waste with high dissolved solids	1,071,831
F039	M134	Deepwell/underground injection	B114	Other aqueous waste with low dissolved solids	750,900
F039	M134	Deepwell/underground injection	B111	Aqueous waste with reactive sulfides	489,252
F039	M134	Deepwell/underground injection	B116	Leachate	56,568
F039	M134	Deepwell/underground injection	B105	Acidic aqueous waste	5,864
F039	M134	Deepwell/underground injection	B119	Other inorganic liquids (Specify in Comments)	5,515
F039	M134	Deepwell/underground injection	B102	Aqueous waste with low other toxic organics	1,041
F039	M134	Deepwell/underground injection	B115	Scrubber water	216
F039	M134	Deepwell/underground injection	B103	Spent acid with metals	164
F039	M134	Deepwell/underground injection	B110	Caustic aqueous waste	83
				TOTAL	4,829,125

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Settling Clarification

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M123	Settling/clarification	B113	Other aqueous waste with high dissolved solids	695
F039	M123	Settling/clarification	B219	Other organic liquids (Specify in Comments)	542
F039	M123	Settling/clarification	B116	Leachate	6
				TOTAL	1,243

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Phase Separation

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M124	Phase separation	B102	Aqueous waste with low other toxic organics	2734
F039	M124	Phase separation	B219	Other organic liquids (Specify in Comments)	542
F039	M124	Phase separation	B113	Other aqueous waste with high dissolved solids	8
				TOTAL	3,284

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Transfer Facility

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M141	Transfer facility storage	B116	Leachate	5,637
F039	M141	Transfer facility storage	B115	Scrubber water	3,861
F039	M141	Transfer facility storage	B319	Other waste inorganic solids (Specify in Comments)	230
F039	M141	Transfer facility storage	B303	Ash, slag, or other residue from incineration of wastes	54
F039	M141	Transfer facility storage	B609	Other organic sludges (Specify in Comments)	30
F039	M141	Transfer facility storage	B607	Biological treatment sludge	23
F039	M141	Transfer facility storage	B404	Spent carbon	19
F039	M141	Transfer facility storage	B407	Other halogenated organic solids (Specify in Comments)	4
F039	M141	Transfer facility storage	B310	Spent solid filters or adsorbents	1.46
F039	M141	Transfer facility storage	B403	Solid resins or polymerized organics	1.01
F039	M141	Transfer facility storage	B203	Nonhalogenated solvent	0.10
F039	M141	Transfer facility storage	B409	Other nonhalogenated organic solids (Specify in Comments	0.05
F039	M141	Transfer facility storage	B307	Metal scale, filings, or scrap	0
				TOTAL	9,861

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Other Unknown Treatment

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M129	Other - unknown (treatment)	B119	Other inorganic liquids (Specify in Comments)	37646
F039	M129	Other - unknown (treatment)	B116	Leachate	712
F039	M129	Other - unknown (treatment)	B114	Other aqueous waste with low dissolved solids	350
		TOTAL			38,708

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Other Known Disposal

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M137	Other - known (disposal)	B219	Other organic liquids (Specify in Comments)	64,058
F039	M137	Other - known (disposal)	B101	Aqueous waste with low solvents	18,405
F039	M137	Other - known (disposal)			31
F039	M137	Other - known (disposal)	B201	Concentrated solvent-water solution	0
				TOTAL	82,494

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Aqueous Organic Treatment

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M085	Aqueous organic treatment	B219	Other organic liquids (Specify in Comments)	224,235
F039	M085	Aqueous organic treatment	B116	Leachate	119,262
F039	M085	Aqueous organic treatment	B102	Aqueous waste with low other toxic organics	89,489
F039	M085	Aqueous organic treatment	B201	Concentrated solvent-water solution	38,010
			TOTAL		470,996

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Manged Using Precipitation

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M077	Precipitation	B115	Scrubber water	507,073
F039	M077	Precipitation	B116	Leachate	2,972
				TOTAL	510,045

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Form Code Analysis: Air/Stream Stripping

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M083	Air/steam stripping	B102	Aqueous waste with low other toxic organics	3,090,642
F039	M083	Air/steam stripping	B219	Other organic liquids (Specify in Comments)	714,933
F039	M083	Air/steam stripping	B116	Leachate	204,537
F039	M083	Air/steam stripping	B101	Aqueous waste with low solvents	50,706
				TOTAL	4,060,819

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Form Code Analysis Other Treatment

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M094	Other organic/inorganic treatment	B116	Leachate	488,121

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Neutralization

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M121	Neutralization	B115	Scrubber water	79,587
F039	M121	Neutralization	B101	Aqueous waste with low solvents	65,289
F039	M121	Neutralization	B116	Leachate	7,586
				TOTAL	152,462

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 19

F039 Landfill

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M132	Landfill	B519	Other inorganic sludges (Specify in Comments)	17,195
F039	M132	Landfill	B607	Biological treatment sludge	8,295
F039	M132	Landfill	B303	Ash, slag, or other residue from incineration of wastes	5,520
F039	M132	Landfill	B319	Other waste inorganic solids (Specify in Comments)	4,116
F039	M132	Landfill	B605	Reactive or polymerizable organics	2,971
F039	M132	Landfill	B		2,460
F039	M132	Landfill	B502	Lime sludge with metals/metal hydroxide sludge	1,911
F039	M132	Landfill	B305	"Dry" lime or metal hydroxide solids chemically "fixed"	1,250
F039	M132	Landfill	B301	Soil contaminated with organics	334
F039	M132	Landfill	B306	"Dry" lime or metal hydroxide solids not "fixed"	212
F039	M132	Landfill	B116	Leachate	108
F039	M132	Landfill	B302	Soil contaminated with inorganics only	72
F039	M132	Landfill	B514	Drilling mud	8
F039	M132	Landfill	B310	Spent solid filters or adsorbents	8
F039	M132	Landfill	B409	Other nonhalogenated organic solids (Specify in Comments)	3
F039	M132	Landfill			2
				TOTAL	44,462

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Other Known Treatment

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M125	Other - known (treatment)			11,680
F039	M125	Other - known (treatment)	B607	Biological treatment sludge	7,403
F039	M125	Other - known (treatment)	B114	Other aqueous waste with low dissolved solids	2,224
F039	M125	Other - known (treatment)	B116	Leachate	2,200
F039	M125	Other - known (treatment)	B113	Other aqueous waste with high dissolved solids	1,675
F039	M125	Other - known (treatment)	B504	Other wastewater treatment sludge	349
F039	M125	Other - known (treatment)	B310	Spent solid filters or adsorbents	2
F039	M125	Other - known (treatment)	B609	Other organic sludges (Specify in Comments)	1
				TOTAL	25,533

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Stabilization

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B		2,460
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B303	Ash, slag, or other residue from incineration of wastes	821
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B319	Other waste inorganic solids (Specify in Comments)	79
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B519	Other inorganic sludges (Specify in Comments)	15
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B116	Leachate	8
F039	M111	Stabilization/fixation with cementitious/pozzolanic materials	B310	Spent solid filters or adsorbents	1
				TOTAL	3,383

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Form Code Analysis: Surface Impoundment Management

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M133	Surface impoundment	B219	Other organic liquids (Specify in Comments)	1,284
F039	M133	Surface impoundment	B116	Leachate	463
				TOTAL	1,747

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

F039 Land Treatment

RCRA Code	Mgmt Code	Management Type	Form Code	Waste Form Code Description	Tons
F039	M131	Land treatment/application/farming	B319	Other waste inorganic solids (Specify in Comments)	52

This table identifies the physical forms of F039 wastes managed onsite by the indicated management method, using 1997 BRS.

Appendix E. Analysis of Available Commercial Capacity for Combustion and Landfilling

- Analysis of Available Commercial Capacity for Combustion
- Analysis of Available Capacity for Landfilling

Analysis of Available Commercial Capacity for Combustion

This appendix presents a summary of the estimated maximum practical, utilized, and available capacities for combustion of hazardous wastes. Section 1 discusses their methodology for identifying, collecting, and analyzing data pertaining to available capacity for combustion. Section 2 presents maximum practical, utilized, and available capacities. Section 3 briefly discusses caveats of the analysis.

1. METHODOLOGY FOR ESTIMATING MAXIMUM PRACTICAL, UTILIZED, AND AVAILABLE CAPACITIES

We used the 1997 Biennial Reporting System (BRS) (September 1999), 1995 BRS and the Resource Conservation and Recovery Information System (RCRIS) database in Envirofacts (November 1999).

The maximum practical capacity, as defined for this analysis, is the amount of hazardous waste that could be handled by a facility, given constraints of a calendar year, work shifts, and permits. The utilized capacity is the amount of hazardous waste that was actually managed in the year (i.e., the quantity managed according to the 1997 BRS). The available capacity is the difference between the maximum practical and the utilized capacities.

In analyzing the maximum practical, utilized, and available commercial capacity for combustion, we included only those incineration and energy recovery (i.e., boiler and industrial furnaces, or BIFs) facilities included in a list other EPA office compiled (Permit and State Program Division, Office of Solid Waste). This list identifies hazardous waste combustion facilities that are commercial and operational as of May 27, 1999.

1.1 Maximum Practical Commercial Capacity Analysis

Step 1: Estimating the maximum operational commercial RCRA capacity from capacity data from the PS Form of the 1995 BRS

Capacity data for incineration and energy recovery, for each facility for which data were available, were extracted from the On-site Waste Treatment, Disposal, or Recycling Process System (PS) Form of the 1995 BRS. Data elements contained in the PS Form and used in the analysis include maximum RCRA operational capacity and percent capacity commercially available. The *1995 Hazardous Waste Report Instructions and Forms* (EPA Form 8700-13A/B (5-80) (8-95)) defines maximum RCRA operational capacity as the greatest RCRA quantity that could have entered the process system, assuming all of the following:

- No change in equipment;
- An unlimited supply of waste of the same typical mix managed in 1995;
- Willingness to add additional shifts;
- Necessary routine downtime;
- Effects of other process systems sharing the same units for competing for capacity;
- Limits in current permit will not be exceeded; and

C Regulatory limitations.

The maximum operational commercial RCRA capacity was estimated by multiplying the maximum RCRA operational capacity times the percent capacity commercially available. We were only able to estimate the maximum operational commercial RCRA capacity for about 50 percent of the combustion facilities included in their analysis.[58]

Step 2: Extracting process design capacity data from the RCRIS database

Maximum RCRA operational capacity data obtained from the 1995 BRS were supplemented with process design capacity data obtained from the RCRIS database in Envirofacts (http://www.epa.gov/ enviro/index_java.html). The *RCRIS Data Element Dictionary*[59] defines process design capacity as the amount of waste capacity handled in the unit or the capacity for which the unit is designed. This value does not factor in constraints of calendar year, work shifts, commercially available percentage, and the permitted amount of waste that can be treated in the unit. Thus, the process design capacity value, as obtained from RCRIS, cannot be used directly as the maximum practical commercial capacity estimate. Nevertheless, as described in Step 3, this value could be used to a limited extent.

