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EPA Background Document for Capacity Analysis for Land Disposal Restrictions: Inorganic Chemical Production Wastes (Final Rule)

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List of Abbreviations and Acronyms

BDAT	Best Demonstrated Available Technology
BIF	Boiler and Industrial Furnace
BRS	Biennial Reporting System
BTU	British Thermal Unit
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMBST	Combustion treatment standard (40 CFR 268.42)
EDF	Environmental Defense Fund
EPA	U.S. Environmental Protection Agency
FR	Federal Register
HSWA	Hazardous and Solid Waste Amendments of 1984
HWIR	Hazardous Waste Identification Rule
LDRs	Land Disposal Restrictions
MTRs	Minimum Technological Requirements
NPDES	National Pollutant Discharge Elimination System
POTW	Publically Owned Treatment Works
RCRA	Resource Conservation and Recovery Act of 1976
RCRIS	Resource Conservation and Recovery Act Information System
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TRI	Toxics Release Inventory
TU	Temporary Unit
UTS	Universal treatment standard

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 inorganic chemical production wastes. EPA is listing as hazardous three wastes from inorganic chemicals 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.

This background document, which presents the capacity analyses conducted for the LDR standards for newly listed inorganic chemical production wastes (K176, K177, K178), 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 Treatment Capacity for Newly Listed Inorganic Chemicals Production Wastes.** Describes the generation and management of these newly listed wastes, the constituents of concern, quantity generated, the quantity that currently meets the LDRs, relevant waste management methods, and the detailed methodology and data used to assess required treatment capacity for newly listed inorganic production wastes (K176, K177, and K178).

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

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. Under HSWA, EPA must promulgate

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[1] The LDRs are effective when the listings and LDRs are 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)).

regulations restricting the land disposal of hazardous wastes according to a strict statutory schedule.[2] Also, for any hazardous wastes identified or listed after November 8, 1984, EPA must promulgate LDR prohibitions and treatment standards within six months of the date of identification or final listing (RCRA Section 3004(g)(4), 42 U.S.C. 6924(g)(4)). 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. If the technology selected as BDAT does not treat the waste to specified constituent levels, EPA may establish a technology-specific treatment standard which requires treatment using the best demonstrated technology rather than treatment to a specified level. Additional information regarding how the final treatment standards affect the capacity analysis are found in Section 3.

If 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 otherwise-applicable date and establishes a different 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 or for which wastes have not been managed in a way to meet the final LDR standards. 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.

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

[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)).

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)].

Exhibit 1-1 also lists proposed rules which are relevant to the LDR program. These rules are included because if they are finalized, they would affect the capacity analysis for inorganic chemical production wastes.

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

Rulemaking	Federal Register Notice	Promulgation/ Proposal Date
Final Rules		
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

[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
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
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; Chlorinated Aliphatics Production Wastes; Land Disposal Restrictions for Newly Identified Wastes; CERCLA Hazardous Substance Designation and Reportable Quantities; Final Rule	65 *FR* 67067	November 8, 2000
Proposed Rules		
Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Dye and Pigment Industries; Hazardous Waste Listing Determination Policy; and CERCLA Hazardous Substance Designation and Reportable Quantities; Proposed Rule	59 *FR* 66072	December 22, 1994

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; Dye and Pigment Industries; Land Disposal Restrictions for Newly Identified Wastes; CERCLA Hazardous Substance Designation and Reportable Quantities; Proposed Rule	64 *FR* 40192	July 23, 1999
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* 55683	September 14, 2000
Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Paint Production Wastes; Land Disposal Restrictions for Newly Identified Wastes; CERCLA Hazardous Substance Designation and Reportable Quantities; Designation of n-Butyl alcohol, Ethyl benzene, Methyl isobutyl ketone, Styrene, and Xylenes as Appendix VIII constituents; Addition of Acrylamide and Styrene to the Treatment Standards of F039; and Designation of Styrene as an Underlying Hazardous Constituent; Proposed rule	66 *FR* 10060	February 13, 2001

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. A first step to satisfying the goals of a capacity analysis is to make a "threshold" analysis concerning 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.

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

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 onsite and will consequently need commercial treatment to meet the LDR treatment standards. Required commercial capacity also 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 waste streams and their quantities under different management practices. Further, EPA identifies the waste streams potentially affected by the LDRs by types of land disposal units, including surface impoundment, waste pile, land treatment unit, landfill, underground injection well, salt dome formations, salt bed formations, and underground mines and caves.

To assess the type of alternative capacity required to treat the affected wastes, EPA conducts a "treatability analysis" of each waste stream. Based on the waste's physical and chemical form and information on 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 numerical treatment standards, more than one technology may be applicable. For treatment standards with technologies as methods of treatment, only the specified technologies are applicable because they are technologies that are allowed to be used for compliance with LDRs. 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 can 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 onsite, 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 assess available commercial treatment capacity focus on treatment capacity projected to be available for the two years following the effective date of the final rule. Available treatment capacity can be assessed 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 analysis of available capacity focuses on commercial facilities. Consequently, most estimates of capacity presented in this document represent commercially available capacity.

1.3 SUMMARY OF CAPACITY ANALYSIS FOR FINAL RULE

In the September 14, 2000 (65 *FR* 55683) proposed rule, EPA proposed to list as hazardous three wastes generated from antimony oxide production and titanium dioxide production. EPA is finalizing its decision not to list other waste streams; such wastes are not addressed in this capacity analysis. EPA is finalizing its decision to list K176, K177, and K178 wastes as hazardous:

- K176: Baghouse filters from the production of antimony oxide, including filters from the production of intermediates (e.g., antimony metal or crude antimony oxide).

- K177: Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates (e.g., antimony metal or crude antimony oxide).

- K178: Residues from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process.

Today's final rule concurrently promulgates land disposal restrictions for the three wastes listed. A summary of the types of treatment standards and the treatment technologies expected to be used in meeting the final treatment standards is as follows:

- K176: This waste is comprised of metals on a cloth matrix. EPA is requiring that the waste meet numerical treatment standards, equivalent to UTS, for antimony, arsenic, cadmium, lead, and mercury. EPA expects that facilities will use stabilization and/or metals recovery to meet the final standards. EPA does not expect facilities to use mercury recovery technologies because the level of mercury in the waste is less than 260 mg/kg (i.e., within the "low mercury" subcategory identified in 40 CFR 268.48).

- K177: This waste is an inorganic matrix. EPA is finalizing numerical treatment standards, equivalent to UTS, for antimony, arsenic, and lead. EPA expects that facilities will use stabilization and/or metals recovery to meet the final standards.

- K178: This waste is a sludge or solid. EPA is finalizing numerical treatment standards for thallium and for forms of octa-, hepta-, tetra-, penta-, and hexadioxins and furans. In addition, EPA is promulgating an alternative treatment standard of combustion (CMBST) for the dioxin/furan components. EPA expects that facilities will use incineration followed by stabilization to meet the final treatment standards.

For these wastes, EPA has determined that only nonwastewater forms of the waste are generated. However, wastewater forms may occasionally be generated as treatment residuals, etc. One of the constituents proposed as a basis for listing K178, manganese, is not on the list of universal treatment standards; EPA is deferring final action on treatment standards for manganese in K178. EPA also proposed to add manganese to the UTS table (40 CFR 26.48) and to the constituents regulated by F039 (40 CFR 268.40). In the final rule, EPA is deferring final action on the application of the manganese treatment requirements to F039 leachate, and on the addition of manganese to the UTS.

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 of recovery capacity as a result of the 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 K176, K177, or K178.

Exhibit 1-2. Inorganic Chemicals Production Wastes Finalized for Listing: Capacity Analysis Summary			
Waste Stream	**Quantities Requiring Alternative Capacity (tons per year)**	**Type of Waste Management Required***	**Adequate Commercial Treatment Capacity Available?**
K176 Nonwastewaters	8	Stabilization or metals recovery	Yes
K177 Nonwastewaters	22	Stabilization or metals recovery	Yes
K177 Nonwastewaters - Waste Pile and Contaminated Soils	120,000 (one-time quantity)	Either leave-in-place, treatment onsite, or offsite stabilization or metals recovery	Yes
K178 Nonwastewaters	50	Incineration followed by stabilization	Yes
K178 Nonwastewaters - Waste Pile and Contaminated Soils	500,000 (one-time quantity)	Either leave-in-place, treatment onsite, or offsite incineration followed by stabilization	Yes
Wastewater forms of K176, K177, and K178	Minimal	---	Yes
Other Soil and Debris Contaminated with K176, K177, and K178	Minimal	---	Yes

***Because numerical standards are being finalized, generators may use any method (other than impermissible dilution) to meet the treatment standards. For K178, generators may use the alternative treatment standard of combustion to satisfy the land disposal restrictions for dioxins and furans. This table lists the technologies identified as BDAT or otherwise likely to be used in meeting the treatment standard.

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2. AVAILABLE TREATMENT CAPACITY

This section presents EPA's estimates of available commercial treatment capacity for selected treatment technologies applicable to inorganic chemical production wastes. This information is used in subsequent sections for evaluating the availability of capacity for treatment/recovery technologies as alternatives to land disposal of the newly promulgated hazardous wastes and making treatment capacity variance determinations for LDR wastes.

This section is organized into the following five sections:

- Section 2.1: Combustion Capacity;
- Section 2.2: Stabilization Capacity;
- Section 2.3: Metals Recovery Capacity;
- Section 2.4: Wastewater Treatment Capacity; and
- Section 2.5: Alternatives to Combustion for Dioxin Treatment

These five technologies were selected because they are commonly used by the hazardous waste management industry for the treatment of nonwastewater forms of newly identified hazardous wastes and/or they are designated as best demonstrated available technologies (BDATs) for hazardous wastes (e.g., combustion for organic compounds).

2.1 COMMERCIAL HAZARDOUS WASTE COMBUSTION CAPACITY

EPA is promulgating numerical treatment standards, based on universal treatment standards, for dioxins and furans in K178. Combustion is being promulgated as an alternative, technology-specific treatment standard for dioxin and furan components. Combustion, therefore, represents one treatment technique that can be used to achieve these treatment standards. A discussion of the ability of combustion facilities to treat such dioxin-containing waste was prepared for the chlorinated aliphatics production waste final rule (EPA, Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Final Rule), Section 2.1.4, September 2000).

In assessing the available treatment capacity for combustion, EPA used data provided by commercial combustion facilities from the 1995 and 1997 BRS. A summary of the results are provided in this section with a more detailed discussion included in Appendix A.

EPA used data obtained from the RCRA Information System (RCRIS), the 1997 Biennial Reporting System (BRS), and the 1995 BRS to identify hazardous waste combustion facilities that are commercial and operational as of May 1999. For each facility, EPA calculated the maximum practical capacity as the amount of hazardous waste that could be handled by a facility, given constraints of a calendar year, work shifts, and permits. This was calculated using the PS (process systems) form from the 1995 BRS. 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).

A description of the data and methodology are presented in Appendix A and results are summarized here. EPA identified 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. This is available capacity for liquids, pumpable sludges, solids, and non-pumpable sludges.

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 metric tons per year comes from incineration.

Some limitations of the analysis include the following (additional limitations are discussed in Appendix A):

- EPA uses facility capacity data from 1995 and waste generation and management data from 1997. No adjustments to the data are made for facilities that have opened, closed, or changed their treatment capacity since 1995. No adjustment is made for any changes in the quantities of wastes treated between 1997 and the present.

- The analysis only accounts for the treatment of hazardous wastes by combustion facilities (this is because the BRS only accounts for hazardous wastes). Such facilities also are likely to accept and treat nonhazardous wastes, which are not considered in the analysis. This might or might not result in an overestimate of the available treatment capacity because facilities already may be using some of their remaining capacity for the treatment of nonhazardous wastes or a facility has discretion to use its capacity solely for the treatment of hazardous wastes.

- The data used for identifying treatment capacity (the PS form of the 1995 BRS) is not comprehensive because facilities voluntarily provided these data. Additional facilities may have conducted similar treatment in 1995 and not be accounted for in the analysis. This would result in an underestimate of the available treatment capacity.

- EPA identified that several incineration facilities used in this analysis have since closed, and one additional facility is operating. The impact of these operational changes on available capacity is presented in Appendix C.

2.2 STABILIZATION CAPACITY

Stabilization is a widely used conventional treatment technology that effectively treats wastes contaminated with metals and other inorganic contaminants. Therefore, stabilization is applicable to the inorganic chemical production wastes covered by this rule.

In estimating stabilization capacity, EPA used the results of the analysis presented in "Capacity Analysis for Land Disposal Restrictions Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (final rule)," April 1998. For this analysis, EPA identified facilities conducting stabilization treatment activities by examining the BRS, review of public comments to the Phase IV LDR proposed rule, and review of the data used in developing an initial capacity estimate for the Phase IV final rule. EPA estimated maximum and operational capacity of a total of 61 facilities using the following methodology (more than one data source was used for some facilities so the sum of the number of facilities below do not sum to the total number of unique facilities):

- For 16 facilities, complete maximum and utilized treatment capacity data were available from the 1995 PS forms;[5]

- For 9 facilities, the 1995 BRS data did not provide adequate capacity information, so EPA used information reported by these facilities in the 1993 BRS;

- For 12 facilities, EPA received maximum and utilized treatment capacity data through direct (voluntary) correspondence with facility representatives;

- For 3 facilities, additional information was received from contact with states;

- For 24 facilities, EPA estimated the utilized capacity information based on the waste quantities reported in the WR and GM forms, and since maximum capacity information is not provided in the WR and GM forms, these capacities were calculated from the utilized capacity and the average industry utilization rate (14 percent)[6] calculated based on data from facilities that provided complete information; and

- For 1 facility the utilized capacity was estimated from its maximum capacity and based on the average industry utilization rate of 14 percent.

A summary of the results of this analysis are provided in Exhibit 2–1. Based on this analysis, EPA estimates that as much as 18.5 million tons/year of stabilization capacity was available in 1995 for wastes restricted from land disposal restrictions (prior to the effective date of Phase IV).[7] Even if EPA restricts their analysis to facilities reporting fully commercial status, the estimate of available stabilization capacity in 1995 is still approximately 8 million tons (the

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[5]The PS form, which is submitted voluntarily, provides information on the capacity and quantity managed in individual treatment systems; the WR form includes the amount of waste received from offsite; and the GM form includes the amount of waste that was generated and managed onsite.

[6]As identified in the background document to the Phase IV final rule, an average industry utilization rate of approximately 14 percent (1,864,805/13,716,092 = 0.136) was calculated based on the volumes of waste being treated at the 37 facilities that submitted PS forms to the BRS or provided capacity information through direct correspondence with EPA.

[7] Because the primary data source is the 1995 BRS, the capacity estimate is given with that year. However the estimate was supplemented with public comments and facility correspondence from 1997, as well as (for some facilities) 1993 BRS data.

difference is due to data which are missing and to facilities which report that services are available only to a specific site, company, or limited number of generators in their 1995 PS form). This estimate reflects a significant increase from the estimate of 1.1 million tons/year in the capacity analysis for the Phase IV LDR second supplemental proposed rule (62 *FR* 26041, May 12, 1997). This increase in available capacity is attributed to the use of more complete, accurate, and current commercial treatment data.

Several caveats should be noted regarding these data:

- Because the stabilized wastes are typically disposed in onsite landfills, many facilities could be reporting their landfill capacities as stabilization capacities. In such cases, the available stabilization treatment capacity values would be overestimated.

- Although many facilities identified from the BRS indicated that they were fully commercial, many other facilities with stabilization capacity did not provide such information or (more rarely) indicated they had limited commercial availability. Exhibit 2-1 presents results based on two different assumptions: one in which all facilities reporting to the BRS are fully commercial, and a second (lower) estimate that only accounts for facilities verifying that they are fully commercially available.

- 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. Because some of the information provided in the BRS is voluntary (e.g., PS forms), these data may not accurately reflect the maximum and available treatment capacity.

- The average utilization rate of 14 percent used to calculate the utilized and available capacity for many facilities may not provide an accurate statistical representation of the national average.

- Although facilities required to submit a Biennial Hazardous Waste Report must provide both RCRA and total capacity for each onsite hazardous waste treatment, disposal, or recycling process system, they are not required to provide any information on nonhazardous wastes, wastes excluded from RCRA regulation, or wastes that do not meet the definition of solid waste. Facilities are required to report on RCRA hazardous wastes, and the utilized capacity data only refer to the hazardous waste capacity. Therefore, assumptions made about the total available capacity could result in an overestimate and significantly influence the stabilization capacity estimates.

- Another caveat is the ability of the individual facility to meet the final treatment standard; for example the facility may specialize in the treatment of certain types of wastes and therefore be unable to treat wastes with certain constituents. Thus available capacity could be less than estimated due to this factor.

Additional information was obtained during the Phase IV rule public comment period and in discussions with individual facilities. In general, commenters who provided information on available capacity indicated that they are not utilizing their treatment units to the maximum practical capacity.

Some waste streams (i.e., organics) were identified by commercial waste managers as being relatively difficult to treat using stabilization. This is significant for inorganic chemical production wastes because one of the three wastes listed today contain both organic and inorganic constituents above UTS. From the phase IV rule public comments and further discussion with individual facilities, three facilities (Environmental Enterprises, Heritage Environmental Services, and Peoria Disposal Company) noted, for example, that treating organic underlying hazardous constituents (UHCs) would require some type of pretreatment. Two of these facilities (Environmental Enterprises and Heritage Environmental Services) stated that they would incinerate these wastes, and the other facility (Peoria Disposal Company) stated that it would send the wastes off site for pretreatment. EPA received several other comments, however, indicating that these difficulties could be readily overcome. Two commenters (Environmental Quality and LWD, Inc.) specifically stated that organic UHCs in the wastes that they receive can be readily treated to UTS without significant changes in their processes. Therefore, EPA believes that sufficient commercial capacity exists for stabilization treatment technology for wastes containing both organic and inorganic contaminants.

Exhibit 2-1. Summary of Capacity for Stabilization

Technology	Maximum Capacity	Utilized Capacity	Available Capacity	Fully Commercial Available Capacity
Stabilization	19.5 million metric tons/year (21.5 million tons/year)	2.7 million metric tons/year (2.9 million tons/ year)	16.8 million metric tons/year (18.5 million tons/year)	~7.4 million metric tons/year (~8 million tons/year)

Note: available capacity is of 1997, prior to the effective date of the Phase IV rule.
Data source: 1995 and 1997 BRS.

2.3 METALS RECOVERY CAPACITY

Due to several factors - including (1) metal recovery treatment as one of the bases for the LDR treatment standards for several metals, (2) the basic nature of mineral processing wastes and many TC wastes generated by metal industries, and (3) EPA's policy of preferring pollution prevention or recycling to treatment - EPA evaluated the potential to recover metals from inorganic chemical production wastes. In general, metal recovery facilities may specialize in the types of treatment and metal recovery conducted. Specifically, EPA anticipates that K176 and K177 are potentially amenable to metal recovery because these wastes have significant quantities of antimony.

EPA identified hydrometallurgical processes that may be relevant to treating K176. The Center for Advanced Mineral & Metallurgical Processing (CAMP) has prepared a waste management plan specific for K176 (although the specific treatment activity has not taken place). The K176 waste is treated by first leaching with an alkaline solution consisting of sodium sulfide and sodium hydroxide. Liquid/solid separation follows the leaching step. The liquid portion is again treated with an alkaline sulfide solution, producing sodium hydroxyantimonate as a product.[8] The technology can be constructed at the Cookson site at a scale of about 35,000 tons per year.[9]

Hydrometallurgical processes, in general, are demonstrated for the removal of metals from solid materials. One example, applied to copper, has been designed by Cominco Engineering Services Ltd. (CESL). This process uses an acidic solution to leach copper from a copper concentrate. The CESL process is nearly self-contained, only generating some acid that is not reused. CESL has operated a demonstration plant in Richmond, BC Canada since 1998. The demonstration plant is a continuous, fully integrated 1/500 scale operation.[10] Although the process involves acid leaching, it is expected that an alkaline solution could be substituted to treat wastes containing metal constituents that are soluble in basic solutions, depending on the solubility of the metal.[11]

Hydrometallurgical processes are one example of metal recovery processes, which covers a very broad array of technologies. EPA does not possess other data specific to metals recovery for antimony oxide or titanium dioxide production wastes. Although EPA is aware that a market exists for recovered antimony,[12] EPA does not have a list of facilities that conduct this type of processing or their available treatment capacity. The recovery potential of metal-containing wastes must typically be evaluated on a case-by-case basis to identify both marketable metals and detrimental impurities.

EPA collected general metals recovery capacity data collected in support of the Phase IV LDRs.[13] For the Phase IV final rule, EPA examined several data sources for updating the metals recovery capacity estimate from the Phase IV second supplemental proposed rule (62 *FR* 26041, May 12, 1997), including 1995 BRS data representing the PS, WR, and GM forms (i.e., these forms identify the capacity, and the quantities treated). EPA provides information here for facilities conducting metal recovery processes. The results of EPA's analysis are summarized in Exhibit 2–2. Based on this analysis, EPA estimates that as much as 2.2 million tons/year of metals recovery capacity is available for wastes restricted from land disposal. Uncertainties and

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[8] One example of an end use for this compound is for sodium analytical analysis. 'Antimony Compounds' Kirk-Othmer Encyclopedia of Chemical Technology. Fourth edition. Volume 3, page 386 (1992).

[9] Cookson Antimony Process Slag Conceptual Treatment Plant Study. The Center for Advanced Mineral & Metallurgical Processing, Montana Tech of the University of Montana. September 10, 2001.

[10] Information from CESL, www.cesl.com

[11] U.S. EPA. Treatment Technology Background Document, January 1991, p. 184.

[12] 'Antimony Minerals Yearbook 2000.' U.S. Geologic Survey. www.usgs.gov.

[13] U.S. EPA. Background Document for Capacity Analysis of the Land Disposal Restrictions - Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule). April 1998.

limitations associated with this estimate are provided in the Phase IV Capacity Background Document identified above.

Exhibit 2-2. Summary of Capacity for Metals Recovery			
Technology [1]	**Maximum Capacity [2]**	**Utilized Capacity**	**Available Capacity [3]**
Metals Recovery	3.3 million metric tons/year (3.7 million tons/year)	1.3 million metric tons/year (1.4 million tons/year)	2.0 million metric tons/year (2.2 million tons/year)

[1] Not specific to technologies applicable to antimony or titanium waste recovery.
[2] Average 39% utilization rate for facilities without data.
[3] Available capacity as of 1997, prior to the effective date of the Phase IV rule. Data source: 1995 and 1997 BRS. The commercial status of the facilities could be partial or fully available commercial status. The fully commercial facilities alone account for approximately 900,000 tons/yr of available capacity.

2.4 WASTEWATER TREATMENT CAPACITY

Wastewater forms of K176, K177, and K178 (e.g., generated as treatment residuals) may require treatment. EPA used data, primarily from the 1995 and 1997 BRS, to estimate the commercial hazardous waste treatment capacity for wastewaters. The approach used resulted in an estimate of commercially available wastewater treatment capacity of approximately 46 million tons (42 million metric tons or 11.1 billion gallons) per year which is slightly higher than the results of earlier analyses using 1991 BRS data. Detailed results of this more recent analysis are presented in Appendix B.

EPA made estimates regarding the available capacity of wastewater treatment as a whole (e.g., technologies that treat organics and/or metals) for the Phase IV rule.[14] The Phase IV estimate was based on the results of a 1991 survey developed by EPA's Office of Water (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) 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 estimated a total available commercial wastewater treatment capacity of more than 47 million tons each year. This 47 million tons per year capacity includes 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 (waste treatment, disposal, or recycling process systems) 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

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

in the Waste Treatment Industry Questionnaire. 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.

The three estimates for commercially available wastewater treatment capacity are comparable to one another. The estimate using the 1995 and 1997 BRS data resulted in an estimate of 46 million tons (42 million metric tons or 11.1 billion gallons) per year. The estimate using the 1991 Office of Water survey resulted in an estimate of approximately 40 million tons (36 million metric tons or 9.7 billion gallons) per year. The estimate using the 1991 BRS resulted in an estimate of approximately 37 million tons (34 million metric tons or 9.0 billion gallons) per year of available wastewater treatment capacity.

2.5 ALTERNATIVES TO COMBUSTION FOR DIOXIN TREATMENT

Incineration is BDAT for the treatment of dioxin and furan congeners, such as those present in K178 wastes. However, alternative technologies may also be used for the treatment of dioxins and furans, especially for onsite remediation activity. Non-combustion technologies have been identified in the Best Demonstrated Available Technology (BDAT) Background Document For Inorganic Chemical Production Wastes (Appendix A). In general, each of these technologies have been demonstrated to treat dioxin and furan congeners at one or more sites, usually as part of mobile onsite remediation. These technologies include the following:

- Vitrification
- Dehalogenation
- Chemical oxidation or reduction
- High temperature metals recovery
- Vacuum retorting
- Solvated electron technology
- Thermal desorption
- Electrokinetic separation
- Solvent extraction

Additional details concerning these technologies, including technology description, performance, and vendors providing the technology, are presented in the BDAT Background Document.[15] There is some uncertainty as to whether the above technologies would be capable of treating dioxin and furan congeners in K178 wastes to below their UTS level. First, information was obtained from references over the past several years, so there is some question as to whether the technologies are all currently available. Second, every waste is different and some technologies that work well for one type of waste (e.g., a dry material) may not be applicable for K178. Third, some of the above technologies have only been developed to treat a fairly small quantity of waste; as shown in Section 3 the potential quantities of K178 requiring treatment are much higher.

[15] U.S. EPA. Final Best Demonstrated Available Technology (BDAT) Background Document for Inorganic Chemical Production Wastes K176, K177, K178. October 2001.

Follow-up information was obtained for one of these technologies, solvent extraction. The purpose of solvent extraction is to remove, or extract, dioxin and furan components in the waste to a liquid phase. The volume of generated liquid is much smaller than the starting volume of solid waste. As such, the liquid can be more easily sent offsite for treatment and disposal.

One vendor of this technology is Terra-Kleen (Ellicott City Maryland). The technology is portable and has been applied most often to PCB removal of soils at customer sites. The technology incorporates batch washing of the waste material with a solvent. The solvent is separated to concentrate the chlorinated organic components, allowing for continued re-use of the solvent. The process does not destroy the chlorinated compounds, but transfers them to a liquid form allowing for offsite commercial management. However, treatment of dioxins and furans is expected to be feasible because: (1) PCBs are structurally similar to dioxins and furans and treatment of PCBs at a current customer site in North Carolina have been to below 1 ppm (the most stringent UTS for certain dioxin and furan congeners), and (2) the North Carolina regulatory authority is requiring treatment of dioxins and furans to below 0.12 ug/kg TEQ (toxicity equivalent).

The technology has been applied to sites with quantities of soil or waste of no more than 25,000 tons, which is much less than the quantity of K178 waste potentially present at one facility (as described in Section 3). The process typically takes place in tanks, although the process has also been applied in a remote location where such equipment could not be brought in. Instead, a structural pit or impoundment was constructed. Techniques similar to heap leaching were employed, which is used in the mining industry to extract gold from huge quantities of rock. As applied to this one site, the solvent is applied to the top of a pile, allowed to percolate through, then collected at the bottom of a lined impoundment and recirculated. Such an approach could be applied to the large quantities of K178.[16]

[16] Information on Terra-Kleen was obtained from its web site, http://www.terra-kleen.org/, as well as from a telephone conversation between John Vierow (SAIC) and Lanny Weimer (Terra-Kleen, Ellicott City MD, 410-750-0626).

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3. REQUIRED CAPACITY FOR INORGANIC CHEMICALS PRODUCTION WASTES

3.1 INTRODUCTION

This section describes the required treatment capacity for K176, K177, and K178 inorganic 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 listing of these hazardous wastes and simultaneous promulgation of land disposal restrictions. The quantity of K176, K177, and K178 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). EPA uses data from this capacity analysis to assess the need for a national capacity variance from the promulgated LDRs as specified in RCRA 3004(h)(2).

This capacity analysis incorporates data and information on K176, K177, and K178 generation and management collected during the EPA industry study of inorganic chemicals production wastes, described in Section 3.2 of this report. Section 3.1 contains information on the processes generating K176, K177, and K178. Section 3.2 describes the data sources used in estimating the quantities of K176, K177, and K178 generated and managed. Section 3.3 presents EPA's assessment of the quantities of K176, K177, and K178 potentially requiring commercial treatment. Sections 3.4, 3.5, and 3.6 discuss contaminated soil and debris, mixed radioactive wastes, and underground injection, respectively.

Information on the regulatory background of the K176, K177, and K178 wastes, the processes that generate the wastes, and the regulatory definitions of these wastes are presented here. Specifically, regulatory background for K176, K177, and K178 is presented in Section 3.1.1, industry sector overviews are presented in Section 3.1.2, and descriptions of the processes generating the wastes are presented in Section 3.1.3.

3.1.1 Background

EDF Consent Decree

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 also directed EPA (through HSWA) to investigate wastes generated by the inorganic chemical 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 a series of deadlines for promulgating RCRA listing decisions, including a requirement to propose and finalize a hazardous waste listing determination for inorganic chemical production wastes. The wastes specified in the consent decree relevant to inorganic chemical production are as follows:

- Sodium dichromate production wastes
- Wastes from the dry process for manufacturing phosphoric acid
- Phosphorus trichloride production wastes
- Phosphorus pentasulfide production wastes
- Wastes from the production of sodium phosphate from wet process phosphoric acid
- Sodium chlorate production wastes
- Antimony oxide production wastes
- Cadmium pigments production wastes
- Barium carbonate production wastes
- Potassium dichromate production wastes
- Phenyl mercuric acetate production wastes
- Boric acid production wastes
- Inorganic hydrogen cyanide production wastes
- Titanium dioxide production wastes (except for chloride process waste solids).