Process design capacity data in RCRIS is reported in several units. In order to convert to tons per year, the following assumptions were made:

C 1 year = 7,008 operating hours[60];
C 1 gallon = 0.004 tons; and
C 1 BTU per hour = 0.876 pounds of waste/hour or 4.4E-04 tons of waste/year[61].

Process design capacity was not available for three of the combustion facilities included in the analysis (i.e., one incineration facility and two energy recovery facilities).

Step 3: Combining the data and estimate the maximum practical commercial capacity

We assumed that maximum operational commercial capacity was equivalent to maximum practical commercial capacity. To estimate the maximum practical commercial capacity for the remaining combustion facilities, they first estimated the average process operational rate (i.e., the sum of the maximum operational commercial RCRA capacities ÷ the sum of the process design capacities) for facilities for which they had reliable maximum operational commercial RCRA capacity and process

[58] The analysis included a total of 48 facilities (22 incineration and 26 BIF facilities). Of these, only 23 facilities (12 incineration and 11 BIF facilities) reported maximum RCRA operational capacity to the BRS in 1995.

[59] U.S. Environmental Protection Agency. 1998. Resource Conservation and Recovery Information System (RCRIS) Data Element Dictionary (v.7.1.0). Office of Solid Waste. Washington, D.C. August 1998.

[60] Assuming facilities operate 80 percent of a calendar year (i.e., 365 days/year × 24 hours/day × 0.80).

[61] ICF Incorporated. *Commercial Combustion Capacity for Hazardous Waste Sludges and Solids*. August 1990.

design capacity data.[62] For incineration, the estimated average process operational rate is 71 percent. For energy recovery, the estimated average process operational rate is 73 percent. The average process operational rate was then multiplied by the facility-specific process design capacity to obtain the maximum practical commercial capacity for each incineration and energy recovery facility that lacked maximum operational commercial capacity data. They raised the maximum practical commercial capacity estimate to the utilized capacity estimate if the maximum practical commercial capacity estimate for a facility was less than its estimated utilized capacity.

Step 4: Estimate the maximum practical commercial capacity, by waste form

The maximum practical commercial capacity, at a facility level, was broken into three categories: (1) compressed gases, (2) liquids and pumpable sludges, and (3) solids and non-pumpable sludges. To categorize the data into these three waste forms, the average industry proportions of waste forms (based on liquid, solid, and gas utilized capacities; see next section) were calculated and multiplied by the facility maximum practical commercial capacity.

1.2 Utilized Capacity

We extracted hazardous waste stream data for combustion facilities that reported to the 1997 BRS using the BRS system type codes for incineration (i.e., M041 through M049) and energy recovery (i.e., M051 through M059). For combustion facilities that managed hazardous waste generated on site (e.g., primary waste generation by the facility or residuals from pre-treatment), data were collected from their Waste Generation and Management (GM) Forms. For combustion facilities that received hazardous waste from off site for management, data were collected from their Waste Received from Off Site (WR) Forms. For each waste stream, the following data elements were extracted from the 1997 BRS:

- EPA ID of the facility managing the waste stream;
- System type code of management process used;
- Quantity of hazardous waste managed using system type code;
- EPA hazardous waste codes representing the hazardous waste; and
- Waste form code.

They categorized the utilized capacity, at a facility level, as (1) compressed gases, (2) liquids and pumpable sludges, or (3) solids and non-pumpable sludges, as follows:

- Gases (system code M044 for incineration) were assigned to Category 1;

- Liquids (system code M041 for incineration and system code M051 for energy recovery) were assigned to Category 2;

[62] That is, for which these capacities were reasonably similar to those obtain for the Report, *Available Commercial Capacity for Selected Hazardous Waste Management Technologies* (September 30, 1998; Task 7, WA 306, EPA Contract No. 68-W4-0030), hereafter referred to as the Available capacity Report.

- Solids (system code M043 for incineration and system code M053 for energy recovery) were assigned to Category 3;

- Sludges (system code M042 for incineration and system code M052 for energy recovery) were categorized into pumpable and non-pumpable sludges based on the relative quantities of liquid and solid managed at the facility, and assigned to Category 2 or 3, respectively[63]; and

- In cases where the system type did not indicate waste form (system type code M049 for incineration and system type code M059 for energy recovery), the waste was assigned to Category 2 or 3 based on the relative quantities of liquid and solid managed at the facility. (Note that the methodology used in categorizing these wastes is the same methodology that was used in categorizing sludges.)

The utilized capacity was calculated, by waste form, by adding all hazardous waste stream quantities managed at the facility.

1.3 Available Capacity

The available commercial capacity for combustion of hazardous waste was calculated, by waste form, by subtracting the utilized capacity from the maximum practical commercial capacity on a per facility basis. The results of this analysis are presented in Section 2.

2. RESULTS

There were 48 commercial combustion facilities in the nation with a combined maximum practical capacity of 2.8 million tons per year. We determined that less than 1.3 million tons per year of the capacity was being utilized, leaving a total available capacity of almost 1.6 million tons per year.

Exhibit 1 gives a breakdown of the combustion capacity by type of system (i.e., incineration or energy recovery) and waste form. The total available capacity for the combustion of liquids and pumpable sludges is approximately 0.9 million tons per year. Of this capacity, approximately 0.3 million tons per year comes from incineration and 0.6 million tons per year comes from energy recovery. The total capacity for the combustion of solids and non-pumpable sludges is approximately 0.7 million tons per year. Approximately 0.6 million tons per year (or 99.6 percent of the total capacity for the combustion of solids) comes from incineration.

[63] For example, for a facility that reported managing 1 ton of hazardous waste with a system code for liquids, 2 tons of hazardous waste with a system code for solids, and 3 tons of hazardous waste with a system code for sludges, the following assumptions were made: (1) 1 ton of the 3 tons of hazardous waste managed with the system code for sludges was assigned to Category 2 and (2) 2 tons of the 3 tons of hazardous waste managed with the system code for sludges were assigned to Category 3.

Exhibit 1
Maximum Practical, Utilized, and Available Capacities (000s tons/year) for Combustion, by Waste Form, at a National Level

Waste Form	Incineration			Energy Recovery			Total Available Capacity
	Maximum Practical Capacity	Utilized Capacity	Available Capacity	Maximum Practical Capacity	Utilized Capacity	Available Capacity	
Compressed Gases	1	1	0	N/A	N/A	N/A	0
Liquids and Pumpable Sludges	513	237	275	1,359	722	637	913
Solids and Non-Pumpable Sludges	897	269	628	55	30	25	653
Total	1,411	507	903	1,414	752	662	1,566

Exhibits 2 and 3 present summaries by waste forms for maximum practical, utilized, and available capacities for incineration and energy recovery, respectively.

Exhibit 2
Maximum Practical, Utilized, and Available Capacities (tons/year), by Waste Form, for Incineration

Waste Form	Maximum Practical Capacity	Utilized Capacity	Available Capacity
Liquids	512,743	237,420	275,324
Solids	897,151	268,829	628,322
Gases	1,145	828	317

Notes: Maximum operational commercial RCRA capacity (PS Form of the 1995 BRS) and process design capacity (RCRIS) were used in estimating the average process operational rate.
Certain facilities did not report to the BRS in 1997.
Maximum operational commercial RCRA capacity and process design capacity were not available in some instances.
Maximum practical commercial capacity for liquids is equal to the utilized capacity (1997 BRS).

Exhibit 3
Maximum Practical, Utilized, and Available Capacities (tons/year) for Energy Recovery, by Waste Form

Waste Form	Maximum Practical Capacity	Utilized Capacity	Available Capacity
Liquids	1,359,261	721,997	637,264

Solids	54,790	30,148	24,642

Notes: Maximum operational commercial RCRA capacity (PS Form of the 1995 BRS) and process design capacity (RCRIS) were used in estimating the average process operational rate.
Certain facilities included in the analysis did not report to the BRS in 1997.

Exhibits 4 and 5 present facility-specific data by waste forms for maximum practical, utilized, and available capacities for incineration and energy recovery, respectively.

3. CAVEATS

Several caveats should be noted regarding the data used in this analysis:

- Capacity information used in this analysis is primarily based on information provided by the industry in the PS, WR, and GM forms of the BRS database and the RCRIS database. Because some of the information provided in these databases are voluntary (e.g., PS Forms) or dated (RCRIS, 1995 and 1997 BRS), these data may not accurately reflect the current maximum and available treatment capacity.

- The average process operational rate used to calculate the maximum and available capacity for combustion may not provide an accurate statistical representation of the national average.

- Because nonhazardous wastes are not required to be reported in the BRS, the utilized capacity data only refer to the hazardous waste capacity. Therefore, the available capacity could be an overestimate. In addition, wastes excluded from the definition of solid waste and permitting requirements are not reported in the BRS. These factors could significantly influence the capacity estimates.

Exhibit 4
Maximum Practical, Utilized, and Available Capacities (tons/year), by Waste Form, for Incineration

EPA ID	Facility Name	Liquids			Solids			Gases		
		Maximum Practical Capacity	Utilized Capacity	Available Capacity	Maximum Practical Capacity	Utilized Capacity	Available Capacity	Maximum Practical Capacity	Utilized Capacity	Available Capacity
ALD031499833 *	Allied-Signal Inc.	0	0	0	1,604	1,517	88	0	0	0
ARD006354161	Reynolds Metals Co.	0	0	0	239,955	46,278	193,676	0	0	0
ARD069748192	ENSCO Inc.	118,757	17,609	101,148	165,689	24,568	141,121	0	0	0
ILD098642424 *	TWI Transportation Inc.	30,594	17,754	12,841	21,284	12,351	8,933	322	187	135
KSD981506025	Safety Kleen Argonite Inc.	3,246	1,458	1,788	16,094	7,231	8,863	0	0	0
KYD006373922	Elf Atochem N. America Inc.	12,498	2,597	9,901	0	0	0	0	0	0
KYD088438817 *	LWD, Inc.	43,806	15,328	28,478	56,194	19,663	36,531	0	0	0
LAD008161234 ‡	Rhodia Inc.	2,095	2,095	0	0	0	0	0	0	0
LAD010395127	Safety Kleen Baton Rouge Inc.	7,125	8	7,117	75,547	89	75,458	0	0	0
MOD985798164 *	ICI Explosives Environmental Co.	0	0	0	7,500	1,060	6,440	0	0	0
MSD985972074 ^	Hughes Environmental Systems (FTMI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NED981723513	Clean Harbors Environmental Services	30,058	30,058	0	15,369	15,369	0	0	0	0
NJD053288239 ^	Safety- Bridgeport Inc.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NYD000632372	Safety-Kleen (BDT) Inc.	0	0	0	339	91	248	36	10	26
OHD048415665	Ross Incineration Services, Inc.	45,754	22,357	23,397	20,234	9,887	10,347	0	0	0
OHD980613541 *	Waste Technologies Industries (WTI)	36,113	36,113	0	23,898	23,898	0	0	0	0
SCD981467616	Safety-Kleen Roebuck Inc.	31,542	31,542	0	0	0	0	0	0	0
TXD000838896	Chemical Waste Management	19,577	19,577	0	52,311	52,311	0	0	0	0
TXD008099079	Rhone-Poulenc Basic Chemical Co.	63,909	8,029	55,880	141	18	123	0	0	0
TXD055141378	Safety-Kleen Inc. Deer Park	28,047	27,916	131	33,828	33,669	158	613	610	3
UTD982595795	Safety-Kleen (Clive), Inc.	37,622	4,688	32,934	167,165	20,829	146,336	174	22	153
WID990829475	WRR Environmental Services Inc.	2,000	291	1,709	0	0	0	0	0	0
Total		512,743	237,420	275,324	897,151	268,829	628,322	1,145	828	317

***** Maximum operational commercial RCRA capacity (PS Form of the 1995 BRS) and process design capacity (RCRIS) were used in estimating the average process operational rate.