Inorganic Wastes Promulgated for Listing

Three wastes are promulgated for listing under 40 CFR Part 261 in today's rule; no other wastes are being listed as hazardous. These three wastes are generated from two inorganic chemical manufacturing sectors: titanium dioxide manufacturing and antimony oxide manufacturing. These hazardous wastes are defined as follows:

- K176: Baghouse filters from the production of antimony oxide, including filters from the production of intermediates (e.g., antimony metal or crude antimony oxide).

- K177: Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates (e.g., antimony metal or crude antimony oxide).

- K178: Residues from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process.

3.1.2 Industry Overview

Regulatory Background of Previous Solid Waste Regulations Affecting Industry

EPA has previously listed as hazardous a number of wastes in 40 CFR §261.32 from specific sources within the inorganic chemicals industry, including wastes from the production of inorganic pigments (codes K002 through K008), and wastes from chlorine production (codes K071, K073, and K106).

EPA also prepared a Report to Congress which further studied mineral processing wastes identified in the 1990 rule to determine their regulatory status under the Bevill exclusion. EPA issued this report on July 31, 1990 (Report to Congress on Wastes from Mineral Processing). As a result of this Report to Congress, EPA published a regulatory determination on June 13, 1991 (56 FR 27300) which finalized the list of Bevill exempt activities and wastes (40 CFR §261.4(b)(7)).

One waste from titanium dioxide production processes is specifically listed under 40 CFR 261.4(b)(7)(ii)(S) as the following Bevill exemption: "chloride process waste solids from titanium tetrachloride production". These solids are generated during the chlorination reaction of the titanium ore in the reducing presence of coke at elevated temperatures, and are generated from both the chloride process and the chloride-ilmenite process. Solids are also generated from the oxidation and finishing stages of titanium dioxide production that are not covered by the Bevill exemption. When these 'Bevill' and 'non-Bevill' wastes are mixed, the resulting waste is no longer covered by the Bevill exemption.

Inorganic Chemicals Manufacturing Industry

EPA's listings apply only to facilities manufacturing titanium dioxide or antimony oxide. This is a small subset of the entire inorganic chemicals manufacturing industry. In fact, EPA is aware of only one titanium dioxide production facility which has processes that may generate the newly listed waste (not all titanium dioxide production facilities are impacted, only those using one particular process). Similarly, EPA is aware of only three facilities currently producing antimony oxide and an additional facility that recently ceased production (all four antimony oxide facilities are expected to be impacted). Each of the facilities potentially expected to be affected by this listing are identified below:[17]

- U.S. Antimony, Thompson Falls MT. Generates K176 and K177.
- Amspec, Gloucester City NJ. Generates K176 and K177.
- Laurel Industries, LaPorte TX. Generates K176 and K177.
- Great Lakes Chemical/Cookson, Laredo TX. Stores K177 onsite in land-based units.
- DuPont, Edgemoor DE. Generates K178 and stores K178 onsite in land-based units.

[17] U.S. EPA, Antimony Oxide Listing Background Document for the Inorganic Chemical Listing Determination (August 2000); U.S. EPA, Titanium Dioxide Listing Background Document for the Inorganic Chemical Listing Determination (August 2000); ICMP-00028, public comments by Cookson Group PLC on the inorganic chemicals proposed rule; ICMP-00022, public comments by DuPont on the inorganic chemicals proposed rule.

3.1.3 Processes Generating Inorganic Chemical Production Wastes

Antimony Oxide Production

Antimony oxide was produced by four facilities in the United States in 1998. Antimony oxide is used as a flame retardant in plastics and textiles, a smoke suppressant, a stabilizer for plastics, an opacifier in glass, ceramics and vitreous enamels, and a coating for titanium dioxide pigments and chromate pigment.

Two processes are used to produce antimony oxide, the direct process and the indirect process. In the direct process, antimony oxide is roasted in the presence of air. The antimony oxide is formed as a fume, cools, and is condensed in a baghouse. In the indirect process, coarse oxides, slags and other feedstocks are reduced to antimony metal prior to the production of antimony oxide. The metal is then volatilized and reacted with oxygen in the vapor phase to produce antimony oxide. The antimony oxide cools and is condensed in a baghouse.

Listed wastes generated from antimony oxide production include antimony slag (K176) and baghouse filters (K177). Based on EPA record sampling, the antimony content of K176 ranges from 9 to 15 percent and the antimony content of K177 ranges from 2 to 13 percent.[18] In addition to these wastes, there are other materials produced that are immediately reused in the production process or generated as solid wastes.

Titanium Dioxide Production Using the Chloride-Ilmenite Process

Titanium dioxide (TiO_2) is a bright-white powder used predominately as a pigment for paints, rubber, paper, and plastics. Titanium dioxide is manufactured through either the sulfate, chloride, or chloride-ilmenite process. Only one facility (the Edgemoor Delaware facility of E.I. DuPont de Nemours and Company (DuPont)) using the chloride-ilmenite process generates K178.

The chloride-ilmenite process utilizes several steps to convert a low-grade ilmenite to TiO_2. First, the ilmenite ore is reacted with chlorine in the presence of coke as a reducing agent; the chlorine reacts with the iron oxide and other metals in the ilmenite ore to produce gaseous metal chloride intermediates. The gas, comprised of $TiCl_4$ and other volatile metal compounds, is purified to remove ore/coke solids, ferric chloride acid, and vanadium impurities. The purified titanium tetrachloride is oxidized to form titanium dioxide, for sale as a dry solid or water-based slurry.

At the Delaware facility, ferric chloride acid is sold as a byproduct. Prior to sales, the facility adds chlorine to the acid stream, filters the acid to remove solids (the filtered solids are discharged to the facility's wastewater treatment plant), and stores the ferric chloride acid in a surface impoundment. Additionally, the titanium dioxide production process generates various

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[18] U.S. EPA. Final Best Demonstrated Available Technology (BDAT) Background Document for Inorganic Chemical Production Wastes K176, K177, K178. October 2001.

other wastewaters and wastestreams which are managed at the wastewater treatment plant. Solids generated from treatment plant (identified as Iron-Rich® by the facility) would be classified as K178 based on the facility's current process configuration.

3.2 DATA SOURCES

For this capacity analysis for inorganic chemical production wastes, EPA primarily used information and data from the RCRA §3007 Questionnaire. This survey was distributed to inorganic chemical production facilities in Spring 1999, collecting data for the year 1998.

3.2.1 Survey Components

EPA developed an extensive questionnaire under the authority of Section 3007 of RCRA for distribution to the inorganic chemicals production industry. The purpose of the RCRA §3007 Questionnaire was to gather information about solid and hazardous waste management practices in the U.S. inorganic chemicals 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
- Residual generation and management information
- Information for specific onsite and offsite residual management units
- Constituents present in the wastes.

EPA distributed the industry-wide survey in Spring 1999 (for calender year 1998) regarding consent decree wastes generated by each facility. Data from these responses were reviewed by EPA and are summarized in this capacity analysis for the wastes promulgated for listing today. For this capacity analysis, EPA primarily used information regarding residual generation and management.[19]

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. Simultaneous with some of the site visits, EPA conducted familiarization sampling and analysis to more precisely identify target analytes and any potential matrix interference problems.

Upon completion of the familiarization sampling and analysis effort, EPA initiated record sampling and analysis of the wastes generated from inorganic chemicals production in 1999. The

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[19] U.S. EPA, Antimony Oxide Listing Background Document for the Inorganic Chemical Listing Determination (August 2000); U.S. EPA, Titanium Dioxide Listing Background Document for the Inorganic Chemical Listing Determination (August 2000).

record sampling results were used in EPA's risk assessment as well as to identify constituents promulgated for LDR treatment standards. Record sampling was conducted at two antimony oxide production facilities, at one titanium dioxide production facility generating K178, and at other facilities and industries in which EPA subsequently determined not to list any wastes as hazardous. The sampled facilities that generate the wastes promulgated for listing are as follows:

Titanium Dioxide Wastes
- DuPont, Edgemoor, DE. Sampled K178.

Antimony Oxide Wastes
- Laurel Industries, LaPorte, TX. Sampled K176 and K177.
- U.S. Antimony, Thompson Falls, MT. Sampled K176 and K177.

3.2.3 Public Comments

EPA received public comments regarding its September 14, 2000 proposal to list titanium dioxide and antimony oxide production wastes. Relevant comments and EPA responses regarding the capacity analysis are presented in Appendix F. EPA also incorporated waste quantity and management information from generators in this report.

3.2.4 Biennial Reporting System

Data from the 1997 BRS were used to identify data relevant for the DuPont Edgemoor facility generating K178. The results are presented in Appendix D.

3.2.5 Toxics Release Inventory

Data from the 1998 Toxics Release Inventory (TRI) were used in identifying relevant data for the DuPont Edgemoor facility generating K178. The results are presented in Appendix D.

3.3 METHODOLOGY, ASSUMPTIONS, AND PRELIMINARY RESULTS FOR K176, K177, and K178

In conducting the capacity analysis for K176, K177, and K178 inorganic chemical production wastes, EPA estimated the quantities of wastes generated and identified the quantities that will require hazardous waste commercial treatment and/or recovery as a result of the LDRs. The method that EPA developed for the K176, K177, and K178 inorganic chemical production wastes capacity analysis is comprised of three steps:

1. Estimate the annual quantity of K176, K177, and K178 generated (Section 3.3.1). Data for this estimate were obtained from the RCRA 3007 surveys described in Section 3.2 and public comments to the proposed rule.

2. Identify the management practices conducted and estimate the annual quantity of waste currently meeting LDR standards (Section 3.3.2). Several waste management

methods presently conducted would likely satisfy LDR treatment standards, or are exempt from LDR treatment standards. Current managment mentods were determined using the RCRA 3007 surveys described in Section 3.2 of this report. The quantities being managed in these methods can be estimated and subtracted from the overall capacity assessment.

3. Identify facilities with alternative onsite treatment or recovery availability (Section 3.3.3). Several facilities have onsite treatment technology that can result in all, or most, of the facility's generated K176, K177, and K178 volume being managed onsite and not requiring commercial treatment capacity. This assessment was made using sources such as the RCRA 3007 surveys described in Section 3.2 of this report.

The results of these three steps determine how much offsite commercial capacity is required to manage K176, K177, and K178 (See Exhibit 3–1). The derivation of the quantities presented in Exhibit 3–1 is discussed in Sections 3.3.1 to 3.3.3 for K176, K177, and K178, respectively.

Exhibit 3-1. Generation and Management Practices of K176, K177, and K178 Wastes Following Effective Date of LDRs

Waste Stream	(1) Annual Quantity Generated, tons	(2) One-Time Waste Quantities, tons	(3) Annual Quantity Currently Meeting LDR Standards, tons	(4) Annual Quantity with Onsite Treatment/ Recovery Availability, tons	(5) Annual Quantity Requiring Commercial Treatment, tons
K176 Nonwastewaters (no K176 wastewaters are found to be generated)	10	0	0	2	8
K177 Nonwastewaters (no K176 wastewaters are found to be generated)	22	120,000	0	0	22
K178 nonwastewaters (no K178 wastewaters are found to be generated	50	500,000	0	0	50

All quantities are developed using 1998 data.

3.3.1 K176 Wastes

The K176 wastes are principally cloth filters. As a result, EPA expects K176 to be generated in nonwastewater form; no quantities of wastewater forms of K176 are expected to be generated.

The different waste management methods for the process waste are listed in Exhibit 3-2. This information was gathered from the 1998 surveys and site visits to each facility. Table 3-2 identifies the facility using the management method, the reported 1998 waste generation quantity, and an indication of whether (1) record sampling data are available, or (2) an assessment of whether the management method could likely comply with the land disposal restrictions. A waste generation quantity at one facility was not estimated. However, this waste stream is recycled onsite so that commercial offsite treatment is not expected to be required.

Data in Exhibit 3-2 identify an estimated K176 waste generation rate of 10 tons per year. This quantity does not include one facility that manages its waste in an on-site antimony oxide production furnace. Several of the other K176 waste management methods identified will likely continue following promulgation of listing and land disposal restrictions. Thus, approximately two tons can be treated onsite or recovered offsite and will not require commercial treatment capacity. Two other facilities dispose of these wastes in a non-hazardous waste incinerator and an industrial Subtitle D landfill. These facilities may or may not be able to use their onsite production furnace to manage their wastes; they do not have any other alternative onsite treatment capacity. We assumed these two facilities would require alternative offsite commercial treatment.

These findings are summarized in Exhibit 3-3. As a result of this analysis, required alternative treatment capacity for K176 nonwastewaters is estimated to be eight tons per year. EPA anticipates that commercially available stabilization, as well as other technologies such as metals recovery, can be used in meeting the numerical treatment standards. We estimate that the commercially available stabilization capacity is much greater than this estimated quantity and therefore sufficient to treat the K176 hazardous wastes that would require treatment. Therefore, EPA is not granting a national capacity variance for K176 wastewaters or nonwastewaters.

Exhibit 3-2. Reported Management Methods for K176

Final Management	Facility	1998 Quantity (tons)	Comment
Antimony recovery in Mexico	U.S. Antimony, Thompson Falls, MT	2.2	Two record samples collected. Management practice would likely comply with LDRs.
Offsite nonhazardous waste incineration	Amspec, Gloucester City, NJ	3.3	Alternative management would be required to meet LDRs.
Recycled to onsite furnace for antimony recovery	Great Lakes Chemical, Laredo, TX	Not available	Currently closed.
Subtitle D Landfill disposal	Laurel Industries, LaPorte, TX	4.4	One record sample collected. Alternative management would be required to meet LDRs.
Subtotal		10	

Exhibit 3-3. Capacity Analysis Summary for K176	
Step in Methodology	**1998 Quantity, tons**
1. Annual Quantity Generated	10
2. Annual Quantity Currently Meeting LDR Standard	0
3. Annual Quantity that Could be Managed Using onsite Treatment or Recovery	2
4. Annual Quantity Requiring Commercial Treatment	8

3.3.2 K177 Wastes

The K177 wastes are principally slag. As a result, EPA expects K177 to be generated in nonwastewater form; no quantities of wastewater forms of K177 are expected to be generated.

The facility-specific waste generation and management practices for K177 wastes are presented in Exhibit 3-4. This information was gathered from the 1998 surveys, site visits to several of the facilities, and public comments. As shown in Exhibit 3-4, three facilities generate slag. However, only one is expected to generate K177 because the other two facilities send the waste offsite for lead or antimony recovery (e.g., for manufacture of batteries which use a lead-antimony alloy), and thus would not meet the listing definition for this waste.

Exhibit 3-4. Reported Management Methods for K177				
Facility	**Waste Management Activity**	**1998 Generation Quantity (tons/yr)**	**Onsite Storage Quantity (tons)**	**Comment**
U.S. Antimony, Thompson Falls, MT	Onsite drum storage. Land-based unit may be constructed in future to manage the material.	22	~200	One record sample collected. Alternative management would be required to meet LDRs
Amspec, Gloucester City, NJ	Sold to Mexican broker for antimony/lead recovery	22 **	—	Would not meet listing definition.
Laurel Industries, LaPorte, TX	Sold to broker for lead recovery	80 **	—	One record sample collected. Would not meet listing definition.
Cookson/ U.S. Antimony, Laredo TX	Onsite storage in pile. No ongoing generation.	—	120,000 (contaminated soil + waste)	
Subtotal		22		

** The listing definition for K177 would only include wastes that are disposed or speculatively accumulated. Therefore, the quantities of wastes at the New Jersey and Texas facilities are not included in the resulting K177 generation quantity.

Exhibit 3-4 also identifies two facilities that store K177 onsite. One of these facilities (U.S. Antimony, Thompson Falls Montana) stores the waste in on-site drums prior to planned onsite land-based storage. These materials have been reportedly stored onsite in steel drums for a minimum of four years, and possibly as long as ten years, with the facility reporting that they intend to reclaim the antimony from this slag when antimony prices are favorable. This facility may or may not be able to use their onsite production furnace to manage its waste; they do not have any other alternative onsite treatment capacity. Therefore, we assumed this facility would require alternative offsite commercial treatment. To estimate a quantity of waste affected, EPA multiplied the annual generation quantity (20 tons per year) by the number of years of accumulation (as long as ten years) for a total of 200 tons.

A second facility (Cookson/U.S. Antimony, Laredo Texas) also stores waste onsite. According to public comments from Cookson Company (comment numbers 00028 and L0005), approximately 60,000 tons of K177 waste is currently located in a waste pile at this facility, with a volume of contaminated soil roughly equivalent to the volume of the slag pile (this is the same plant identified as Great Lakes Chemical in Exhibit 3-2; Cookson is the previous owner of the site). If the slag and soil are excavated and handled after the effective date, the volume of waste potentially subject to regulation is 120,000 tons. This waste can potentially be treated using the treatment technologies identified in Section 2.2 (stabilization) or Section 2.3 (metal recovery) of this report. If removed for offsite disposal, the contaminated soil would require treatment if the levels of hazardous constituents are greater than ten times the promulgated treatment standard (see Section 3.4 of this report for the relevance of this standard). Characterization data for soil or slag from this site are unavailable, but slags from other sites contain inorganic constituents at levels ranging from ten to one hundred times the UTS.[20] Therefore, no conclusion can be made concerning the likely levels of hazardous constituents in soil, which would determine whether treatment would be required prior to any offsite disposal.

While the quantity present in a pile at the Laredo Texas facility is quite large, there are several mitigating factors which indicate that capacity will not be required for the entire amount in one year. First, it is possible that a portion of the K177 waste (however small) could be managed as a nonhazardous waste prior to the effective date of the listings. For example, if a generator is currently managing antimony oxide production slag in the waste piles, the generator could avoid managing the stored quantities as hazardous waste by sending those amounts off-site for treatment or to a Subtitle D landfill prior to the effective date. Second, it is likely that the facility will have the option of closing all or a portion of the unit in place without actively managing the area. If a waste pile is not actively managed after the effective date, the wastes are not subject to regulation. Active management does not include simple closure and post-closure activities such as the placement of a cap and groundwater monitoring. EPA notes that the site is already undergoing corrective action by the state of Texas and that closure in place is an option in the context of corrective action. If, however, the unit is actively managed, the wastes would qualify as K177 wastes and the owner or operator would be responsible for making sure that the

[20] U.S. EPA. Final Best Demonstrated Available Technology (BDAT) Background Document for Inorganic Chemical Production Wastes K176, K177, K178. October 2001.

wastes are properly managed under RCRA Subtitle C regulations after the effective date of the listing.

EPA researched if there were any other cases where hazardous waste that was present at a facility was left in place. The effect of such an action would be to reduce or eliminate demand for commercial treatment capacity. Through state contacts, EPA identified several such cases of land-based units (e.g., piles) where the management and treatment were directed through a State agency. EPA also identified Superfund actions (Records of Decision) that resulted in capping and monitoring of waste piles and similar units. Management was typically identified as capping, although treatment was not always conducted. In addition, many of the Superfund actions involved some level of excavation of the most highly contaminated soils and sediments prior to final capping. Appendix E details these findings.

The capacity analysis findings for K177 are summarized in Exhibit 3-5. As a result of this analysis, required alternative treatment capacity for K177 nonwastewaters is estimated to be 22 tons per year, with a one-time generation of up to 120,000 tons. EPA is promulgating numerical treatment standards for K177 nonwastewaters. EPA anticipates that commercially available stabilization, as well as other technologies (as identified in Section 2.3 of this report), can be used in meeting these treatment standards. We estimate that the commercially available stabilization capacity is much greater than these estimated quantities and therefore sufficient to treat the K177 hazardous wastes that would require treatment. Therefore, EPA is not granting a national capacity variance for K177 wastewaters or nonwastewaters.

Exhibit 3-5. Capacity Analysis Summary for K177

Step in Methodology	Quantity, tons/yr
1. Annual Quantity Generated	22
2. Annual Quantity Currently Meeting LDR Standard	0
3. Annual Quantity that Could be Managed Using onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	22

3.3.3 K178 Wastes

The K178 wastes are principally sludges or treatment solids. EPA expects K178 to be generated in nonwastewater form; no quantities of wastewater forms of K178 are expected to be generated. This waste is generated by one facility, Dupont Edgemoor (Deleware).

In the proposed rule (65 *FR* 55770; September 14, 2000), EPA initially estimated that approximately 7,300 tons per year of K178 may require alternative treatment. Since the finalized listing definition is narrower in scope than what was proposed, only one facility (rather than three) is expected to generate the waste, and the one facility will reduce the amount generated per year to approximately 50 tons per year (identified in a subsequent submission to EPA from the one facility).[21] The facility has also indicated that there is approximately 500,000 tons of waste (identified by DuPont as Iron-Rich®) in storage at the facility (public comment No. 22). EPA is considering these quantities separately: an annual K178 generation of 50 tons and a potential one-time K178 generation of 500,000 tons.

DuPont will have multiple options for the management of these wastes in storage: the wastes could be excavated (even partially) prior to the effective date and transferred off-site to a solid waste landfill, or the facility could close the units in place without actively managing the units as a RCRA landfill with a state-approved cap and groundwater monitoring (See Appendix E). A final mitigating factor in the capacity determination is that the rulemaking will not be in effect until the state is authorized for its implementation. As shown in Section 3.7, the extra time needed for a state to receive authorization for the rulemaking is likely to be at least 1.5 years.

The Delaware facility also manages K178 waste in surface impoundments. DuPont is working with the Delaware Department of Natural Resources and Environmental Control (DNREC) to develop a Conciliatory Agreement and closure plan for the ponds. As part of this agreement, DuPont is planning to cease use of this impoundment in the fourth quarter of 2001, and to proceed with a DNREC approved closure of the ferric chloride product storage surface impoundment. Activities are expected to include neutralizing and stabilizing the solids; with solids management completed in early 2002.[22]

If DuPont's waste is managed in unretrofitted impoundments[23], it would thus be land disposed in a prohibited manner. These impoundments can be retrofitted, closed, or replaced with tank systems. If the impoundment continues to be used to manage K178 waste, the unit will be subject to RCRA Subtitle C requirements. In addition, any hazardous wastes managed in the affected impoundment after the effective date of today's rule are subject to land disposal prohibitions.[24] However, a facility may continue to manage newly listed K178 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 basic groundwater monitoring (40 CFR Parts 264 and 265 Subpart F) and recordkeeping. Surface impoundments that are newly subject to RCRA subtitle C minimum technology requirements due to promulgation of a new hazardous waste listing are afforded up to 48 months after promulgation

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[21]The generation figure is based on a May 4, 2001 letter (Greg Martin (Dupont to Lillian Bagus and Stephen Hoffman (US EPA)). This letter is available in the docket to today's rule.

[22]Letter to Lillian Bagus, EPA, from DuPont, regarding K178 Hazardous Waste Listing of Ferric Chloride Solids, May 4, 2001. This letter is available in the docket to today's rule.

[23] A unretrofitted impoundment is one not satisfying the minimum technology requirements (MTR) specified in sections 3004(o) and 3005(j)(11).

[24] 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..."

of the new listing to retrofit the surface impoundments to meet minimum technological requirements (see RCRA section 3005(j)(6)(A), 40 CFR 265.221 (h)).

The capacity analysis findings for K178 are summarized in Exhibit 3-6. EPA is finalizing numerical treatment standards for K178 nonwastewaters, as well as an alternative treatment standard of combustion (CMBST) for the dioxin/furan components. EPA anticipates that commercially available incineration followed by stabilization, as well as other technologies (see Section 2.5 of this report), can be used in meeting these treatment standards. If commercial treatment of the quantity of K178 stored onsite is required, EPA anticipates that commercial incineration facilities would take several years to complete treatment. Interim permitted hazardous waste storage could be conducted prior to incineration. EPA verified that at least one incineration facility can likely accept this waste. See Appendix C for telephone logs of inquiries regarding incineration capacity. We estimate that the commercially available incineration and stabilization capacity is much greater than these estimated quantities and therefore sufficient to treat the final K178 hazardous wastes that would require treatment. Therefore, EPA is not granting a national capacity variance for K178 wastewaters or nonwastewaters.

Exhibit 3-6. Capacity Analysis Summary for K178

Step in Methodology	**Quantity, tons/yr**
1. Annual Quantity Generated	50
2. Annual Quantity Currently Meeting LDR Standard	0
3. Annual Quantity that Could be Managed Using onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	50

3.4 CONTAMINATED SOIL AND DEBRIS

In addition to the process wastes generated from inorganic chemical production facilities on a routine basis, EPA also considered the quantity of contaminated soil and debris present at these facilities. In Section 3.3, EPA previously discussed waste and contaminated soil present onsite at specific facilities (i.e., one facility managing K177 and one facility managing K178). 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 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).[25] CAMU allows an area of land at a facility to be designated as such and receive remediation wastes without triggering LDR standards or minimum technological requirements (MTRs), while a TU allows the facility to temporarily store such wastes without triggering permit requirements. 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.[26] 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 contaminated soils onsite. These innovative treatment technologies being used include soil vapor extraction, thermal desorption, ex-situ bioremediation, in-situ bioremediation, soil washing, solvent extraction, dechlorination as well as other innovative treatment technologies.[27]

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* 28602; 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 result in a

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[25] An August 24, 2001 letter from Cookson (in the public docket for this rule) speculates that CAMU or other potential actions may or may not be applicable to this particular site. This section of this Background Document identifies potential management alternatives for hazardous waste sites in general. Actual application is conducted on a case-by-case basis. For any one particular site, it is difficult or impossible for EPA to speculate on which particular alternative is likely to be employed.

[26] 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.

[27] 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.

greater use of offsite management due to an increase in flexibility, but at the same time the demand for commercial offsite treatment for such wastes would be less than a case where a more stringent treatment standard is employed. 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 newly proposed dye and pigment process 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 waste 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.

Finally, 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.

3.5 MIXED RADIOACTIVE WASTES CONTAMINATED WITH K176, K177, and K178

EPA identified no quantities of K176, K177, and K178 destined for treatment as mixed radioactive wastes based on information from the RCRA 3007 surveys and site visits. Also, no commenters submitted any data on these wastes. EPA is not granting a national capacity variance for mixed radioactive wastes of for soil and debris contaminated with mixed radioactive wastes.

3.6 UNDERGROUND INJECTED WASTES

EPA identified no quantity of K176, K177, and K178 that is presently managed by underground injection from the RCRA 3007 surveys and site visits. Also, no commenters submitted any data on these wastes. EPA is not granting a national capacity variance for underground injected wastes.

3.7 HOW THE EFFECTIVE DATE OF THE LISTING MAY AFFECT CAPACITY

In the proposed rule, EPA described all of the proposed listings as being "HSWA listings" (65 FR 55772) because the wastes proposed for listing were primarily associated with the inorganic chemical manufacturing sectors identified in the EDF consent decree. The consent decree serves as the final definition of EPA's obligations under the 1984 HSWA. Because of the changes to the scope of the K178 listing in response to public comments, EPA is now classifying the K178 listing determination as a non-HSWA listing because it is primarily associated with the production of ferric chloride (albeit from acids generated during titanium dioxide production). HSWA specified a list of industries for which the Agency was to assess and make listing determinations on the wastes generated by those industries. The EDF consent decree describes in more detail those specific wastes for which the Agency is obligated to make determinations to be responsive to the HSWA mandates. Focusing on today's final action, HSWA directed EPA to assess wastes from the inorganic chemicals manufacturing industry, and the EDF consent decree more specifically identified EPA's obligations on 14 inorganic chemical manufacturing sectors, one of which is the titanium dioxide sector. While EPA believes that the actions today with respect to the non-exempt ferric chloride solids are warranted, these actions fall outside the scope of the consent decree (and therefore HSWA) obligations. As such, this non-HSWA listing will become effective when the state in which the waste is generated (i.e., Delaware) adopts the rulemaking.

The capacity determination is affected by when the rule is adopted and becomes effective within a state. If the state adopts the rule very quickly, the rule could be effective as quickly as the effective date on the original rulemaking. However, states have historically needed more time to adopt a rule and get authorization from EPA. Exhibit 3-7 shows the amount of time between the promulgation date of major rulemakings and the effective date for the states that are fastest to receive authorization for a rulemaking. Only some (not all) major rules are shown and some older rules are shown because attempts were made to find both listing rules and non-HSWA rules. The table provides the date of the fastest state to authorize each rulemaking, so in many cases, states take longer than what is shown. The average for the fastest state is over a year and a half. Therefore, generators will likely have far longer than the effective date shown in today's final rulemaking to plan for the rule to be in effect.

Exhibit 3-7. Survey of Time for State Authorization

Rulemaking	Publication Date	Fastest State to Authorization	Amount of time from rule publication to authorization effective date
Radioactive Mixed Waste (non-HSWA)	7/3/86	Colorado	4 months
Land Disposal Restrictions - Third Third Rule (HSWA)	6/1/90	New York	Approx. 2 years
Universal Waste Rule (non-HSWA)	5/11/95	Florida	Approx. 2 years

Exhibit 3-7. Survey of Time for State Authorization			
Rulemaking	**Publication Date**	**Fastest State to Authorization**	**Amount of time from rule publication to authorization effective date**
Boilers and Industrial Furnaces (Both HSWA and non-HSWA)	2/21/91	Nevada	16 months
Petroleum Refining Process Wastes (HSWA)	2/11/99	Pennsylvannia (only 1 state authorized)	Approx. 22 months
Petroleum Refining Process Wastes (HSWA and non-HSWA)	10/9/98	Deleware (only 2 states authorized)	Approx. 2 years
Exclusion of Recycled Wood Preserving Wastewaters (Non-HSWA)	5/26/98	Louisiana	Approx. 2 years
Carbamates final listing (HSWA)	5/12/95	Nevada	15 months
Wastes from Wood Surface Protection (non-HSWA)	1/4/94	Nevada	15 months
Listing of Spent Pickle Liquor (K062) (Non-HSWA)	5/28/86	North Carolina	Approx. 2 years, 4 months
Chlorinate Toluene Production Waste Listing (HSWA)	10/15/92	Nevada	21 months
Average			19.7 months

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4. CAPACITY ANALYSIS RESULTS

This section presents the results of the capacity analysis for alternative commercial treatment of the inorganic chemical production wastes (K176, K177, and K178). A brief summary of these results was presented in Section 1 of this document (see Exhibit 1-2). The capacity analysis is based on assessment of available treatment capacity (Section 2) and the required treatment quantities of K176, K177, and K178 (Section 3). This section compares estimates of required treatment capacity to that commercially available for these wastes.