^ Did not report to the BRS in 1997.

‡ Maximum operational commercial RCRA capacity and process design capacity were not available. Maximum practical commercial capacity for liquids is equal to the utilized capacity (1997 BRS).

N/A= Not available

Exhibit 5
Maximum Practical, Utilized, and Available Capacities (tons/year) for Energy Recovery, by Waste Form

EPA ID	Facility Name	Liquids			Solids		
		Maximum Practical Capacity	Utilized Capacity	Available Capacity	Maximum Practical Capacity	Utilized Capacity	Available Capacity
ARD981512270 *	Ash Grove Cement	64,629	52,556	12,073	67	55	13
IND001859032	Rhodia Inc.	61,768	13,261	48,507	0	0	0
IND005081542	Essroc Cement Corp.	203,809	87,691	116,118	27	11	15
IND006419212	Lone Star Industries Inc.	64,328	57,271	7,057	14	13	2
KSD007148034 *	Lafarge Corp.	81,400	1	81,399	0	0	0
KSD031203318	Ash Grove Cement	75,437	22,370	53,067	28,643	8,494	20,149
KSD980739999	Heartland Cement Co.	58,452	21,211	37,241	4,357	1,581	2,776
KYD059568220 ^	Kentucky Solite	N/A	N/A	N/A	N/A	N/A	N/A
MID005379607	Alpena Plant Lafarge Corp.	65,227	35,801	29,426	0	0	0
MOD029729688 *	Holnam Inc.	138,486	79,171	59,315	0	0	0
MOD054018288	Continental Cement Co.	60,676	55,954	4,722	21,681	19,994	1,687
MOD981127319	Lone Star Industries	53,121	39,870	13,251	0	0	0
MSD077655876	Holnam,Inc.	84,159	34,327	49,833	0	0	0
NCD003152642	Carolina SoliteCorp.	5,350	5,350	0	0	0	0
NYD080469935	Norlite Corporation	24,707	24,015	693	0	0	0
OHD005048947 ^	Lafarge	N/A	N/A	N/A	N/A	N/A	N/A
OHD986983237 ^	Environmental Purification Industries	N/A	N/A	N/A	N/A	N/A	N/A
PAD002389559 *	Keystone Cement Co.	70,153	54,614	15,539	0	0	0
PAD083965897	Medusa Cement Co.	36,931	36,931	0	0	0	0
SCD003351699 ^	Giant Cement	N/A	N/A	N/A	N/A	N/A	N/A
SCD003368891 ^	Holnam,Inc.	N/A	N/A	N/A	N/A	N/A	N/A
TND982109142 ^	Diversified Science	N/A	N/A	N/A	N/A	N/A	N/A
TXD007349327	TXI Midlothian	58,971	58,971	0	0	0	0
TXD008097487	Olin	41,822	4,920	36,902	0	0	0
VAD042755082	Solite	53,083	19,027	34,056	0	0	0
VAD046970521	Virgina Solite Co.	56,750	18,685	38,066	0	0	0
Total		1,359,261	721,997	637,264	54,790	30,148	24,642

* Maximum operational commercial RCRA capacity (PS Form of the 1995 BRS) and process design capacity (RCRIS) were used in estimating the average process operational rate.

^ Did not report to the BRS in 1997.

N/A= Not available

Analysis of Available Capacity for Landfilling

This appendix discusses the data collection efforts and data analyses pertaining to commercial capacity for landfills used to manage hazardous waste in the United States. Section 1 discusses the methodology for identifying, collecting, and analyzing data pertaining to available commercial capacity for landfills. Section 2 presents the results of the capacity analysis. Section 3 briefly discusses caveats of the analysis.

1. METHODOLOGY FOR ESTIMATING MAXIMUM PRACTICAL, UTILIZED, AND AVAILABLE CAPACITIES

This section describes the methodology for estimating maximum, utilized, and available capacities for landfills. The major data sources used in this analysis include the 1995 and 1997 Biennial Reporting System (BRS) and the Resource Conservation and Recovery Information System (RCRIS) database (May 2000).[64]

For landfills, BRS and RCRIS were used to estimate maximum and utilized commercial landfill capacities. Maximum and utilized capacity estimates were used to assess the available commercial landfill capacity, which is defined as the remaining capacity at a permitted facility.

1.1 Landfill Commercial Capacity

In analyzing the remaining commercial capacity for hazardous waste landfills, data were extracted from the 1997 BRS (system type code M132) and RCRIS (process code D80). In addition, for some of the facilities identified through BRS and RCRIS, telephone interviews were conducted in order to obtain an accurate estimate of the remaining landfill capacity at selected facilities.

Landfill facilities (i.e., facilities associated with the above system and process codes) were only included in the analysis if they satisfied the following conditions:

- The facility conducts commercial hazardous waste management:
  - — The facility conducts commercial hazardous waste management for a limited group of generators or facilities (i.e., commercial availability code 3 in the On-site Waste Treatment, Disposal, or Recycling Process System (PS) Form of the 1995 BRS);
  - — The facility conducts commercial hazardous waste management for any generators or facilities (i.e., commercial availability code 4 in the PS Form of the 1995 BRS); or

[64] The 1997 BRS data files from EPA's website at http://www.epa.gov/epaoswer/hazwaste/data/brs97.htm were downloaded in October 1999. In addition, the following reference was used: *Available Commercial Capacity for Selected Hazardous Waste Management Technologies (September 30, 1998; under Task 7, WA 306, EPA Contract No. 68-W4-0030)*, hereafter referred to as the Available Capacity Report.

— The facility did not submit a PS Form in 1995 or, if a PS Form was submitted, did not provide a commercial availability code in the PS Form (and thus we assumed that the facility conducted commercial hazardous waste management).

- The facility's landfill does not have an operational status of permanently closed (i.e., operational status code 03 in the PS Form of the 1995 BRS).

Once a preliminary list of landfill facilities was compiled using data reported to the BRS and RCRIS, the list of landfills in the Available Capacity Report and information gathered through consultations to eliminate any non-commercial landfill facilities from the list was used.

As stated earlier, telephone interviews were conducted to obtain an accurate estimate of the remaining landfill capacity at selected facilities (i.e., seven landfill facilities). Telephone logs are in Exhibit 1. Information provided by facility representative reflects the actual remaining landfill capacity at their facility. Thus, for these landfill facilities, the capacity estimate provided by the facility representative is the remaining capacity.

Exhibit 1. LANDFILL CAPACITY ANALYSIS TELEPHONE LOGS

Contact Information	Information Collected
John Hanley, Environmental Manager **Chemical Waste Management, Inc. (AL)** (EPA ID ALD000622464) (205) 652-8125 By Margaret E. James, ICF, May 22, 2000	Mr. Hanley indicated that Chemical Waste Management currently has the capacity for 227,469 tons of commercial hazardous waste. On average, the facility receives 113,734 tons of hazardous waste annually. At this rate, they will use up their capacity in approximately two years. Mr. Hanley also mentioned that they have a permit to build cells to store an additional 568,672 tons of waste. These cells are already in construction or will be constructed in the next year. Finally, Mr. Hanley provided an estimate of 25-50 years for the remaining capacity that the facility has, including permitted and not permitted capacity.
Ron Edwards, Vice-president **Peoria Disposal Co, Inc. (IL)** (EPA ID ILD000805812) (309) 676-4893 By Margaret E. James, ICF, May 22, 2000	Mr. Edwards indicated that, as of January 1, 2000, Peoria Disposal has capacity for 1.3 million tons of hazardous waste. He further indicated that this capacity would last for approximately ten years.
Carl Carlson, Environmental Manager **Chemical Waste Management (LA)** (EPA ID LAD000777201) (318) 583-2169 By Margaret E. James, ICF, May 22 and 23, 2000	Mr. Carlson indicated that Chemical Waste Management's current available capacity is 170,000 tons. He also indicated that they have been permitted to store an additional 8.1 million tons of hazardous waste. Their facility usually receive 240,000 tons of hazardous waste each year.

Contact Information	Information Collected
Becky Zayatz, Environmental Engineering Manager **CWM Chemical Services, L.L.C. (NY)** (716) 754-0279 By Margaret E. James, ICF, May 23, 2000	Ms. Zayatz indicated that CWM Chemical Services (EPA ID NYD04983667) currently has a capacity of 300,000 cubic yards, but will the capacity for 1,700,000 more cubic yards as of January 1st of 2001.
Ken Alcomb **Envirocare of Utah, Inc. (UT)** (EPA ID UTD982598898) (801) 532-1330 By Margaret E. James, ICF, May 24, 2000	Mr. Alcomb indicated that, currently, Envirocare has a capacity of 200,000 cubic yards. He also indicated that they are permitted to increase their facility's capacity by 400,000 cubic yards and that they have room for an additional 600,00 cubic yards after the permitted capacity is reached.
Paul Nowlin, Vice President **Waste Control Specialists (TX)** (EPA ID TXD988088464) (505) 394-4300 By Maribelle Rodríguez, ICF, June 28, 2000	Mr. Nowlin indicated that Waste Control Specialists is permitted to receive and dispose of hazardous waste, non-hazardous waste, and radioactive material. Their permitted capacity is 11 million cubic yards. Currently, Waste Control Specialists has a capacity of 500,000 cubic yards. These capacity estimates apply to all types of wastes since all types of wastes are disposed of in the same landfill.
Jim Maloney **Heritage Environmental Services, Inc. (IN)** (EPA ID IND980503890) (317) 390-3113 By Margaret E. James, ICF, July 31, 2000	Mr. Maloney indicated that Heritage Environmental Services has a current capacity of 255,000 cubic yards. He also indicated that the facility is permitted to increase its capacity by 2,050,000 cubic yards. Mr. Maloney stated that the facility's capacity would last for approximately 16 years.