EPA is listing two wastes from antimony oxide production: K176 and K177. EPA is finalizing numerical treatment standards, equivalent to universal treatment standards, for each of these wastes. For K176, the waste must meet numerical treatment standards for antimony, arsenic, cadmium, lead, and mercury. For K177, the waste must meet numerical treatment standards for antimony, arsenic, and lead. From available data sources, the required treatment capacity for K176 nonwastewaters is estimated to be eight tons per year and the required alternative treatment capacity for K177 is estimated to be 22 tons per year. No wastewater forms of K176 or K177 are expected to be generated and, therefore, there is no quantity of the wastewater form of K176 or K177 that would require treatment. EPA anticipates that commercially available stabilization, as well as other technologies (such as metal recovery discussed in Section 2.3 of this report), can be used in meeting these treatment standards. We estimate that the commercially available stabilization capacity is at least eight million tons, or much greater then these estimated quantities and therefore sufficient to treat the K176 and K177 hazardous wastes that would require treatment. Therefore, EPA is not granting a capacity variance for K176 or K177 hazardous wastes.

For K177 waste, there is a large quantity of K177 in storage at a single facility and could require alternative treatment. This facility has ceased operation in the United States, but is storing approximately 60,000 tons of slag in a pile. In addition, the facility has a volume of contaminated soil roughly equivalent to the volume of the slag pile. If the slag and soil are excavated and handled after the effective date, the volume of waste potentially subject to regulation is 120,000 tons. This site is already under a corrective action order with the State of Texas to clean up the site because of antimony contamination. As part of this effort, some remediation of the historic waste pile is expected. In cases involving corrective action, it is possible to treat and/or manage hazardous waste without triggering LDR treatment standards. If the slag of contaminated soil is not removed from the land via excavation (e.g., *in situ* treatment), then LDR standards will not be applied to these wastes. In addition, if hazardous slag or contaminated soil is excavated, LDR standards will only apply if the subsequent management is considered "land disposal" for the purposes of the LDR program.

The K177 listing is conditional: if a facility legitimately recycles its wastes without speculatively accumulating them and without use constituting disposal, it will not be regulated as a listed waste. Thus, the listing and the LDRs may not apply to these materials. Therefore, the facility may require little off-site commercial treatment capacity for its K177 waste and soil contaminated with K177 waste.

Under a worst-case scenario, there is a potential that capacity will be needed for the waste pile containing an estimated 60,000 tons of slag (K177) and estimated 60,000 tons of contaminated soil from one facility. Even if the additional 120,000 tons of K177 slag and contaminated soil from the facility must be managed off-site as hazardous waste and the waste is not legitimately recycled or left in place, EPA anticipates that commercially available stabilization, as well as other technologies, can be used to meet the treatment standards applicable to the waste. EPA estimates that the commercially available stabilization capacity is at least eight million tons per year. Thus, there is sufficient capacity to treat the K177 hazardous wastes that will require treatment.

EPA is listing one waste, K178, generated from titanium dioxide production using the chloride-ilmenite process. In today's rule, EPA is requiring the waste to meet numerical treatment standards for one metal (thallium) and for certain dioxin and furan congeners. The required alternative treatment capacity for K178 is estimated to be 50 tons per year. No wastewater forms of K178 are expected to be generated, and therefore, there is no quantity of the wastewater form of K178 that would require treatment. The numerical treatment standards for dioxins and furans can likely be met using combustion, as discussed in Section 2.1 (the alternative treatment standard, CMBST, would also require combustion). This can be followed by stabilization if necessary to treat the metal constituent. EPA estimates that the commercially available sludge and solid combustion capacity is at least one million tons per year and therefore sufficient to treat the nonwastewater forms of K178 that would require treatment. The stabilization capacity is at least eight million tons per year. Therefore, EPA is not granting a capacity variance for K178 nonwastewaters or wastewaters.

EPA has identified that one facility manages or generates K178 in surface impoundments. The facility may remove K178 waste before the effective date of the listing (if finalized), and therefore may not be subject to LDR requirements. However, if the waste is actively managed in unretrofitted impoundments (*i.e.*, impoundments not satisfying the minimum technology requirements (MTR) specified in RCRA sections 3004(o) and 3005(j)(11)) after the effective date in the authorized state, it would be land disposed in a prohibited manner. The impoundment can be retrofitted, closed, or replaced with tank systems. If the impoundments continue to be used to actively manage K178 waste, the units will be subject to subtitle C 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 (if the rule is finalized) are subject to the land disposal prohibitions. EPA expects the facility using surface impoundments to discontinue their use prior to the effective date of the listing and land disposal restrictions, as discussed in Section 3.3.3 of this Background Document.

In addition to the amount generated from year to year, comments indicate that approximately 500,000 tons of K178 is stockpiled at one facility. EPA believes that it is unlikely that the entire quantity will require offsite treatment capacity after the effective date. For example, the facility could work with the State Implementing Agency to close the unit in place without actively managing the units. Even if the entire 500,000 ton quantity becomes subject to the K178 listing after the effective date, EPA expects that commercial facilities could store this quantity of material and subsequently manage it using treatment such as combustion or non-combustion technologies over a period of several years should the demand for such capacity arise. In addition, because this is a non-HSWA rule and will take effect only after authorized states adopt parallel listings under state law and EPA authorizes revisions to the codified state programs, there will be additional time (beyond six months) for the facility to identify and implement management options for the stored K178 waste. EPA anticipates that commercially available combustion capacity is adequate to meet the demands.

EPA believes that most soil and debris contaminated with K176, K177, and K178 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 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 promulgated wastes, the affected party may also request a capacity variance extension per 40 CFR 268.5 on a case-by-case basis.

In summary, EPA is not granting a national capacity variance for nonwastewater or wastewater forms of K176, K177, or K178 being surface-disposed or underground injected. EPA also is not granting a national capacity variance for soil and debris contaminated with K176, K177, or K178 wastes. EPA estimates that there are no generated quantities of mixed radioactive wastes contaminated with K176, K177, and K178 or soil and debris contaminated with radioactive mixed waste and EPA is not granting a national capacity variance for such wastes. Therefore, if finalized, the LDR standards become effective when the K176, K177, and K178 listings become effective. As discussed earlier in this document, the LDR treatment standards become effective essentially at the same time a listing does, unless EPA grants a national capacity variance (see RCRA Section 3004(h)(2)). This effective date is six months following publication of the final rule for K176 and K177. The K178 listing, promulgated under section 3001(b), an non-HSWA authority, will not take effect in any authorized state until that state promulgates a rule adopting the listing. It will not take effect under federal law until EPA authorizes the revision to the state program. The LDR requirements for K178 also will not apply immediately in authorized states. RCRA allows generators to apply for an extension to the LDR effective date 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)).

Appendix A. 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, EPA included only those incineration and energy recovery facilities (i.e., boiler and industrial furnaces) identified in a list of hazardous waste combustion facilities commercial and operational as of May 27, 1999 (EPA OSW, Permit and State Program Division).

1.1 Maximum Practical Commercial Capacity Analysis

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

Capacity data for incineration and energy recovery, for each facility for which data were available, were extracted from the Onsite 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
- Regulatory limitations.

The maximum operational commercial RCRA capacity was estimated by multiplying the maximum RCRA operational capacity times the percent capacity commercially available. EPA was only able to estimate the maximum operational commercial RCRA capacity for about 50 percent of the combustion facilities included in their analysis.[28]

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*.[29] 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:

- 1 year = 7,008 operating hours;[30]
- 1 gallon = 0.004 tons; and
- 1 BTU per hour = 0.876 pounds of waste/hour or 4.4E–04 tons of waste/year.[31]

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

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[28]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.

[29]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.

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

[31]U.S. Environmental Protection Agency. *Commercial Combustion Capacity for Hazardous Waste Sludges and Solids*. Prepared by ICF Incorporated. August 1990.

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 design capacity data.[32] 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. The maximum practical commercial capacity estimate was raised to the utilized capacity estimate if the former quantity was less than the latter.

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's 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 onsite (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 offsite for management, data were collected from their Waste Received from Offsite (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.

We 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;

[32] 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, prepared by ICF under EPA Contract No. 68–W4–0030), hereafter referred to as the Available Capacity Report.

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

- 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[33]; 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 A-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

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[33]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.

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.

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

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

		Liquids			Solids			Gases		
EPA ID	Facility Name	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 A-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	Virginia 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

Appendix B. Updated Analysis of Commercial Wastewater Treatment Capacity for Hazardous Wastes

This appendix presents a method of estimating commercially available wastewater treatment capacity for hazardous wastes. For several years, EPA has used an approach which relied on data from the 1991 Office of Water survey of Centralized Waste Treatment (CWT) facilities and 1991 Biennial Reporting System (BRS) data. However, the underlying data are dated and, therefore, may not be reflective of current market conditions. Using these Office of Water and 1991 BRS data (presented in EPA's *Background Document for Land Disposal Restrictions for Wood Preserving Wastes (final rule): Capacity Analysis and Response to Capacity-Related Comments,* April 1997) resulted in an estimate of commercially available wastewater treatment capacity of approximately 37 million tons (34 million metric tons or 8.9 billion gallons) per year.

The purpose of this appendix is to present a revised approach using more recent data which relies primarily on the 1995 and 1997 Biennial Reporting System (BRS). (The approach also uses some data from the 1991 Office of Water survey.) This revised approach results in an slightly higher estimate of commercially available wastewater treatment capacity of approximately 46 million tons (42 million metric tons or 11.1 billion gallons) per year. The results of both analyses are summarized in Exhibit B-1.

Exhibit B-1. Comparison of Approaches Used to Estimate Available Commercial Wastewater Treatment Capacity for Hazardous Wastes at a National Level, tons

Approach	Number of Facilities	Operational Capacity	Utilized Capacity	Available Capacity
Current [A]	83	78,200,000	32,000,000	46,300,000
Former [B]	35	135,000,000	103,000,000	37,000,000

Unless site-specific data were available, this appendix uses a conversion factor of 240 gallons per ton (equal to the density of water).
A. As described in this appendix, relying primarily on 1995 and 1997 BRS data.
B. As described in EPA's *Background Document for Land Disposal Restrictions for Wood Preserving Wastes (final rule): Capacity Analysis and Response to Capacity-Related Comments,* April 1997), this approach used results from the 1991 Office of Water CWT Survey and the 1991 BRS. A total of 87 facilities responded to the CWT survey. Available capacity was scaled to account for underreporting and therefore does not exactly equal the difference between operational and utilized capacity.

B.1. Introduction

Land disposal restrictions for hazardous wastes require that wastes meet numerical or technology-specific treatment standards prior to land disposal. Aqueous hazardous wastes generated by facilities and subsequently land disposed must meet appropriate standards depending on whether the waste is classified as a wastewaters or as a nonwastewater. Facilities that generate such wastes and that do not have appropriate onsite treatment facilities must therefore manage the wastes at an offsite facility, shipping the waste by drum, tanker truck, pipeline, etc. Commercial wastewater treatment facilities commonly accept wastes that are aqueous or pumpable, regardless of whether the waste is classified as a 'wastewater' or nonwastewater in 40 CFR 268.2 (wastewaters have less than 1 percent solids and less than 1 percent total organic carbon).

Not all aqueous hazardous wastes must meet LDR treatment standards. Many such wastes are not land disposed (e.g., because they are managed solely in tanks prior to discharge). However, other facilities may manage nonhazardous wastes in Subtitle D surface impoundments or underground injection wells. If such wastes became hazardous they would require alternative management such as management at a commercial facility. Other facilities may manage their hazardous wastes in underground injection units. If the generated wastes were subject to any changes in LDRs the waste may require alternative management, such as management at a commercial facility. Note that LDR treatment standards are not required if the wastewater is managed in a lined surface impoundment that meets the requirements of §3005(j)(11) (i.e., meets minimum technological requirements and is dredged annually).

This appendix describes our methodology for estimating the available commercial treatment capacity for wastewater treatment of hazardous wastes. Such treatment would be appropriate, for example, in managing aqueous wastes generated by individual facilities. While this appendix typically refers to these materials as 'wastewaters,' such wastes are not required to meet the 40 CFR 268.2 definition of a wastewater (with less than 1 percent solids and less than 1 percent total organic carbon) to be managed in this manner.

Wastewater treatment technologies used by commercial wastewater treatment facilities include biological treatment, chemical precipitation, filtration, and many other technologies. For the estimate developed in this appendix, we have considered treatment methods that would be likely to result in substantial waste treatment, to below 40 CFR Part 268 treatment standards. These treatment facilities can be commercial treatment storage disposal (TSD) facilities that receive wastes exclusively from offsite, as well as TSD facilities that treat a combination of both wastewater generated onsite and wastewater received from offsite. While commercial facilities may have multiple technologies for treating a wider variety of wastes, not every commercial facility has the capability to accept and treat every type of waste (or have the necessary permits to accept such a wide variety of wastes). Additionally, generators typically restrict shipments to a commercial facility located relatively close, particularly if larger quantities of wastes must be transported. Nevertheless, the result of this analysis is a single estimate of available commercial treatment capacity for all treatment methods; the limitations of this estimate are discussed in Section B.6.

The following steps are used in conducting this analysis:

- Identify the population of commercial facilities (Section B.2)
- Estimate the quantity of wastes presently treated (i.e., waste throughput) (Section B.3)
- Estimate the total or maximum operational treatment capacity (Section B.4)
- Estimate the available treatment capacity (Section B.5)
- Discuss uncertainties and limitations (Section B.6).

B.2. Population of Commercial Facilities

To estimate the current population of commercial wastewater treatment facilities, we used the following information sources: the WR form of the 1997 BRS, the results of the 2000 paint production wastes survey, the PS form of the 1995 BRS, and the 1991 Office of Water survey.

Data and information from the 1997 BRS as a starting point (1997 is the most recent year of BRS data). Specifically, a search of the BRS was conducted to identify facilities who reported accepting hazardous wastes from offsite and managing them using one of three general treatment technologies: aqueous inorganic treatment, aqueous organic treatment, and aqueous organic and inorganic treatment.[34] A total of 87 facilities were initially identified in this manner. As shown below, a number of adjustments were made that resulted in a final list of 83 facilities for the capacity assessment.

Not all facilities reporting the receipt of wastes in 1997, however, are commercial. ("Commercial" is defined as accepting wastes from any facility. See Section 1.2.2 of this background document for definitions used in this analysis.) For example, some facilities may only receive wastes generated from a single site within its corporate structure. At the same time, additional commercial facilities are known to exist but, for whatever reason, did not report receiving hazardous wastes from offsite in 1997. To correct these deficiencies, a number of adjustments were made to this list:

- Facilities were ADDED to the list if they were identified as wastewater treatment facilities that receive paint production wastes and had a RCRA permit.[35] A total of 13 such facilities were identified in this manner.

- Facilities were REMOVED from the list if they were not commercial (i.e., facilities with status codes 1 or 2 were removed). Facilities identified their commercial status in the 1995 BRS.[36] Facilities used one of four commercial status codes:

  1: System only manages wastes generated from onsite operations.
  2: System is available only to other facilities within the same corporate structure.
  3: System is available to a limited group of facilities.
  4: System is commercially available to any facility.

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[34] These management methods correspond to system codes M071 through M099 from the 1997 BRS waste received (WR) form.

[35] EPA distributed a RCRA §3007 Questionnaire to paint manufacturing facilities in Spring 2000, collecting data for the year 1998. Among other information, facilities were required to report the destination of in-scope wastes shipped offsite. Facilities that reported sending wastes to 'offsite wastewater treatment facilities' are included in this total. We assumed that such facilities are commercial. For each facility, RCRA permit information was identified using the RCRA Information System in Envirofacts (http://www.epa.gov/enviro/html/rcris/rcris_query_java.html).

[36] Data from the 1995 BRS PS (process system) form were used. Similar data were not available for later years.

Facilities that reported a commercial status code of 1 or 2 were removed from the list (they are not included on any of the lists in this appendix). Facilities that reported a commercial status code of 3 or 4 (or did not report any status code) were retained on the list.[37]

- Facilities were RETAINED on the list if they were included in the Office of Water's 1991 survey of the centralized waste treatment (CWT) industry. This survey identified centralized waste treatment facilities that accepted wastes from offsite, but not exclusively by pipe (note that this is a distinction made by the Office of Water survey). Facilities on this list were assumed to be commercial.

Using the procedures described in this Section, a total of 83 facilities in the U.S. were identified as commercial hazardous wastewater treatment facilities. These facilities are identified in Exhibit B-2.

B.3. Estimation of Waste Throughput

Using the list of facilities identified from this analysis in Section B.2 (i.e., 83 facilities), we subsequently estimated the quantities of hazardous wastes that are managed in each facility's wastewater treatment system. The principal data source for this information was the 1997 BRS. These data were supplemented with information from the 1995 BRS and the 1991 CWT Survey. These specific data sources are discussed in detail below.

Use of 1997 BRS Data

The 1997 BRS identifies, for each facility, the total quantities of hazardous waste generated and managed onsite (this information is from the GM form), as well as the total quantities of hazardous waste accepted from offsite facilities (this information is from the WR form). Both of these quantities contribute to a facility's total waste throughput.

Each of the 83 facilities was assessed in this manner. However, not all wastes accepted from offsite will be managed using wastewater treatment. For example, a facility may have multiple treatment operations, only a portion of which may be appropriate for treating aqueous wastes. The WR form of the 1997 BRS indicates the treatment used for each waste shipment. To estimate the quantity of wastes received from offsite and managed in each facility's wastewater treatment system, we summed the total quantities of wastes managed in each of the following system codes using the WR form results of the 1997 BRS:

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[37] Occasionally, a facility reporting multiple systems would identify different codes for each system. For example, it may have one management system used exclusively for its own generated wastes and a second management system available for commercial use. In most cases, the system capacity associated with one code was much greater than any of the others. This code was used to represent the entire facility's wastewater treatment operation. For a facility whose wastewater treatment commercial availability was unknown, its other waste treatment operations were investigated even if they were unrelated to wastewater treatment. For example, if a facility did not report whether its wastewater treatment system is commercially available, but reported a commercial availability code for its onsite incinerator, then it was assumed that this same code would apply to its wastewater treatment operations.

- System codes M071 to M079, aqueous inorganic treatment
- System codes M081 to M089, aqueous organic treatment
- System codes M091 to M099, aqueous organic and inorganic treatment.

Similarly, not all wastes generated onsite are managed in a facility's wastewater treatment system. To identify the quantity of wastes generated onsite and managed in each facility's wastewater treatment system, we used a slightly different list of system codes. An expanded set of codes were used to account for the possibility that a facility only reported an intermediate management step, or only reported an initial management step. To estimate the quantity of wastes generated onsite and managed in each facility's wastewater treatment system, we summed the total quantities of wastes managed in each of the following system codes using the GM form results of the 1997 BRS:

- System codes M071 to M079, aqueous inorganic treatment
- System codes M081 to M089, aqueous organic treatment
- System codes M091 to M099, aqueous organic and inorganic treatment
- System code M121, neutralization only
- System code M122, evaporation only
- System code M123, settling or clarification only
- System code M124, phase separation (e.g., emulsion breaking or filtration) only
- System code M134, deepwell/underground injection
- System codes M135, discharge to a sewer/POTW
- System code M136, discharge to a surface water under National Pollutant Discharge Elimination System (NPDES) permit.

The latter codes M121 to M136 do not represent the same degree of treatment as the other treatment codes. However, it is assumed that facilities reporting such management would, in addition, manage their generated wastewaters in their onsite treatment system prior to discharge.

The 1997 total throughput includes the sum of the wastes generated onsite and wastes received from offsite.

Use of 1995 BRS Data and 1991 CWT Survey Data

For 13 of the facilities (i.e., those identified from the paint survey), waste throughput data were not available from the 1997 BRS. For these facilities, data from the PS form of the 1995 BRS were investigated. The PS form identifies the total throughout in a facility's treatment system. To identify the quantity of wastes managed in each facility's wastewater treatment system, we summed the total quantities of wastes (the influent quantity from the PS form) managed using system codes M071 through M099, M121 to M124, and M134 to M136 (i.e., the same system codes used when considering treatment system loading from wastes generated onsite). A total of two additional facilities reported waste throughput in this manner.

Finally, EPA investigated data from the 1991 CWT survey for the remaining 11 facilities for which the above approaches using 1997 or 1995 BRS data were unsuccessful.[38] Only one of these facilities provided responses to the 1991 CWT Survey. For the remaining ten facilities, waste throughput data could not be estimated.

B.4. Estimation of Total Operational Treatment Capacity

Total (or maximum) operational capacity is the greatest rate of wastewaters that can be treated in the system, limited only by permit requirements and equipment considerations. This quantity was estimated for each facility using one of three approaches:

- Use of 1995 BRS data
- Use of 1991 CWT survey data
- Extrapolation.

Details of each approach are presented below.

Use of 1995 BRS Data

Data from the PS form of the 1995 BRS were attempted to be obtained for each of the 83 facilities identified in Section B.2 (1995 is the latest year that total or maximum operational capacity was collected). Initially, the analysis was limited to each facility's wastewater treatment operations (i.e., management using the system codes M071 through M099). For each facility, the operational capacity associated with each relevant system was identified and summed, providing a single operational capacity for each facility.

For facilities that did not report maximum operational capacity for system codes M071 to M099 in their 1995 PS forms, we reviewed their PS forms to identify if capacity information for other treatment methods were reported. This was conducted for facilities reporting capacity information for 'neutralization' (M121) and 'emulsion breaking' (M124). When appropriate, we assumed that the system would likely treat wastewaters or be part of a larger wastewater treatment system.

Of the 83 commercial hazardous wastewater treatment facilities identified in Section B.2, 1995 PS form data were available for 32 facilities. Note that we only used maximum operational capacity from the 1995 PS form. Waste influent data was obtained from each facility using the approach described in Section F.3.

Use of 1991 CWT Data

For facilities not providing maximum operational capacity information in the 1995 PS form, data from the 1991 CWT survey were used instead. The relevant survey results are

[38] These data are available in EPA's 1997 Background Document for Land Disposal Restrictions Wood Preserving Wastes (final rule), Capacity Analysis and Response to Capacity-Related Comments, pages 2-6 to 2-10.

presented in Exhibit 2-2 and Appendix B of EPA's 1997 Background Document for Land Disposal Restrictions Wood Preserving Wastes (final rule), Capacity Analysis and Response to Capacity-Related Comments. Data for nine facilities were provided from this source.

Extrapolation of Results for Remaining Facilities

For facilities not providing capacity information in their BRS PS form, or in the 1991 CWT Survey, their operating capacity was estimated. No other data sources were identified that would have this information. Estimation of their operation capacity was conducted in the following manner.

Facilities identified in Exhibit B-2 that provided data on both their waste throughput and their operating capacity were used as the basis for estimating operating capacity of the remaining facilities. Data were available for both total waste throughput and maximum operating capacity using the approaches described in Sections B.3 and B.4, respectively. Each facility's utilization rate was calculated by dividing the waste throughput by the operating capacity. For all facilities with such data, an overall median utilization rate was calculated. EPA identified 41 facilities with sufficient data to calculate individual utilization rates, as identified in Exhibit B-3. The median utilization rate for all 41 facilities was calculated to be 17 percent.

The median utilization rate was used for all facilities that supplied waste throughput data but did not supply operational capacity data. The operating capacity was calculated for each facility by dividing the waste throughput by the utilization rate. Operating capacity was estimated for 32 facilities using this approach.

Operational capacity could not be calculated for ten facilities. This is because the waste throughout for these ten facilities could not be determined using the data sources in Section B.3. As a result, these ten facilities are essentially omitted from the calculations due to lack of data.

B.5. Calculation of Estimated Available Commercial Treatment Capacity

The nationwide estimated available commercial treatment capacity was calculated by integrating the above information on waste throughput (Section B.3) and maximum operational capacity (Section B.4). The information was used in the following manner:

- The population of facilities was selected as shown in Section B.2. This process identified facilities accepting wastes from offsite but eliminated facilities that were not identified as 'commercial.' A total of 83 facilities, identified in Exhibit B-2, were identified.

- For each facility identified in Section B.2, waste throughput was calculated using the methods described in Section B.3 and operational capacity was calculated using the methods described in Section B.4. For each facility, the waste throughput was subtracted from the operational capacity to identify each facility's available treatment capacity. For facilities who reported that their operational capacity was less than their throughput, their available capacity was assumed to be zero. Therefore, each facility's available capacity was equal to or greater than zero.

- The individual facilities' available commercial treatment capacity were summed to generate a nationwide estimate.

The results of the analysis are presented in Exhibit B-2. Based on these results, EPA estimates that the commercially available hazardous waste treatment capacity is 47 million short tons per year (equal to 42 million metric tons per year or 11.2 billion gallons per year).

Note that the above calculation approach is slightly different than simply adding each facilities' operational capacity and subtracting from the sum of wastes treated. This is because some facilities inadvertently reported that their operating capacity was less than the total quantity of wastes treated. For such a facility, we assumed the available commercial treatment capacity was zero rather than a negative number.

B.6. Uncertainty and Limitations

This appendix presents an estimate of the nationwide commercial wastewater treatment capacity for hazardous wastes. Wastewater treatment, however, is a compilation of many different types of processes. For example, some facilities may specialize in the treatment of inorganic wastes (e.g., chemical precipitation) while others treat organic wastes (e.g., biological treatment). Such differences were not accounted for in this analysis due to data limitations. One of the source materials, the results of the 1991 CWT survey as reported in EPA's 1997 Background Document for Land Disposal Restrictions Wood Preserving Wastes (final rule), Capacity Analysis and Response to Capacity-Related Comments, did not distinguish between treatment type. The other principal source of data, the BRS, does distinguish between treatment type. However, these distinctions were not used because much higher scrutiny of the data would have been necessary to account for complex facility processes.

Another difficulty with presenting a national estimate for wastewater treatment capacity is that generators prefer not to ship wastewaters long distances to a commercial facility, particularly if larger quantities of wastes must be transported. Therefore generators may not be able to effectively utilize wastewater treatment capacity if the treatment facility is located far from their generating facility. This limitation of the analysis can be overcome if the national estimate for capacity is compared to national estimates of waste generation. Assuming that generators of a particular waste are distributed throughout the U.S., then comparison to a national estimate of available treatment capacity is appropriate because the treatment facilities are also distributed throughout the U.S.

There are several limitations to the numerical estimate of available treatment capacity presented in this appendix:

- No single source was available to identify commercial hazardous waste wastewater treatment facilities. Instead, the identification of these facilities was conducted using the 1997 BRS and data from the 1998 Paint Industry survey as described in Section B.2. These data are several years old, and additionally may not have captured every facility with wastewater treatment capability. Therefore, use of this population may underestimate available treatment capacity.

- Much of the maximum operational capacity data (presented in Section B.4) used in this analysis is based on the PS form from the 1995 BRS, which facilities voluntarily provided. Therefore, these data may not accurately reflect the actual capacity for all facilities. These data were supplemented with data from the 1991 CWT survey. Both data sources are dated and may not reflect the current operating practices of the facilities.

- Exhibit B-2 identifies that a total of 30 million short tons of wastes are received from offsite (using the methodology described in Section B.3). This waste quantity may be received in drums, tanker truck, or by pipe. While portions of this quantity may not be subject to land disposal restrictions (e.g., from piped sources), nevertheless it impacts the available commercial capacity of treatment facilities.

- Operating capacity was estimated for facilities that did not otherwise provide this information. A utilization rate of 17 percent was calculated as a median value from all facilities supplying sufficient data. The use of this estimate may not provide an accurate representation for a national estimate.

- 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 if non-hazardous waste is being managed. In addition, wastes excluded from the definition of solid waste and permitting requirements are not reported in the BRS. Therefore, use of these data likely overestimates available treatment 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 and therefore overestimating available treatment capacity.