For landfill facilities for which information was not obtained directly from the facility, the remaining capacity was estimated. A discussion of the methodology used to estimate the remaining capacity at these facilities follows. However, it should be noted that, to obtain more reliable results, all commercial landfill facilities were included in the analysis.

Maximum Commercial Capacity

To estimate the maximum commercial landfill capacity at each permitted facility, four steps were followed:

1. Estimate maximum operational commercial RCRA capacity from capacity data from the PS Form of the 1995 BRS;

2. Extract process design capacity data from the RCRIS database;

3. Combine the data and estimate the maximum commercial capacity; and

4. Estimate a low and a high maximum commercial capacity.

These steps are described below.

Step 1: Estimate maximum operational commercial RCRA capacity from capacity data from the PS Form of the 1995 BRS

Capacity data for landfills were extracted, for each facility for which data were available, from the PS Form of the 1995 BRS. Data elements contained in the PS Form used in this part of the analysis include total maximum operational capacity, maximum RCRA operational capacity, and percent capacity commercially available. For a landfill system, the *1995 Hazardous Waste Report Instructions and Forms* (EPA Form 8700-13A/B (5-80) (8-95)) defines maximum operational capacity as the quantity of hazardous and non-hazardous waste that can enter the process system over its remaining lifetime.

The maximum operational commercial RCRA capacity was then estimated by multiplying the maximum RCRA operational capacity times the percent capacity commercially available.[65,66] The maximum operational commercial RCRA capacity could be estimated for only about 62 percent of the landfill facilities included in the analysis.[67]

Step 2: Extract process design capacity data from the RCRIS database

The maximum operational commercial RCRA capacity data from the 1995 BRS was supplemented with process design capacity data from the RCRIS database. Process data on landfills were extracted from RCRIS by specifying the process code for landfills: "D80." Data elements extracted from the RCRIS database include:

- Process unit group sequence number;
- Process unit group commercial status;
- Effective date;
- Process detail data sequence number;
- Process legal status;
- Process operating status;
- Process design capacity; and
- Capacity unit of measure.

Once all records pertaining to landfills were obtained, the "effective date" field was used to select the most recent record for each landfill unit. Permitted, operating units were then selected by

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[65] If the maximum RCRA operational capacity was not available, the total maximum operational capacity was used.

[66] If the percent capacity commercially available was not provided by the facility, it was assumed that 100 percent of the RCRA or total maximum operational capacity was commercially available.

[67] The analysis included a total of 21 landfill facilities. Of these, only 13 facilities reported total maximum operational capacity and/or maximum RCRA operational capacity to the BRS in 1995.

specifying a process legal status "PI" (i.e., permitted) and process operating status "OP" (i.e., operational).

The *RCRIS Data Element Dictionary*[68] defines process design capacity as the amount of waste capacity handled in the unit or the capacity for which the unit is designed. This value does not factor in the commercially available percentage and the permitted amount of waste that can be disposed of in the unit. Thus, the process design capacity value, as obtained from RCRIS, cannot be used directly as the maximum practical commercial capacity estimate. Nevertheless, this value could be used to a limited extent. Process design capacity were available for 18 of the 21 landfill facilities included in the analysis.

Process design capacities in RCRIS were reported in volumetric units (i.e., acre-feet and cubic yards). Thus, these capacities had to be converted into tons. To do this, the process design capacity was multiplied by the average density of hazardous waste disposed in a landfill. This average density of 1.19 tons/cubic meters was estimated based on the density of hazardous waste disposed of in 1997.[69]

Step 3: Combine the data and estimate the maximum practical commercial capacity

Following Step 2, the maximum commercial capacity was estimated for landfill facilities for which reliable maximum capacity data were not available. To do this, the average process operational rate (i.e., the sum of the maximum operational commercial RCRA capacities ÷ the sum of the process design capacities) was estimated for the four facilities for which reliable maximum operational commercial RCRA capacity and process design capacity data were available.[70] This estimated average process operational rate is 74 percent. The average process operational rate was then multiplied by the process design capacity to obtain the maximum commercial capacity for each landfill facility that lacked reliable maximum operational commercial RCRA capacity data (i.e., maximum practical commercial capacity = average process operational rate × process design capacity).

Note that for certain facilities the maximum practical commercial capacity was less than the utilized capacity. For these facilities, their utilized capacity is expected to be a more reliable indicator of their maximum practical commercial capacity, and therefore, the utilized capacity was used in lieu of the maximum practical commercial capacity.

Step 4: Estimate a low and a high maximum practical capacity

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[68] U.S. Environmental Protection Agency. 1998. Resource Conservation and Recovery Information System (RCRIS) Data Element Dictionary (v.7.1.0). Office of Solid Waste. Washington, D.C. August 1998.

[69] Average density estimate is based on information reported by six facilities in their WR or GM (on site) Forms. These facilities reported influent quantities in gallons and the density of the influent in pounds/gallon.

[70] That is, the four facilities for which maximum operational commercial RCRA capacities were reasonably similar to those obtain for the Available Capacity Report: Laidlaw Environmental Services - Imperial Valley (EPA ID CAD00063316), Envirosafe Services of Idaho (EPA ID IDD073114654), Envirosafe Services of Ohio (EPA ID OHD04524370), and Chemical Waste Management of the Northwest (EPA ID ORD08945235).

Due to the uncertainty associated with the maximum practical commercial capacity estimate, a bounding analysis was conducted to develop a range of possible capacity estimates. Based on review of available data, a bounding approach that captures between 75 percent and 125 percent of the estimated maximum capacity is expected to provide reasonably reliable estimates. The maximum practical commercial capacity estimated in Step 3 were multiplied by 0.75 (low estimate) and by 1.25 (high estimate).

Commercial Utilized Capacity

Data for hazardous waste streams that were disposed in landfills in 1997, as reported to the BRS, were extracted. For landfill facilities that only received hazardous waste from off site, data were collected from their WR Forms. For landfill facilities that received hazardous waste from off site and disposed their hazardous waste on site (e.g., primary waste generation by the facility or residuals from pre-treatment), data were also collected from their GM Forms. To do this, the BRS system type code for landfills (i.e., M132) was used. For each waste stream, the following data elements were extracted from the 1997 BRS:

- EPA ID of the facility managing the waste stream;
- System type code of management process used;
- Quantity of hazardous waste managed using system type code;
- EPA hazardous waste codes representing the hazardous waste; and
- Waste form code.

The utilized capacity was calculated by adding up all hazardous waste stream quantities disposed in a landfill at the facility in 1997. This amount was then multiplied by four to develop a rough estimate of the amount of waste disposed in the landfill over the past four years.[71]

Remaining Capacity

To obtain the remaining capacity for landfill facilities that were not contacted directly, the utilized capacity was subtracted from both the "low" maximum commercial capacity and the "high" maximum commercial capacity. By doing this, a range for the remaining landfill capacity was estimated. The results of this analysis are presented in Section 2.

2. RESULTS

Exhibit 2 presents the remaining commercial landfill capacity at each of the 21 permitted facilities in the United States. As shown in the exhibit, the total remaining landfill capacity for hazardous waste ranges from 24.2 to 38.8 million tons. This amount translates into an average annual capacity between 1.2 and 1.9 million tons, assuming a remaining life for each facility of about 20 years.

[71] Note that the 1995 PS Form provides maximum operational RCRA commercial capacity for 1996. Thus, the maximum practical commercial capacity estimated in Step 3 is the maximum practical commercial capacity as of 1996.

Exhibit 2. Remaining Commercial Landfill Capacity (000s tons), by Permitted Facility [a]

EPA ID	Site/Company Name	Remaining Capacity	
		Low Estimate	High Estimate
ALD000622464	Chemical Waste Management, Inc. (Emelle) [b]	227	227
CAD000633164	Laidlaw Environmental Services (Imperial Valley) [c]	225	375
CAD980675276	Laidlaw Environmental Service (Lokern)	1,279	2,131
CAT000646117	Chemical Waste Management, Inc. (Kettleman Hills)	2,875	4,791
COD991300484	Laidlaw Env Services (Deer Trail) Inc.	2,477	4,129
IDD073114654	Envirosafe Services of Idaho, Inc [c]	1,400	2,334
ILD000805812	Peoria Disposal Co Inc [b]	1,300	1,300
IND078911146	Chemical Waste Management of Indiana LLC [d]	N/A	N/A
IND980503890	Heritage Environmental Svc Inc [b]	232	232
LAD000777201	Chemical Waste Management (Lake Charles) [b]	170	170
MID048090633	Wayne Disposal, Inc.	5,548	9,247
NVT330010000	US Ecology Inc, Beatty, NV	1,962	3,270
NYD049836679	CWM Chemical Services, L.L.C.[b]	273	273
OHD045243706	Envirosafe Services of Ohio Inc. [c]	2,020	3,367
OKD065438376	Laidlaw Environmental Services, Inc (Lone Mountain)	2,770	4,617
ORD089452353	Chemical Waste Management of the Northwest [c]	561	934
SCD070375985	Laidlaw Env Svs of SC Inc (GSX) [e]	N/A	N/A
TXD069452340	Texas Ecologists, Inc.	179	298
TXD988088464	Waste Control Specialists [b]	29	29
UTD982598898	Envirocare of Utah, Inc. [b]	182	182
UTD991301748	Laidlaw Env. Services (Grassy Mountain)	535	892
	Total	**24,244**	**38,798**

[a] Unless otherwise noted, remaining capacity was estimated using the average process operational rate, the process design capacity, and the utilized capacity.

[b] Data obtained through telephone conversation with landfill facility representative. See Exhibit 1.

[c] Estimate based on maximum operational *commercial* RCRA capacity from the 1995 PS Form and utilized capacity from the 1997 BRS.

[d] Maximum capacity data were not available in RCRIS or the BRS. Based on BRS data, this facility disposed of approximately 131,471 tons in its landfill in 1997.

[e] Maximum capacity data were not available in RCRIS or the BRS. Based on BRS data, this facility disposed of approximately 141,840 tons in its landfill in 1997.