Exhibit B-2. Commercial Capacity Availability Analysis

EPA ID	Facility Name	City	State	Is Facility Identified in 1991 CWT Survey?	Quantity, Short Tons			Available Commercial Capacity, Tons	Data Source		
					Total Received from Offsite	Generated Onsite	Sum of Max. Op. Capacity		Facility ID	Throughput Data	Capacity Data
ALD070513767	M & M CHEMICAL & EQUIPMENT COMPANY, INC.	REECE CITY	AL	No	1	0	7	6	WR	WR+GM	Estimated
ARD981057870	RINECO	BENTON	AR	No	2	0	11	9	WR	WR+GM	Estimated
CAD983672155	McKittrick Waste Treatment Site	McKittrick	CA	No				0	Paint	No estimate	No estimate
CAT080013352	Demenno/Kerdoon	Compton	CA	No	156,572		336,000	179,428	Paint	PS	PS
CTD000604488	CECOS TREATMENT CORP.	BRISTOL	CT	Yes	4,328	0	260,208	255,880	WR	WR+GM	PS
CTD002593887	BRIDGEPORT UNITED RECYCLING INC	BRIDGEPORT	CT	No	1,298	0	94,900	93,602	WR	WR+GM	PS
CTD021816889	UNITED OIL RECOVERY, INC.	MERIDEN	CT	Yes	12,214	0	1,064,000	1,051,786	WR	WR+GM	PS
DED984073692	International Petroleum Company	Wilimington	DE	No				0	Paint	No estimate	No estimate
FLD981928484	Industrial Water Services	Jacksonville	FL	No				0	Paint	No estimate	No estimate
GAD033582461	ALTERNATE ENERGY RESOURCES, INC.	AUGUSTA	GA	Yes	2,775	362	32,500	29,362	WR	WR+GM	PS
IAD005289806	JOHN DEERE-COMPONENT WORKS	WATERLOO	IA	Yes	355	280	163,341	162,706	WR	WR+GM	CWT
IAT200010601	ISU-CHEMICAL WASTE HANDLING FACILITY	AMES	IA	No	0	0	0	0	WR	WR+GM	Estimated
ILD000672121	Clean Harbors Services, Inc.	Chicago	IL	Yes	70,500		150,000	79,500	Paint	CWT	CWT
ILD000666206	ENVIRITE CORP. (IL)	HARVEY	IL	Yes	38,531	0	86,600	48,069	WR	WR+GM	PS
ILD005087630	UNITED REFINING & SMELTING CO	FRANKLIN PARK	IL	No	111	0	332	221	WR	WR+GM	PS
ILD010284248	CID LANDFILL	CALUMET CITY	IL	No	19,072	0	176,000	156,928	WR	WR+GM	PS
ILD062480850	PHIBRO TECH INC	JOLIET	IL	No	17,150	0	103,457	86,307	WR	WR+GM	Estimated
ILD085349264	HERITAGE ENVIRONMENTAL SERVICES	LEMONT	IL	No	6	0	650	644	WR	WR+GM	PS
ILD980613913	SAFETY-KLEEN ENVIRONSYSTEMS CO	DOLTON	IL	No	25	0	151	126	WR	WR+GM	Estimated
IND000646943	POLLUTION CONTROL INDUSTRIES INC	EAST CHICAGO	IN	No	34	0	207	173	WR	WR+GM	Estimated
IND093219012	HERITAGE ENVIRONMENTAL SERVICES, INC.	INDIANAPOLIS	IN	Yes	70,076	0	201,200	131,124	WR	WR+GM	PS
KSD985003037	Reddi Services	Kansas City	KS	No				0	Paint	No estimate	No estimate
KYD985072008	WESTLAKE MONOMERS & WESTLAKE CA & 0 CORP	CALVERT CITY	KY	No	10,416	545,078	3,350,932	2,795,438	WR	WR+GM	Estimated
MAD000650051	WINDFIELD ALLOY INC	LAWRENCE	MA	No	5	0	54	49	WR	WR+GM	PS
MAD046613279	ATTLEBORO REFINING CO -- HANDY & HARMAN	ATTLEBORO	MA	No	1,419	0	665	0	WR	WR+GM	PS
MDD980551600	METALS & RESIDUES PROCESSING CO, INC	COCKEYSVILLE	MD	No	1	0	5	4	WR	WR+GM	Estimated
MED019051069	ENVIRONMENTAL COMPLIANCE CORP	SOUTH PORTLAND	ME	No	2,838	18,103	1,131	0	WR	WR+GM	PS
MID005503263	MODERN HARD CHROME SERVICE CO	WARREN	MI	No	229	0	1,379	1,150	WR	WR+GM	Estimated
MID074259565	DYNECOL, INC.	DETROIT	MI	Yes	39,226	30,122	145,280	75,932	WR	WR+GM	CWT
MID088754668	EDWARDS OIL CO.	DETROIT	MI	Yes	1,076	0	3,152,520	3,151,444	WR	WR+GM	PS
MID092947928	DRUG AND LABORATORY DISPOSAL INC	PLAINWELL	MI	No	7	0	41	34	WR	WR+GM	Estimated
MID098011992	CYANOKEM, INC.	DETROIT	MI	No	3,591	0	21,663	18,072	WR	WR+GM	Estimated
MID980991566	USL CITY ENVIRONMENTAL INC	DETROIT	MI	No	42,148	0	330,000	287,852	WR	WR+GM	PS
MND980996805	ENVIRO CHEM INC	ROGERS	MN	No	49	0	65	16	WR	WR+GM	PS
MND981098478	METRO RECOVERY SYSTEMS	ROSEVILLE	MN	Yes	17,855	0	57,191	39,336	WR	WR+GM	CWT
MOD981123391	HAZ MAT RESPONSE DISPOSAL INC	KANSAS CITY	MO	No	27	0	163	136	WR	WR+GM	Estimated
MOD981505555	HERITAGE ENVIRONMENTAL SVCS LLC	KANSAS CITY	MO	No	235	1,607	11,111	9,269	WR	WR+GM	Estimated
NCD061263315	Ashland Chemical	Charlotte	NC	No				0	Paint	No estimate	No estimate
NCD986215002	All Waste	Charlotte	NC	No				0	Paint	No estimate	No estimate

Exhibit B-2. Commercial Capacity Availability Analysis

EPA ID	Facility Name	City	State	Is Facility Identified in 1991 CWT Survey?	Quantity, Short Tons: Total Received from Offsite	Quantity, Short Tons: Generated Onsite	Quantity, Short Tons: Sum of Max. Op. Capacity	Available Commercial Capacity, Tons	Data Source: Facility ID	Data Source: Throughput Data	Data Source: Capacity Data
NJD002385730	E.I. Dupont DeNemours Co.,Inc.	Deepwater	NJ	Yes	29,323,815		55,000,000	25,676,185	Paint	PS	PS
NVD980895338	21ST CENTURY EMI DBA TRANSPORTER	FERNLEY	NV	No	2,528	0	11,414	8,886	WR	WR+GM	PS
NYD045604964	DUPONT ROCHESTER	ROCHESTER	NY	No	2,177	2,420	2,168	0	WR	WR+GM	PS
NYD049836679	CHEMICAL WASTE MANAGEMENT OF NEW YORK	MODEL CITY	NY	Yes	4,533	127,983	329,259	196,743	WR	WR+GM	PS
NYD080336241	CECOS INTERNATIONAL	NIAGARA FALLS	NY	Yes	21,989	3,871	311,000	285,140	WR	WR+GM	PS
OHD066060669	Chemtron	Avon	OH	No				0	Paint	No estimate	No estimate
OHD987027604	Northeast Chemical	Cleveland	OH	No				0	Paint	No estimate	No estimate
OHD004178612	RESEARCH OIL CO.	CLEVELAND	OH	Yes	31,890	0	200,000	168,110	WR	WR+GM	PS
OHD004274031	CLARK PROCESSING, INC. (PERMA-FIX OF DAYTON)	DAYTON	OH	Yes	1,360	0	641	0	WR	WR+GM	PS
OHD081290611	SAFETY KLEEN (WT)INC	HILLIARD	OH	No	14,500	0	87,472	72,971	WR	WR+GM	Estimated
OKD000402396	PERMA-FIX TREATMENT SVCS INC	TULSA	OK	No	4,642	0	28,002	23,360	WR	WR+GM	Estimated
OKD007233836	CONOCO, INC. PONCA CITY	PONCA CITY	OK	Yes	684	0	2,721,600	2,720,916	WR-CWT	WR+GM	CWT
OKD982293334	ENVIRONMENTAL MGMT	GUTHRIE	OK	No	0	0	0	0	WR	WR+GM	Estimated
ORD009020231	TEKTRONIX, INC.	BEAVERTON	OR	Yes	44	23,416	1,596,143	1,572,683	WR	WR+GM	PS
PAD004835146	MILL SERVICE, INC. YUKON PLT.	YUKON	PA	Yes	13,054	58,018	475,823	404,751	WR-CWT	WR+GM	PS
PAD010154045	ENVIRITE CORP. (PA)	YORK	PA	Yes	24,682	0	62,500	37,818	WR	WR+GM	PS
PAD085690592	WASTE CONVERSION, INC.	HATFIELD	PA	Yes	2,029	460	144,400	141,911	WR	WR+GM	PS
RID095978995	GEIB REFINING CORP	WARWICK	RI	No	24	0	140	116	WR	WR+GM	PS
RID980906986	ETICAM	WARWICK	RI	Yes	202	0	37,903	37,701	WR	WR+GM	PS
SCD982128746	Western Carolina Regional Sewer Authority	Greenville	SC	No				0	Paint	No estimate	No estimate
SCD070371885	PHIBRO-TECH INC	SUMTER	SC	No	24	0	144	121	WR	WR+GM	Estimated
SCD981467616	SAFETY KLEEN ROEBUCK INC	ROEBUCK	SC	No	65	0	391	326	WR	WR+GM	Estimated
TND982141392	Safety Kleen	Chattanooga	TN	No				0	Paint	No estimate	No estimate
TND981922826	SAFETY-KLEEN OF NASHVILLE INC	NASHVILLE	TN	No	14,428	3	87,052	72,621	WR	WR+GM	Estimated
TXD000461533	UNION CARBIDE CORP	TEXAS CITY	TX	No	14	701,415	4,231,257	3,529,829	WR	WR+GM	Estimated
TXD055135388	TREATMENT ONE, DIV. OF SET ENVIRONMENTAL, INC.	HOUSTON	TX	Yes	191	0	7,560	7,369	WR	WR+GM	CWT
TXD073912974	INTERCONTINENTAL TERMINALS CO.	DEER PARK	TX	Yes	4,414	89,787	37,800	0	WR	WR+GM	CWT
TXD077603371	SAFETY-KLEEN SYSTEMS INC	DENTON	TX	No	75	0	454	378	WR	WR+GM	Estimated
TXD097673149	EMPAK, INC. DEER PARK	DEER PARK	TX	Yes	13,409	0	1,196,034	1,182,625	WR	WR+GM	CWT
TXD102599339	ALLWASTE RECOVERY SYSTEMS INC	DALLAS	TX	No	4,400	312	28,423	23,711	WR	WR+GM	Estimated
TXD980626154	DETREX CORP	ARLINGTON	TX	No	103	0	619	516	WR	WR+GM	Estimated
TXD980748461	A subsidiary of Stolt-Nielson S.A.	Houston	TX	No	1,392	5,295	40,338	33,651	WR	WR+GM	Estimated
WAD000812909	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC GEORGE)	SEATTLE	WA	Yes	382	0	1,235	853	WR	WR+GM	PS
WAD009250366	DUNKIN & BUSH INC TOSCO	FERNDALE	WA	No	1,240	0	7,481	6,241	WR	WR+GM	Estimated
WAD009262171	BOEING RENTON	RENTON	WA	No	252	10,783	66,571	55,535	WR	WR+GM	Estimated
WAD009276197	TEXACO REFINING & MARKETING	ANACORTES	WA	No	180	0	1,087	907	WR	WR+GM	Estimated

Exhibit B-2. Commercial Capacity Availability Analysis

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WAD020257945	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC TACOMA)	TACOMA	WA	Yes	149	0	24,700	24,551	WR	WR+GM	PS
WAD041337130	BOEING CO. - AUBURN	AUBURN	WA	Yes	947	310,816	1,405,914	1,094,152	WR	WR+GM	CWT
WAD041585464	BOEING EVERETT	EVERETT	WA	No	899	37,641	232,490	193,949	WR	WR+GM	Estimated
WAD991281767	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC KENT)	KENT	WA	Yes	5,977	0	10,400	4,423	WR	WR+GM	PS
WI0000934174	AURA II INC	MILWAUKEE	WI	No	28	29	347	289	WR	WR+GM	Estimated
WID000808824	HYDRITE CHEMICAL CO	COTTAGE GROVE	WI	No	127	0	769	641	WR	WR+GM	Estimated
WID990829475	WRR ENVIRONMENTAL SERVICES CO INC	EAU CLAIRE	WI	No	2,105	0	12,701	10,595	WR	WR+GM	Estimated
WVD981107600	REGENERATION TECHNOLOGIES INC	MORGANTOWN	WV	No	115	1,934	12,358	10,309	WR	WR+GM	Estimated
TOTAL					30,011,246	1,969,736	78,156,352	46,255,485			

Data sources

Facility identification (all facilities were assumed to be commercial)

WR: Facility identified using WR form of 1997 BRS and not reporting a commercial status code of 1 or 2 in the PS form of the 1995 BRS.
WR-CWT: Facility identified using WR form of 1997 BRS, reporting a commercial status code of 1 or 2 in the PS form of the 1995 BRS, AND identified using results of Office of Water 1991 CWT survey.
Paint: Facility identified using results of Office of Solid Wastes 2000 paint production wastes survey (facility accepted wastes generated by paint manufacturers).

Waste throughput (wastes received from offsite and generated onsite)

WR+GM: Data from the 1997 BRS using the WR and GM forms were used. In the column entitled 'generated onsite,' a zero is shown for some facilities. This indicates that the GM form of the 1997 BRS did not indicate that any generated wastes were managed onsite in the facility's wastewater treatment facility.
PS: Influent quantities identified using the PS form of the 1995 BRS.
CWT: Waste throughput was calculated from the results of the 1991 CWT survey, as presented in Exhibit 2-2 of the Background Document for Land Disposal Restrictions of Wood Preserving Wastes (Final Rule). Throughput was calculated as maximum capacity minus available capacity.
No estimate: No estimate for waste throughput could be found from these sources.

Maximum operational capacity

PS: Maximum operational capacity identified using the PS form of the 1995 BRS.
CWT: Maximum capacity identified from the results of the 1991 CWT survey, as presented in Exhibit 2-2 of the Background Document for Land Disposal Restrictions of Wood Preserving Wastes (Final Rule).
Estimated: Divided the facility's waste throughput by 17 percent (the median utilization rate for facilities with both waste throughput data and maximum operational capacity data) to estimate maximum operational capacity.
No estimate: No estimate for maximum operational capacity could be found from these sources.