N/A Not Available

Exhibit 3. Maximum, Utilized, and Remaining Capacities for Landfills: Low [a]

EPA ID	Site/Company Name	Low Estimate Max Cap (tons)	Utilized Capacity (tons)	Remaining Capacity (tons)
CAD000633164	Laidlaw Environmental Services (Imperial)	225,000	13,674	211,326
CAD980675276	Laidlaw Environmental Service (Lokern)	1,278,663	29,247	1,249,416
CAT000646117	Chemical Waste Management, Inc.	2,874,653	32,175	2,842,478
COD991300484	Laidlaw Env Services (Deer Trail) Inc.	2,477,436	50,947	2,426,489
IDD073114654	Envirosafe Services of Idaho, Inc Site B	1,400,442	9,188	1,391,254
IND078911146	Chemical Waste Management of Indiana LLC	125,883	125,883	0
MID048090633	Wayne Disposal, Inc.	5,548,003	650,253	4,897,751
NVT330010000	US Ecology Inc, Beatty, NV	1,961,868	13,846	1,948,021
OHD045243706	Envirosafe Services of Ohio Inc	2,020,200	963,699	1,056,501
OKD065438376	Laidlaw Environmental Services, Inc	2,770,342	264,880	2,505,462
ORD089452353	Chemical Waste Management of the NW	560,571	161,571	399,000
SCD070375985	Laidlaw Env Svs of SC Inc	567,358	567,358	0
TXD069452340	Texas Ecologists, Inc.	178,625	10,514	168,111
UTD991301748	Laidlaw Env. Services (Lone & Grassy Mtn)	535,387	87,482	447,905

[a] Excludes the seven landfill facilities for which remaining capacities were obtained through consultations.

Exhibit 4. Maximum, Utilized, and Remaining Capacities for Landfills: High [a]

EPA ID	Site/Company Name	High Estimate Max Cap (tons)	Utilized Capacity (tons)	Remaining Capacity (tons)
CAD000633164	Laidlaw Environmental Services (Imperial)	375,000	13,674	361,326
CAD980675276	Laidlaw Environmental Service (Lokern)	2,131,106	29,247	2,101,859
CAT000646117	Chemical Waste Management, Inc.	4,791,089	32,175	4,758,914
COD991300484	Laidlaw Env Services (Deer Trail) Inc.	4,129,060	50,947	4,078,113
IDD073114654	Envirosafe Services of Idaho, Inc Site B	2,334,070	9,188	2,324,882
IND078911146	Chemical Waste Management of Indiana LLC	125,883	125,883	0
MID048090633	Wayne Disposal, Inc.	9,246,672	650,253	8,596,420
NVT330010000	US Ecology Inc, Beatty, NV	3,269,780	13,846	3,255,933
OHD045243706	Envirosafe Services of Ohio Inc	3,367,000	963,699	2,403,301
OKD065438376	Laidlaw Environmental Services, Inc	4,617,237	264,880	4,352,357
ORD089452353	Chemical Waste Management of the NW	934,285	161,571	772,714
SCD070375985	Laidlaw Env Svs of SC Inc	567,358	567,358	0
TXD069452340	Texas Ecologists, Inc.	297,708	10,514	287,194
UTD991301748	Laidlaw Env. Services (Lone & Grassy Mtn)	892,312	87,482	804,829

[a] Excludes the seven landfill facilities for which remaining capacities were obtained through consultations.

4. CAVEATS

Several caveats should be noted regarding the data used in this analysis:

- Capacity information used in this analysis is primarily based on information provided by the industry in the PS, WR, and GM Forms of the BRS database and the RCRIS database. Because some of the information provided in these databases is voluntary (e.g., PS Forms) or outdated (RCRIS, 1995 and 1997 BRS), these data may not accurately reflect the current available (for solvent recovery systems) or remaining (for landfills) management capacity.

- The BRS does not contain information on the commercial status for some of the facilities included in our analysis. When no information was available, we assumed the facility was a commercial facility. Thus, we may be overestimating the number of commercial facilities.

- The average process operational rate used to calculate the maximum and remaining capacity for landfills may not provide an accurate statistical representation of the national average.

Appendix F. Telephone Logs for Facilities Researched for Landfill Capacity

Telephone Log

Date: July 9, 2000

Bill Ross, Western Manager, **Safety Kleen**
(916) 379-2242

Recorded by: Jeff Kohn, SAIC

Subject: Identification of Landfills or Landfill Cells that are Maintained Below pH 6

Mr. Ross represents all Safety-Kleen (formerly Laidlaw) permitted landfills.

Introduction: EPA proposed to list a high-mercury waste (1% mercury) as hazardous as part of a 1999 chlorinated aliphatic proposed rule. LDR treatment standards were proposed as numerical standards for mercury, plus pH restrictions on waste, plus pH restriction on co-disposed wastes to <6.0.

1. Based on operations at you landfills, do you have cells that meet this criteria now?

Mr. Ross stated that all of his landfills are usually alkaline in nature. He believed that disposing acidic waste could easily be a violation of treatment standards as they apply to corrosive wastes.

Hazardous waste that normally enters a landfill is in the form of stabilized metals. Current LDR treatment standards require that most organic wastes be incinerated, so the bulk of the wastes entering the landfills are metallic. Stabilized wastes have pozzolanic properties that dictate that the pH of the landfill be > 10.5.

2. Do you have information either on leachate pH of operating cells, or info on pH of wastes as disposed?

Stabilized wastes create significant compaction (usually averaging 130 lbs/cu ft), so Mr. Ross claims that landfills do not commonly collect leachate, except in the Southeast where there is more rain. Instead, rain water is "ponded" on top of the waste in the landfill and periodically pumped out. Mr. Ross reiterated that stabilized wastes have pozzolanic properties that dictate that the pH of the landfill be > 10.5.

Hazardous waste is usually on 15-20% of the waste destined for a permitted landfill. The remaining amount is usually in the form of soil or debris that meets the alternative treatment standards, or macroencapsulated materials, such as creosote treated wood poles. Telephone poles are not typically hazardous, but wood poles from ocean piers are often hazardous wastes.

Mr. Ross emphasized that none of his landfills intentionally segregate waste according to any properties.

Although he doesn't believe such a landfill cell currently exists, someone could potentially create one. If the waste stream is large enough, a facility could segregate a cell for only that waste. This occurs for some waste streams now, although not for its pH properties, but instead for possible future recovery of the waste. For example, if General Motors wanted to dispose a waste, but possibly later dig it up and recover it, a landfill could create a special cell for customer convenience. However, this is usually very expensive and not recommended.

Telephone Log

Date: July 9, 2000 with follow up on July 10, 2000

John Hanley, Regional Director, **Waste Management**
(205) 652-9721

Recorded by: Jeff Kohn, SAIC

Subject: Identification of Landfills or Landfill Cells that are Maintained Below pH 6

Mr. Hanson represents all Waste Management (formerly Chemical Waste Management) permitted landfills.

Introduction: EPA proposed to list a high-mercury waste (1% mercury) as hazardous as part of a 1999 chlorinated aliphatic proposed rule. LDR treatment standards were proposed as numerical standards for mercury, plus pH restrictions on waste, plus pH restriction on co-disposed wastes to <6.0.

1. Based on operations at you landfills, do you have cells that meet this criteria now?

There are no cells that currently meet this condition. If the volume is high enough, WM might be willing to make special arrangements. They could: designate a cell to the waste, build a huge substructure, or create a microvault.

Upon further discussion, Mr. Hanley said that the Emille, AL landfill does segregate their waste for compatibility purposes. They separate reactives from other wastes, and also they keep their extremely high pH waste separate from their low pH waste. However, the low pH waste is usually between 5 and 7, and is not often below 6. Mr. Hanley stated that they prefer not to take "acids". This separation occurs within the same landfill cell, and the leachate is collected on a cell by cell basis (usually somewhere between 7 and 10 pH).

2. Do you have information either on leachate pH of operating cells, or info on pH of wastes as disposed?

The leachate that comes from his landfills is usually around pH 7-10, with spikes up to 11.

Mr. Hanley referred me to the operator of Lake Charles landfill, Carl Carlsson.

Telephone Log

Date: July 10, 2000

Carl Carlson, Lake Charles Landfill, **Waste Management**
(337) 583-2169

Recorded by: Jeff Kohn, SAIC

Subject: Identification of Landfills or Landfill Cells that are Maintained Below pH 6

Mr. Carlson represents the Lake Charles landfill, and he believes this understanding extends to all Waste Management (formerly Chemical Waste Management) permitted landfills.

Introduction: EPA proposed to list a high-mercury waste (1% mercury) as hazardous as part of a 1999 chlorinated aliphatic proposed rule. LDR treatment standards were proposed as numerical standards for mercury, plus pH restrictions on waste, plus pH restriction on co-disposed wastes to <6.0.

1. Based on operations at your landfills, do you have cells that meet this criteria now?

Mr. Carlson said that most of the wastes disposed at his landfill are stabilized with cement kiln dust and thus are in the caustic range (10 - 11 pH). So, he does not envision a scenario where a cell or even a portion of a cell at his facility would meet the BDAT criteria. In terms of other Waste Management facilities, Mr. Carlson's understanding is that all of his company's landfills use stabilizing compounds to treat metal waste streams. Therefore, all of the landfills will have alkaline systems.

The Lake Charles landfill has taken the Borden waste in the past.

If he were asked by a generator to meet this criterion, he would explore two options: build a new cell only for that waste, or macroencapsulate the waste. He would not likely build a new cell because the volume of the waste would not justify such an action. However, Mr. Carlson strongly believes that macroencapsulation would be a viable management alternative for the waste. He explained very briefly that macroencapsulation involves the use of a roll-off bin that is lined with 100 ml MTBE (an polyethylene liner). Once full, the bin is sealed. This procedure is characterized as a "liner vault". Mr. Carlson said that he believe that a slightly acidic waste could be handled in a vault, and that the acid atmosphere would be maintained for a long period of time in the landfill. He said that he would look into whether performance data exists for this type of management. The manufacturer of the vault is called National Seal (recently bought out by Serrot International).

The facility performs no segregation of its wastes. If a waste comes on site below pH 4, it is neutralized so that it is at least pH 4, if not higher.

2. Do you have information either on leachate pH of operating cells, or info on pH of wastes as disposed?

The pH of the leachate from the Lake Charles facility is around 10-11.

Mr. Carlson has submitted data to his corporate office about the amount of mercury in his leachate for creating comments on another rulemaking in the past. Mr. Carlsson wasn't sure which rulemaking that was.

Telephone Log

Date: July 12, 2000

Carl Carlson, Lake Charles Landfill, **Waste Management**
(337) 583-2169

Recorded by: Ross Elliott, Hazardous Waste Identification Division
Office of Solid Waste

Subject: Identification of Landfills or Landfill Cells that are Maintained Below pH 6

On July 12, 2000, staff from the U.S. EPA phoned Carl Carlson of ChemWaste Management's landfill in Lake Charles, Louisiana in order to ask several questions related to the August 25, 1999 proposed chlorinated aliphatics listing rule. Specifically, EPA was trying to determine whether there would be sufficient capacity to treat the proposed K175 wastestream (VCM-A wastewater treatment sludge) under the proposed land disposal restrictions (LDRs), particularly with respect to the proposed requirement limiting the pH of other wastes that might be co-disposed with K175. EPA staff participating in the call were: John Austin, Pan Lee, Greg Helms, and Ross Elliott, all from the EPA's Office of Solid Waste.

Mr. Carlson stated that he was the Environmental Health and Safety Manager for the Lake Charles Landfill, a RCRA Subtitle C (hazardous waste) disposal facility. EPA staff confirmed with Mr. Carlson that the proposed K175 wastestream from Borden Chemicals and Plastics was routinely disposed in the Lake Charles Landfill, albeit as a non-hazardous waste. Mr. Carlson stated that he had been contacted by EPA's contractor working on LDR capacity issues for the chlorinated aliphatics rule. EPA staff asked Mr. Carlson if the landfill or a portion of the landfill had a pH of 6.0. Mr. Carlson said no; he said the pH throughout the landfill (as indicated by leachate pH) ranges from 9 to 11, and is usually about 10 to 10.5. EPA staff asked if there were seasonal variability in the pH of the landfill leachate, and Mr. Carlson said no, not really, that it was an alkaline environment due primarily to the materials used to stabilize hazardous wastes.

Regarding isolating a specific disposal cell for wastes with a pH of 6.0, Mr. Carlson said this would not make sense, particularly for a small volume waste such as Borden's VCM-A sludge (150 tons/year). Mr. Carlson described a technology that ChemWaste presently employs at their landfill for purposes of meeting the hazardous debris LDR standard of macroencapsulation. Mr. Carlson described a molded high-density polyethylene (HDPE) "box" that is 100 mm thick, fits in a standard roll-off box, and is shaped so that it has structural integrity. Mr. Carlson describe the manner in which the HDPE "box" is utilized and placed into the landfill. Each macroencapsulation "box" holds about 20 cubic yards of waste, Mr. Carlson said, or about 15 to 20 tons of waste per box, and essentially prevents any interaction between the material inside the box, and the surrounding landfill. When asked if he thought the HDPE box would be compatible with Borden's waste, and would prevent the waste from being exposed to the alkaline environment in the landfill, Mr. Carlson said yes.

Mr. Carlson stated that if a particular waste (such as the proposed K175) was banned from alkaline landfills, it was his opinion the waste might end up being sent to Canada for disposal, although he said he could not speak for what Borden would do.

Mr. Carlson, when asked by EPA staff, confirmed that disposal of non-hazardous waste in a hazardous waste landfill costs less than hazardous waste disposed in a hazardous waste landfill. Mr. Carlson said that cost of utilizing the HDPE box adds about $100 to $200 per ton to the cost of disposal. Factors such as whether waste needs other treatment prior to macroencapsulation (as can be required for some hazardous debris) affects the cost.

EPA staff asked Mr. Carlson to describe the size and shape of the individual cells in the Lake Charles landfill. Each cell holds about 3 to 6 million cubic yards, occupies 20 to 30 acres of land, and takes 10 years to fill. Cells are subdivided into "modules" that are about 5 to 7 acres and hold around 250,000 to 1,000,000 cubic yards of waste. Mr. Carlson reiterated that there would have to be a large incentive to dedicate one 5 to 7 acre module to a waste such as the proposed K175 waste, perhaps they would need 200,000 tons/year of waste (versus 120 tons/year of K175).

Telephone Log

Date: July 11, 2000

Anonymous

Recorded by: Jeff Kohn, SAIC

Subject: Identification of Landfills or Landfill Cells that are Maintained Below pH 6

The anonymous input came from a hazardous waste landfill, which is a privately owned and operated facility. The company is not associated with others contacted. The interviewee did not want to be identified for the official record.

Introduction: EPA proposed to list a high-mercury waste (1% mercury) as hazardous as part of a 1999 chlorinated aliphatic proposed rule. LDR treatment standards were proposed as numerical standards for mercury, plus pH restrictions on waste, plus pH restriction on co-disposed wastes to <6.0.

1. Based on operations at your landfills, do you have cells that meet this criteria now?

The facility does not take corrosives. The pH is usually between 9 and 11 due to use of stabilization as primary treatment. All wastes are commingled; there is no separation. The facility only accepts waste if they believe that there will not be any compatibility issues. The facility receives stabilized waste, non-hazardous industrial waste, treated wastes, and hazardous wastes that do not have treatment standards established yet.

The facility likely would not undergo the extra cost of creating another cell for this volume of waste. And although macroencapsulation is a viable alternative, the anonymous source didn't think they would take the waste because the time and expense of the permit modification procedures would not justify the small volume of waste. It depends on the rulemaking and what permit modification is required. If this is a Class I permit modification (under 40 CFR 270.42), then they would probably offer to take the waste. But if a Class II or III permit modification is required, the landfill would not take the time to get their permit modified.

The facility currently has state authority to macroencapsulate waste or accept waste in sealed containers. But a drawback of the macroencapsulation standard is that it does not specify two criteria:

a. Permeability
b. Structural integrity

The state environmental protection agency took the debris standard and required a more stringent level by specifying the permeability and structural integrity of the vault. The landfill has been forced to use pre-cast concrete vaults. In that scenario, the permeability is zero in theory. However, the costs are generally 4-6 times normal disposal costs in a hazardous waste landfill.

6 months should be a reasonable period of compliance.

2. Do you have information either on leachate pH of operating cells, or info on pH of wastes as disposed?

The landfill leachate collection is closer to the high end of the pH spectrum due to stabilization, usually between 9 and 11.

Appendix G. Excerpts from Response to Public Comments; Final Listing Determination for Chlorinated Aliphatics Industry Wastes (Capacity Related Comments)

DCN **CALP-00012**
COMMENTER Dow Chemical
SUBJECT **LDR-CAP**
COMMENT

(Reference: pg. 42-43) The five dioxin isomers should not be added to the Universal Treatment Standards or to the Land Disposal Restrictions for F039 wastes.

EPA should collect sufficient information to make an informed decision whether to add the five dioxins to the Universal Treatment Standards and the Land Disposal Restrictions for F039 wastes. There is no reason to make this decision now, with no information on this decision's impact.

Dow does not Support the Addition of 5 Dioxin Isomers to the Universal Treatment Standards and the Treatment Standards for F039 Wastes

EPA incorporated the five dioxins and furans into the existing requirements for UTS and LDR (F039) to fulfil a policy concern. This policy concern was articulated when the initial F039 was listed. While one can understand EPA's proper concern the F039 not be used to evade the LDR requirements, one is frustrated by the use of F039 and UTS to broaden the LDR requirements to increase environmental regulation of commingled wastes. Waste handlers can not easily separate wastes from their integrated waste management systems. No environmental protection results from regulating those using integrated waste management systems to a lower level than those who's economics dictate the use of non-integrated waste management systems. In addition to not serving any environmental goal, EPA has violated its constitutional and APA requirements.

As part of its due process obligations under the Constitution and APA, EPA has a duty to consider the legal environment inside which it may regulate. EPA failed to meet this constitutional due process requirement in evaluating whether or not to grant a national capacity variance of up to two years under 42 USC §6924(h)(2), RCRA §3004 (h)(2). The press of meeting court and statutory deadlines might excuse rushing in some instances. This argument is meaningless in justifying the discretionary addition of these five dioxins and furans to the existing UTS and LDR (F039) as EPA's proper choice is to delay considering the addition of these five new dioxins and furans until it knows the impact of this regulatory change, or if national capacity exists to treat these wastes previously subject to both UTS and LDR (F039). Regulating in the total absence of data is the epitome of abuse of discretion.

EPA should collect sufficient information to make an informed decision whether to add the five dioxins to the Universal Treatment Standards and the Land Disposal Restrictions for F039 wastes. There is no reason to make this decision now, with no information on this decision's impact.

Obviously, EPA will have to gather information to be able to make a proper decision whether or not to add the five dioxins and furans to the UTS and LDR (F039). This can be done in many manners, such as a survey of those wastes already subject to UTS and LDR (F039) under 40 USC §6927(a), RCRA §3007(a).

RESPONSE

EPA has complied with the Administrative Procedures Act by first proposing to amend the list of constituents for F039 and UTS. As we noted in the proposal, in general, EPA requested data on the annual generation volumes and characteristics of wastes affected by this proposed rule and the current treatment or recovery capacity capable of treating the wastes (64 FR 46523).

EPA has the authority to postpone prohibitions on the land disposal of a "newly identified" hazardous waste for two years on a national basis and (potentially) two more years on a case-by-case basis from "the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment will be available" (RCRA § 3004(h)(2)). Here, when changing the treatment requirements for wastes already subject to LDR (including F039 and characteristic wastes), EPA no longer has authority to use RCRA § 3004(h)(2) to grant a capacity variance to these wastes. Although there are no legal constraints to limit EPA's implementation time period for a final rule amending the list of regulated constituents in F039 and in the UTS table, however, EPA is guided by the overall objective of Section 3004(h), that treatment standards best accomplishing the objective of Section 3004(m) to minimize threats posed by land disposal should take effect as soon as possible, consistent with the availability of treatment capacity. Therefore, we evaluated whether sufficient treatment capacity is available for these wastes and based the effective date on this estimate.

In this case, EPA does not believe that such a delay in the effective date is necessary because, according to our analysis, we do not expect a treatment capacity shortfall for these wastes as a result of the addition of the new dioxin and furan congeners to the table of UTS at 268.48 and to the list of regulated constituents in hazardous leachate, F039, in 268.40. The results of this analysis are summarized below and presented in "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," September 2000.

With respect to the issue of capacity availability, we find first that only a limited quantity of hazardous waste leachate is expected to be generated from the disposal of newly-listed K174 and K175 wastes and added to the generation of leachates from other multiple restricted hazardous wastes already subject to LDR. Absent any data from commenters suggesting to the contrary, we have no reason to delay imposition of the LDRs on this ground.

Second, with respect to the other, and potentially much larger volumes of, wastes that would be affected, we evaluated the universe of wastes that could be impacted by today's revisions to the lists of regulated constituents for F039 and UTS. Commenters themselves did not supply any information on these volumes in support of their generalized claims of insufficient capacity or their views that delaying the effective date of these treatment standards is warranted. However, based on 1997 Biennial Report data and some assumptions of waste compositions and their potential for land disposal, we were able to estimate the potential need for additional treatment. For example, EPA estimated an upper bound of 68,000 tons per year of the nonwastewaters mixed with other waste codes, the F039 leachate from which would be potentially impacted by the revisions to the F039 treatment standards. In a similar

fashion, we estimated that no more than 130,000 tons per year of characteristic nonwastewaters potentially could be affected by the promulgated changes to the UTS.

Of course, these upper bound estimates are most likely very overstated since only a portion of each estimated waste volume may contain one or more of the five congeners at concentrations above the numerical concentrations specified in the UTS table and the F039 list. Available hazardous waste landfill leachate characterization data from EPA's Office of Water indicate that only one of 15 samples analyzed shows leachate concentration of OCDD exceeding the numerical UTS level adopted today. Any concentrations below these numerical standards would not trigger any treatment obligation or the concomitant need for treatment capacity. (See the Capacity Background Document for detailed analysis.) Furthermore, EPA does not anticipate that waste volumes subject to treatment for F039 or characteristic wastes would significantly increase because waste generators already are required to comply with the treatment requirements for tetra-, penta-, and hexa- chlorinated dioxin/furan congeners. The volumes of wastes for which additional treatment is needed solely due to the addition of the five new congeners to the F039 and UTS lists is therefore expected to be very small. Both of these factors indicate the highly conservative nature of our volume estimates.

However, even though our volume estimates are highly conservative and overstated, we find that there still would be no shortage of treatment capacity. Based on data submittals in the mid-1990's and the 1997 Biennial Report, EPA has estimated that approximately 37 million tons per year of commercial wastewater treatment capacity are available, and well over one million tons per year of liquid, sludge, and solid commercial combustion capacity are available. These are well above the quantities of wastewater and nonwastewater forms of F039 or characteristic wastes potentially requiring treatment for the 5 hepta and octa isomers even under the conservative screening assumptions described above. We find therefore that there is sufficient treatment capacity for these wastes to ensure that the wastes meet today's revisions to the UTS and F039 treatment standards. For this reason, EPA is finalizing its decision not to delay the effective date for adding the five hepta- and octa- dioxin and furan congeners to the lists of constituents for F039 and UTS. As with the other treatment standards being promulgated today, these revised F039 and UTS standards will become effective six months after the date of promulgation, the same date on which the K174 and K175 listing will become effective. This will provide sufficient time to allow facilities to determine whether their wastes are affected by this rule, to identify onsite or commercial treatment and disposal options, and to arrange for treatment or disposal capacity if necessary.

DCN **CALP-00020**
COMMENTER Vulcan
SUBJECT **LDR-gen**
COMMENT

Fourth, Vulcan questions the statutory authority of the EPA to add five congeners into the existing requirements for universal treatment standards (UTS) and land disposal restrictions (LDR). EPA has a statutory requirement to consider the potential need for national capacity variances before adopting new or changed LDR rules. It has a constitutional requirement to consider the impact of new regulatory requirements before they are enacted. Vulcan does not believe that the due process requirements have been met in regards to this proposed rulemaking with respect to UTS and LDR. Based upon a review of the proposed regulations, it does not appear that the EPA has determined, what fraction of the hazardous wastes required to meet these new requirements will fail; the appropriate means of treatment (if any); and if there is sufficient national capacity to meet the newly imposed treatment burden.

RESPONSE

EPA has complied with the Administrative Procedures Act by first proposing to amend the list of constituents for F039 and UTS. There are no legal constraints to prohibit EPA from revising the LDR treatment standards if appropriate to protect human health and the environment. As we noted in the proposal, in general, EPA requested data on the annual generation volumes and characteristics of wastes affected by this proposed rule and the current treatment or recovery capacity capable of treating the wastes to meet LDR treatment standards (64 FR 46523).

EPA has the authority to postpone prohibitions on the land disposal of a "newly identified" hazardous waste for two years on a national basis and (potentially) two more years on a case-by-case basis from "the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment will be available" (RCRA § 3004(h)(2)). Here, when changing the treatment requirements for wastes already subject to LDR (including F039 and characteristic wastes), EPA no longer has authority to use RCRA § 3004(h)(2) to grant a capacity variance to these wastes. Although there are no legal constraints to limit EPA's implementation time period for a final rule amending the list of regulated constituents in F039 and in the UTS table, however, EPA is guided by the overall objective of Section 3004(h), that treatment standards best accomplishing the objective of Section 3004(m) to minimize threats posed by land disposal should take effect as soon as possible, consistent with the availability of treatment capacity. Therefore, we evaluated whether sufficient treatment capacity is available for these wastes and based the effective date on this estimate.

In this case, EPA does not believe that such a delay in the effective date is necessary because, according to our analysis, we do not expect a treatment capacity shortfall for these wastes as a result of the addition of the new dioxin and furan congeners to the table of UTS at 268.48 and to the list of regulated constituents in hazardous leachate, F039, in 268.40.

For details, see EPA's response to Dow Chemical's comment (CALP-00012) in this section and "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," September 2000 in the docket.

DCN **CALP-00006**
COMMENTER BCP
SUBJECT **LDR-K175**
COMMENT

At 64 FR 46522, two LDR treatment standard conditions are proposed. EPA proposes to require that, "... the waste residue itself, if in the mercuric sulfide form, must itself be pH 6.0 or below." EPA proposes as a second condition that, "co-disposal will be restricted to wastes with similar pH (i.e., not greater than 6.0)." As mentioned elsewhere, the VCM-A filter cake, as generated, is at or below a pH of 6.0. Therefore, BCP has no trouble whatsoever meeting this first condition. However, BCP has been informed that the assurance of co-disposal with similar pH material is not possible given the relatively small quantity of VCM-A filter cake and the large overall quantity of waste received. One alternative to the co-disposal option would be macro-encapsulation. Macro-encapsulation involves enclosing the filter cake in an HDPE vault. This other option is viable for several reasons. First, the waste would be isolated from other materials thus eliminating concerns about mixture with higher pH wastes. Second, the vault would serve as tertiary containment and encapsulation, preventing both the infiltration of liquids into the filter cake and the migration of any liquids from the filter cake into the landfill. Although BCP believes that such conservative measures are not necessary in light of the analysis performed for these comments, should EPA persist in their overly conservative approach to listing this filter cake, macro-encapsulation should be considered.

RESPONSE

The Agency agrees with the alternative disposal designation that the commenter suggested. We understand that facilities with hazardous commercial landfill capacity may not have sufficient volumes of similarly acidic wastes to make it cost-effective to designate an entire unit or cell for disposal of only low pH wastes. We have therefore adopted an alternative that allows land disposal in landfill cells following macroencapsulation of the waste (assuming the waste meets other applicable standards, *i.e.*, Hg concentration and pH 6.0 or less) unless the waste is placed in (1) a Subtitle C monofill containing only K175 wastes that meet all applicable 40 CFR 268.40 treatment standards; or (2) a dedicated Subtitle C landfill cell in which all other wastes being co-disposed are at pH 6.0 or less (See 268.33(d)). Based on a discussion with a hazardous waste management facility (Chemical Waste Management, Inc., Lake Charles, LA), we find that macroencapsulation of K175 waste can be made readily available for K175 waste. Based on available data and analyses, EPA has therefore determined that sufficient commercial treatment and disposal capacity exists to manage K175 waste to meet the LDR standards.

DCN **CALP-00006**
COMMENTER BCP
SUBJECT **LDR-K175**
COMMENT

At various locations, throughout the preamble to this proposed rule, EPA mentions the difficulties associated with the retorting of mercuric sulfide. EPA also provides a detailed discussion of the difficulty associated with retorting mercuric sulfide wastes in its Advanced Notice of Proposed Rulemaking (ANPR) regarding potential revisions to the land disposal restrictions-treatment standards for mercury wastes (Federal Register for 5/28/99, 64 FR 28949-28963). This ANPR fully highlights the need to consider alternate treatment (including those that would allow for landfilling) for mercury wastes. This need is overlooked in the discussion for this proposed listing rule. Although overcoming this difficulty may be technically feasible, BCP's experience with this waste stream and with treatment of its mercury waste streams in general indicates that what may be possible from a technical perspective may not be possible from a logistical and practical perspective. Given the nature of its VCM-A operation BCP has had ample opportunity to interact with vendors of retort services. First, it is important to note that vendors often make claims about processing capabilities, which do not withstand further scrutiny. BCP's independent survey of these companies (through contractors) indicates an unwillingness to accept the VCM-A filter cake. The survey has even included the company referenced in the preamble to this proposed rule. In the majority of cases, the issue is not a matter of money (i.e., paying higher rates for treatment services). Rather, permit and processing considerations are the overriding concern for providers of retort services.

One of the first hurdles to overcome is the 500-ppm by weight exclusion limit on organic compounds listed in 40 CFR 261, Appendix VIII. Many, if not all, companies operate their retort units under the metals recovery exclusion of 40 CFR 266.100, which excludes a "metals recovery" unit from permit requirements, provided that the facility comply with certain operating restrictions. Consequently, retort units are usually unable to accept waste with concentrations of organic constituents in excess of 500 ppm. Another provision of the permitting exclusion is a requirement that the hazardous waste contain "recoverable" levels of metals, although the concept of recoverable metals is also an issue for permitted facilities. The regulations do not provide a definition of what constitutes a recoverable level of metals. Treatment facilities often define this concept in terms of treatment efficiency Obviously, those wastes with higher concentrations of metals can be processed for metals recovery more efficiently. A given quantity of such waste can be processed more quickly and will yield a higher quantity of the metal of interest. This in turns translates into a lower cost of operation and a lower disposal cost to the generator. A generating facility can sometimes simply pay a higher disposal rate for wastes with lower concentrations of a particular metal. However, depending on the economic value of the metal in question, treatment providers may turn down waste material with parts per million quantities of a recoverable metal due to permit-related storage capacity. In other words the facility would rather store and treat those wastes that would yield a larger quantity of a valuable metal, than to store/stockpile wastes with poor yields.

Even if a unit has obtained an operating permit (and thus can accept waste with over 500 ppm organics), the unit may still have permitting and/or operating concerns that preclude treatment of the

waste in question. For example, the chloride content in BCP's mercuric chloride catalyst has often caused retort vendors to turn down the opportunity to treat this waste stream. Vendors have expressed a similar concern with respect to sulfides. BCP has also had difficulty in identifying facilities willing to accept wastes with low (in relative terms) levels of mercury. Treatment difficulties often translate to extended storage time, since the retort facility will have to campaign difficult to treat wastes and, consequently, treat them more slowly. When deciding whether or not to accept a stream, treatment vendors often think in terms of percent concentrations of mercury; whereas, even the highest levels in the VCM-A wastewater treatment sludge only approach 10,000 ppm or 1%. This reluctance is related to the economic benefit of processing this material and company concerns regarding storage.

RESPONSE

EPA has found, from its existing waste analysis data (Listing Background Document for the Chlorinated Aliphatics Listing Determination (Proposed Rule), July 1999), that the waste contains 2.3% total organics but less than 100 ppm 40 CFR Part 261 Appendix VIII organics for those tested by the Agency. The commenter provided no data showing the waste was greater than 500 ppm total Appendix VIII organics. Although EPA agrees with the commenter that the 500 ppm represents a substantial regulatory barrier, available data indicate that this particular waste will most likely be below this level. Additionally, EPA has found that several recovery facilities could conduct pretreatment of such a waste in order to reduce Appendix VIII organics to below 500 ppm for mercury recovery if necessary (see "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," September 2000). Therefore, EPA disagrees with the commenter that the 500 ppm level represents a treatment constraint in this instance.

EPA has also found that the levels of mercury in Borden's waste are well within the range of other wastes commonly accepted by mercury recovery facilities. First, EPA notes that D009 wastes with greater than 260 ppm (0.026 percent) are required to be roasted or retorted for mercury recovery. The mercury content of Borden's waste (1 percent) is well above this. Secondly, EPA has found that several recovery facilities in fact accept other wastes with 1 percent mercury (see "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," July 2000). Therefore, such levels appear to satisfy any individual facility's permit requirements regarding 'recoverable' levels of mercury.

In regards to storage capacity, EPA has found that recovery facilities often have storage capacity well in excess of the generator's annual waste production of 40 cubic yards (see "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," September 2000). Therefore, commercial facilities are expected to have sufficient storage capacity for this quantity of waste.

With regard to chloride and sulfide levels in the wastes, EPA has found that some retorting facilities can presently accept mercury wastes containing chloride and sulfide. EPA acknowledges that such factors differ on a facility-specific level so that one facility may accept sulfide containing waste and another may not, but importantly the technology is shown to be demonstrated for the components in the waste (given that no demonstration data exist for the subject waste).

Nevertheless, EPA acknowledges that for this particular waste, successful retort has not been demonstrated. The commenter cites a general reluctance on the part of vendors they surveyed and the Agency lacks any treatment data demonstrating that the subject waste is recoverable. EPA, therefore, established a numerical treatment standard for K175 based on stabilization and is not requiring RMERC as the treatment standard for this waste. EPA notes that generators can use any treatment technology (except impermissible dilution) to meet this numerical standard. EPA expects that sufficient commercial treatment capacity exists to treat K175. Details of this analysis are presented in "Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule)," September 2000.

To insure that the K175 wastes do not present a long-term hazard once landfill liners eventually fail, we are finalizing a treatment standard that requires that the wastes as currently generated be treated to obtain a TCLP leachate concentration of 0.025 mg/L mercury, that the waste must be at or below a pH 6.0 when disposed, and that the wastes be macroencapsulated in accordance with 40 CFR 268.45 before land disposal unless the waste is placed in (1) a Subtitle C monofill containing only K175 wastes that meet all applicable 40 CFR 268.40 treatment standards; or (2) a dedicated Subtitle C landfill cell in which all other wastes being co-disposed are at pH 6.0 or less. The Agency believes that with adequate treatment and controls on disposal conditions there will be little potential for future environmental releases. EPA expects that commercial treaters can customize their treatment process to immobilize the waste, attain a pH of less than 6.0, and meet the treatment standard. If the facility finds no commercial treatment capacity to treat or dispose its waste, the facility may petition EPA for a case-by-case extension of the effective date in accordance with the provisions of 40 CFR 268.5, or seek a treatability variance based on 40 CFR 268.44.

DCN **CALP-00001**
COMMENTER DuPont Dow Elastomers
SUBJECT **LDR-CAP**
COMMENT

(Reference: pg. 20-22) The USEPA must include a national capacity variance as part of the K173 Listing Rule. The quantities of wastewaters that would be impacted by the K173 Listing Rule are very large. At least one facility would need to temporarily transport K173 wastewaters offsite until it could complete permit and 'No Migration' modifications associated with the K173 Listing Rule. Undoubtedly, other affected facilities would need to transport their K173 hazardous wastewaters to offsite commercial facilities also. It is doubtful that adequate commercial capacity permitted to accept these K173 hazardous wastewaters exists in the United States.

If these wastewaters become K173 listed hazardous wastes and associated Land Disposal Restrictions should be subsequently promulgated, then DuPont Dow Elastomers Pontchartrain Site personnel will no longer be able to dispose of these hazardous wastewaters in the four onsite underground injection wells until significant, time-consuming permit and 'No Migration' Petition modifications are approved. For the three hazardous waste underground injection wells the USEPA must approve a revised "No Migration" Petition, the Louisiana Department of Environmental Quality (LDEQ) must issue a revised Act 803 Determination and the Louisiana Department of Natural Resources (LDNR) must issue a revised operating permit. For the non-hazardous waste underground injection well the USEPA must approve a 'No Migration' Petition, the LDEQ must issue an approved Act 803 Determination and the LDNR must issue a hazardous waste underground injection well operating permit. In addition, the site hazardous waste permit must have a Class 3 permit modification approved by the LDEQ to add the two wastewater storage tanks that feed the non-hazardous underground injection well.

Discussions with UIC personnel at the USEPA Region 6 in Dallas, TX confirm that modifying the Pontchartrain Site "No Migration" Petition will require additional modeling to include the K173 wastewater streams. In addition, the current non-hazardous underground injection well will need to be included within the revised 'No Migration' Petition. Performing the additional modeling and developing the revised "No Migration" Petition for submittal to the USEPA will require at least 12 months. The USEPA Region 6 UIC Division estimates that they will require at least 12-24 months to review the modeling and petition information and to approve the requested modification. Furthermore, the LDNR and the LDEQ will not act until the USEPA approves the revised "No Migration" Petition. Once the "No Migration" Petition is approved, the LDNR and LDEQ will require an additional 6-12 months minimum to review the submitted information, revise the site underground injection well operating permit and approve the revised Act 803 Determination to include the K173 wastewaters for the current hazardous waste injection wells and convert the current non-hazardous waste underground injection well to a hazardous waste underground injection well. The total time required from the K173 Listing Rule promulgation date to final approval of all modifications is estimated to be a minimum of 30 to 48 months. The cost is estimated to be approximately $500,000.

Additionally, preparing the Class 3 Permit Modification to add the two wastewater storage tanks to the site hazardous waste permit will require approximately four months. The LDEQ will require

approximately 24 to 36 months to approve the request; therefore, the total time required for adding the two wastewater storage tanks to the site hazardous waste permit is estimated to be a minimum of 28 to 40 months. Associated costs are estimated to be approximately $40,000.

During this minimum 30 to 48 month period DuPont Dow will only be able to dispose of K173 wastewaters in the underground injection wells from the promulgation date to the effective date of the regulation – typically a period of 6 months. Thus, for at least 24 to 42 months site personnel must use an alternative, approved disposal method for the K173 wastewaters. The only feasible alternative is to transport the wastewaters to an offsite commercial underground injection well approved to accept these K173 wastewaters. At this time it is uncertain if any permitted commercial underground injection wells will be approved to accept K173 hazardous wastewaters by the effective date of the K173 Listing Rule.

As demonstrated in the previous section, significant permit and "No Migration" Petition modifications will be required by impacted facilities if the K173 Listing Rule is finalized as proposed. In addition, major capital investment projects will need to be constructed. For the DuPont Dow Pontchartrain Site the permit and "No Migration" Petition modification approvals will require at least 30 to 48 months after the promulgation date of the final K173 Listing Rule. For DuPont Dow major capital projects required by the rulemaking will require at least 36 months to secure the permits and plan and construct the projects.

After the effective date of the rulemaking (usually 6 months after promulgation) the impacted facilities requiring these approvals and projects will no longer be able to manage their wastewaters onsite until they receive the necessary approvals and complete construction of the projects. Because of the large volumes of impacted wastewaters as demonstrated above, it is doubtful that sufficient treatment and disposal capacity specific to K173 wastewaters will exist in the commercial arena. Furthermore, it is uncertain if sufficient transport vehicles will be available to ship the wastewaters to the commercial facilities.

The USEPA needs to evaluate the total impact of the K173 Listing Rule on the regulated community, determine the quantity of wastewaters that would need to be treated and disposed offsite while permit approvals are being obtained and projects constructed and then ascertain if approved treatment and disposal facilities and transportation vehicles are available for this additional wastewater volume.

Should sufficient treatment and disposal capacity not be available, then the USEPA should grant a 2-year national capacity variance from the Land Disposal Restrictions for K173 wastewaters.

RESPONSE

EPA is finalizing a decision to not list K173 as hazardous. Therefore, the commenter's request for a national capacity variance is unnecessary.

DCN **CALP-00009**
COMMENTER FPC
SUBJECT **LDR-CAP**
COMMENT

(Reference: pg. 9) Under the proposal at 64 FR 46523, the capacity analysis states that "sufficient capacity exists to manage proposed K173 should the need for treatment of proposed K173 waste arise." How can the EPA substantiate the claim that treatment capacity exists for a waste that is not yet listed? Treatment facilities would be required to add the new listing description to their permits prior to accepting the waste. Consequently, no one currently can accept K173 and given the perceived "stigma" of treating dioxin, there is no reason to assume that all waste treatment operations will make the necessary changes to accept the material.

RESPONSE

EPA is finalizing a decision to not list K173 as hazardous. Therefore, the commenter will not need to seek alternative treatment capacity.

DCN **CALP-00011**
COMMENTER Shell
SUBJECT **LDR-CAP-gen**
COMMENT

(Reference: pg. 5) The Deer Park Chemical Plant in Texas manages wastewater for the Shell Chemicals processes, a portion of the Shell Deer Park Refinery, and the Oxy Vinyls vinyl chloride monomer production facility (formally know as Occidental Chemical). The Oxy Vinyls Plant discharges 695,255 Metric tons of wastewater per year which could be classified as a listed hazardous waste by the proposed rule. This stream comprises 7.5% of the approximate 9,298,000 Metric tons per year of the total wastewater flow through the Chemical Plant wastewater treatment system.

The wastewater flow from Oxy Vinyls enters the chemical plant sewer where it commingles with wastewater flows from the other sources described above. The combined wastewater stream is treated by activated sludge aggressive biological treatment in three impoundments and three secondary clarifiers operating in parallel. The treated wastewater is discharged under Texas Discharge Permit #00402.

RESPONSE

The waste discussed in the comment is the proposed K173 wastewater stream. EPA is finalizing a decision to not list K173 as hazardous. Therefore, the commenter will not need to seek alternative treatment capacity for the wastewater currently managed in its surface impoundments.

DCN **CALP-00001**
COMMENTER DuPont-Dow
SUBJECT **LDR-CAP**
COMMENT

(Reference: pg. 23) The Louisville Plant wastewater transport facilities to the POTW would have to be upgraded if the site wastewaters become hazardous wastes. Capital costs are estimated to be at least $10,000,000. These improvements would require a minimum of 36 months to complete. Should the POTW determine that it could no longer accept the DuPont Dow wastewaters, the Louisville Plant would need to permit and construct an onsite wastewater treatment facility with an NPDES outfall at a cost of approximately $20,000,000. The timeframe to receive a revised NPDES permit, design the wastewater treatment facility and construct it is estimated to be at least 48 to 60 months.

RESPONSE

EPA is finalizing a decision to not list K173 as hazardous. Therefore, the commenter will not need to seek alternative treatment capacity for its generated wastewater and no impact on the ability of the POTW to accept the waste.