Exhibit B-3. Calculation of Capacity Utilization Rate for Commercial Wastewater Treatment Facilities

EPA ID	Facility Name	City	State	Total Short Tons Received from Offsite	Short Tons Generated Onsite	Waste Quantity Source	Sum of Max. Op. Capacity, Tons	Capacity Utilization Rate, %	Commercial Availability Code (1995 PS)	Source of Capacity Data
CAT080013352	Demenno/Kerdoon	Compton	CA	156,572		1995 PS	336,000	47	4	1995 PS
CTD000604488	CECOS TREATMENT CORP.	BRISTOL	CT	4,328	0	1997 WR & GM	260,208	2	4	1995 PS
CTD002593887	BRIDGEPORT UNITED RECYCLING INC	BRIDGEPORT	CT	1,298	0	1997 WR & GM	94,900	1	4	1995 PS
CTD021816889	UNITED OIL RECOVERY, INC.	MERIDEN	CT	12,214	0	1997 WR & GM	1,064,000	1	4	1995 PS
GAD033582461	ALTERNATE ENERGY RESOURCES, INC.	AUGUSTA	GA	2,775	362	1997 WR & GM	32,500	10	4	1995 PS
IAD005289806	JOHN DEERE-COMPONENT WORKS	WATERLOO	IA	355	280	1997 WR & GM	163,341	0	unk	1991 CWT Survey
ILD000672121	Clean Harbors Services, Inc.	Chicago	IL	70,500		1991 CWT Survey	150,000	47	unk	1991 CWT Survey
ILD000666206	ENVIRITE CORP. (IL)	HARVEY	IL	38,531	0	1997 WR & GM	86,600	44	4	1995 PS
ILD005087630	UNITED REFINING & SMELTING CO	FRANKLIN PARK	IL	111	0	1997 WR & GM	332	34	4	1995 PS
ILD010284248	CID LANDFILL	CALUMET CITY	IL	19,072	0	1997 WR & GM	176,000	11	4	1995 PS
ILD085349264	HERITAGE ENVIRONMENTAL SERVICES	LEMONT	IL	6	0	1997 WR & GM	650	1	4	1995 PS
IND093219012	HERITAGE ENVIRONMENTAL SERVICES, INC.	INDIANAPOLIS	IN	70,076	0	1997 WR & GM	201,200	35	4	1995 PS
MAD000650051	WINDFIELD ALLOY INC	LAWRENCE	MA	5	0	1997 WR & GM	54	10	3	1995 PS
MAD046613279	ATTLEBORO REFINING CO -- HANDY & HARMAN	ATTLEBORO	MA	1,419	0	1997 WR & GM	665	213	3	1995 PS
MED019051069	ENVIRONMENTAL COMPLIANCE CORP	SOUTH PORTLAND	ME	2,838	18,103	1997 WR & GM	1,131	1,852	4	1995 PS
MID074259565	DYNECOL, INC.	DETROIT	MI	39,226	30,122	1997 WR & GM	145,280	48	unk	1991 CWT Survey
MID088754668	EDWARDS OIL CO.	DETROIT	MI	1,076	0	1997 WR & GM	3,152,520	0	4	1995 PS
MID980991566	USL CITY ENVIRONMENTAL INC	DETROIT	MI	42,148	0	1997 WR & GM	330,000	13	4	1995 PS
MND980996805	ENVIRO CHEM INC	ROGERS	MN	49	0	1997 WR & GM	65	76	3	1995 PS
MND981098478	METRO RECOVERY SYSTEMS	ROSEVILLE	MN	17,855	0	1997 WR & GM	57,191	31	unk	1991 CWT Survey
NJD002385730	E.I. Dupont DeNemours Co.,Inc.	Deepwater	NJ	29,323,815		1995 PS	55,000,000	53	3	1995 PS
NVD980895338	21ST CENTURY EMI DBA TRANSPORTER	FERNLEY	NV	2,528	0	1997 WR & GM	11,414	22	4	1995 PS
NYD045604964	DUPONT ROCHESTER	ROCHESTER	NY	2,177	2,420	1997 WR & GM	2,168	212	3	1995 PS
NYD049836679	CHEMICAL WASTE MANAGEMENT OF NEW	MODEL CITY	NY	4,533	127,983	1997 WR & GM	329,259	40	4	1995 PS

Exhibit B-3. Calculation of Capacity Utilization Rate for Commercial Wastewater Treatment Facilities

EPA ID	Facility Name	City	State	Total Short Tons Received from Offsite	Short Tons Generated Onsite	Waste Quantity Source	Sum of Max. Op. Capacity, Tons	Capacity Utilization Rate, %	Commercial Availability Code (1995 PS)	Source of Capacity Data
	YORK									
NYD080336241	CECOS INTERNATIONAL	NIAGARA FALLS	NY	21,989	3,871	1997 WR & GM	311,000	8	4	1995 PS
OHD004178612	RESEARCH OIL CO.	CLEVELAND	OH	31,890	0	1997 WR & GM	200,000	16	4	1995 PS
OHD004274031	CLARK PROCESSING, INC. (PERMA-FIX OF DAYTON)	DAYTON	OH	1,360	0	1997 WR & GM	641	212	4	1995 PS
OKD007233836	CONOCO, INC. PONCA CITY	PONCA CITY	OK	684	0	1997 WR & GM	2,721,600	0	1	1991 CWT Survey
ORD009020231	TEKTRONIX, INC.	BEAVERTON	OR	44	23,416	1997 WR & GM	1,596,143	1	3	1995 PS
PAD004835146	MILL SERVICE, INC. YUKON PLT.	YUKON	PA	13,054	58,018	1997 WR & GM	475,823	15	1 and 4	1995 PS
PAD010154045	ENVIRITE CORP. (PA)	YORK	PA	24,682	0	1997 WR & GM	62,500	39	4	1995 PS
PAD085690592	WASTE CONVERSION, INC.	HATFIELD	PA	2,029	460	1997 WR & GM	144,400	2	4	1995 PS
RID095978995	GEIB REFINING CORP	WARWICK	RI	24	0	1997 WR & GM	140	17	4	1995 PS
RID980906986	ETICAM	WARWICK	RI	202	0	1997 WR & GM	37,903	1	4	1995 PS
TXD055135388	TREATMENT ONE, DIV. OF SET ENVIRONMENTAL, INC.	HOUSTON	TX	191	0	1997 WR & GM	7,560	3	unk	1991 CWT Survey
TXD073912974	INTERCONTINENTAL TERMINALS CO.	DEER PARK	TX	4,414	89,787	1997 WR & GM	37,800	249	unk	1991 CWT Survey
TXD097673149	EMPAK, INC. DEER PARK	DEER PARK	TX	13,409	0	1997 WR & GM	1,196,034	1	unk	1991 CWT Survey
WAD000812909	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC GEORGE)	SEATTLE	WA	382	0	1997 WR & GM	1,235	31	unk	1995 PS
WAD020257945	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC TACOMA)	TACOMA	WA	149	0	1997 WR & GM	24,700	1	unk	1995 PS
WAD041337130	BOEING CO. - AUBURN	AUBURN	WA	947	310,816	1997 WR & GM	1,405,914	22	unk	1991 CWT Survey
WAD991281767	CHEMICAL PROCESSORS, INC. (BURLINGTON ENVIRONMENTAL INC KENT)	KENT	WA	5,977	0	1997 WR & GM	10,400	57	unk	1995 PS
TOTAL				29,934,938	665,638		69,829,271	17		

The overall median capacity utilization rate is presented in the row entitled 'Total.'

Appendix C. Additional Research of K178 Incineration Treatment Capacity

This Appendix expands upon the analysis of available incineration capacity presented in Appendix A. Appendix A presents a summary of the estimated maximum practical, utilized, and available capacities for combustion of hazardous wastes. In Appendix C, that analysis is supplanted by providing specific information about facilities that provide incinerator capacity on a commercial basis and includes telephone research, Internet research, and Toxics Release Inventory (TRI) data research. Exhibit C-1 investigates the availability of incinerators for dioxin containing waste based on telephone calls with selected facilities. Exhibit C-2 researches all facilities from Table A-4 of Appendix A that are incinerators and summarizes their current capacity. Using the TRI data, EPA also identified whether these facilities receive waste for incineration commercially. The TRI data were used in two ways to identify facilities that were expected to still be operational: 1) for situations where generating facilities identified off-site facilities that received their waste for incineration in the Form R under Section 6.2; and 2) for facilities identified as Subtitle C treatment, storage, and disposal facilities under SIC code 4953, who are required to file their own Form Rs (assuming that they meet the threshold criteria).

The above information was used to identify facilities which may have closed or opened since 1997, the time frame used for the Appendix A analysis. The analysis showed that capacity is somewhat lower than when the analysis was performed originally in 1997. Incinerator capacity for liquids fell slightly from 275,324 to 265,144 tons/year. Incinerator capacity for solids fell from 628,322 to 460,482 tons/year.

Exhibit C-1. Telephone Logs Researching K178 Incineration Treatment Capacity

Facility/ Organization Name	Contact Name and Phone Number	Conversation Summary
American Wood Preserver's Institute, Fairfax, VA	Scott Raminger 703/204-0500	The American Wood Preserver's Institute was contacted for its expertise in addressing wood preserving issues. Mr. Raminger suggested contacting one of their association's members, Vulcan Chemicals, to gather waste treatment information for dioxin-bearing wastes (e.g., F032).
Vulcan Chemicals, Birmingham, AL	N/A 205/298-3000	Contact stated that the Safety-Kleen Coffeyville, KS incinerator had shut down but knows of capacity available in Canada. Also recommended contacting Safety-Kleen Aragonite, UT and Onyx Port Arthur, TX facilities.
Ensco, El Dorado, AR	Theresa Evans 409/736-2821	Ms. Evans stated the only dioxin-bearing waste that Ensco currently accepts is D037. They have had difficulties obtaining permit modifications when they have wanted to add other dioxin-bearing waste codes to their permit. Ms. Evans referred us to Ms. Jane Galle at Trade Waste Incineration in Sauget, IL.

Exhibit C-1. Telephone Logs Researching K178 Incineration Treatment Capacity		
Facility/ Organization Name	**Contact Name and Phone Number**	**Conversation Summary**
Trade Waste Incineration (TWI) (a division of Onyx Environmental Services), Sauget, IL	Jane Galle 618/271-2804, Ext.106 Wayne Fisher 618/271-2804	Ms. Galle was not able to address the treatment capacity question and suggested contacting Jimmy Campbell at Onyx Corporate Headquarters, who deals with waste acceptance issues. Mr. Campbell doubted that TWI would be able to accept K178 waste. He referred caller to Wayne Fisher who is the incineration manager for both the Sauget and Port Arthur facilities for operating capacities. Mr. Fisher also stated that it is unlikely that the Sauget facility would be able to accept K178. The average annual bulk solids capacity for Sauget is 9,000 tons. Available capacity is 25% or 2,250 tons.
*Onyx Environmental Services, Port Arthur, TX	Jimmy Campbell (Onyx Corporate Headquarters) 404/233-0757 Wayne Fisher 618/271-2804	Specific K178 waste profile information was sent to Mr. Campbell for review. After receiving the waste specifications, Mr. Campbell stated that the Onyx Port Arthur facility (formerly Chemical Waste Management) will be able to treat a portion of the client's waste. He referred caller to Wayne Fisher who is the incineration manager for both the Sauget and Port Arthur facilities for operating capacities. The average annual bulk solids capacity for Port Arthur is 25,000 tons (with the possibility to accept up to 2,500 additional tons). Available capacity is 40% or 10,000 tons.
*Safety Kleen, Deer Park, TX	NA (facility was not directly contacted)	Wayne Fisher (Onyx) stated that this facility has the potential to accept the largest portion of the K178 waste since they deal heavily with bulk solids and have an incineration unit dedicated to bulk solids.

*Safety-Kleen, Aragonite, UT	Steve Simmons/ Cory Cook 801/323-8100
	
	Rick Page, UT DEQ Division of Solid and Hazardous Waste 801/538-6170
		The facility is located in Tooele County, Utah, Exit #56 of Interstate 80 (formally Laidlaw Environmental Services).
		• This facility can accept dioxin-bearing wastes with treatment standards similar to K178 (i.e., F032). In order to receive K178 the facility would need to obtain a permit modification.
		• Facility's incinerator is permitted to receive hazardous waste and can handle liquid wastes, sludges, bulk solids and containerized wastes with both high and low Btu values
		• 140 million Btu slagging rotary kiln with vertical afterburner chamber
		• Overall permitted capacity - 13 tons/hr (= 109,000 tpy, avail: 59,000 tons)
		• Typically processes 50,000 tons/year
		• Bulk solids permitted capacity - 8.1 tons/hr of bulk (= 68,000 tpy)
		• With the hope of increasing its incineration capacity, the facility has just completed a trial burn for which it is awaiting the analytical results.
		• Permitting timeline
		    • Initial trial burn was completed on 3/10/92
		    • Post trial burn period began on 5/12/92 and ended on 12/31/93
		    • Permit was reissued on 5/8/00

Exhibit C-1. Telephone Logs Researching K178 Incineration Treatment Capacity		
Facility/ Organization Name	**Contact Name and Phone Number**	**Conversation Summary**
Safety-Kleen, Clive, UT	N/A 801/323-8426	The facility is located 10 miles from the Safety-Kleen Aragonite facility at Exit #49 on Interstate 80 • Formerly known as Laidlaw Environmental Services, the company merged with Safety-Kleen in May 1998. • Steve Simmons of Safety-Kleen Aragonite stated that the Clive facility has shut down its hazardous waste incinerator but could accommodate the dioxin-bearing waste in its storage facility while awaiting eventual treatment. • All incineration idled in December 1997 with closure of some units beginning in October 1998. • Facility is still permitted for bulk storage aiding the Aragonite facility in storage capacity.
Safety-Kleen, Coffeyville, KS	N/A 316/251-6380	The Coffeyville facility was planning to shut down its hazardous waste incinerator on July 26, 2001 according to a January 26, 2001 Safety-Kleen press release. According to 1999 TRI, Coffeyville sends wastes to S-K Deer Park, TX for incineration. This was confirmed via phone call.
Safety-Kleen, Bridgeport, NJ	N/A 856/467-3100	The Bridgeport facility was to cease all operations on May 8, 2001 according to a January 31, 2001 Safety-Kleen press release. This was confirmed via phone call.
Environmental Technology Council, Washington, DC	Scott Slesinger 202/783-0870, Ext. 13	No information obtained.
Waste Treatment Industries, East Liverpool, OH	Rue Mulholland 877/201-3301	Waste Treatment Industries in East Liverpool does not accept any dioxin-bearing wastes.

* Indicates storage and/or treatment capacity is available at facility for K178.
Additional information, including operating permits, for Utah facilities was available from: http://www.eq.state.ut.us/eqshw/cffs-1.htm
All telephone calls made by Linda Rauscher, SAIC, in April and May 2001 and by Mike Cakouros, SAIC, in August 2001.

Exhibit C-2. Capacity Analysis of Commercial Incineration								
EPA ID	**Facility Name**	**Primary SIC Code**	**Location**	**# of Facilities Sending Waste for Incineration ‡**		**Notes**	**Available Capacity (tons/yr) ****	
				Non-Captive	**Captive**		**Liquids**	**Solids**
ALD031499833	Honeywell Inc. CRS (formerly Allied Signal)	2865	1327 Erie Street Birmingham, AL 35224	4	0	From TRI, no off-site transfers for incineration since 1995. Capacity estimates from Appendix A.	0	88
ARD006354161	Reynolds Metals Co. †	4953	500 Reynolds Rd. Gum Springs, AR	2	2	Arkansas website identified facility is OPEN as of May 2001. Capacity estimates from Appendix A.	0	193,676
ARD069748192	ENSCO Inc. (currently being aquired by Teris LLC) †	4953	309 American Circle Union, El Dorado, AR	347	2	2001 Phone log confirms OPEN. Capacity estimates from Appendix A.	101,148	141,121
ILD098642424	Trade Waste Incineration (a division of Onyx Environmental Services)	4953	7 Mobile Ave. Sauget, Illinois 62201	114	7	2001 Phone log confirms OPEN. Capacity estimates are based on personal communication described in Exhibit C-1.		2,250
KSD981506025	Safety-Kleen (Argonite) †	4953	Hwy. 169 North Coffeyville, KS 67337	5	2	2001 Phone log and S-K press release confirm CLOSED. Capacity estimates reflect this operational status.	0	0
KYD006373922	Atofina Chemicals, Inc. (formerly Elf Atochem) †	2819	2316 Highland Ave. Carrollton, KY 41008	0	0	No information found. Atofina website did not mention incineration capacity. Capacity estimates from Appendix A.	9,901	0
KYD088438817	LWD, Inc. †	4953	2475 Industrial Pkwy. Calvert City, KY 42029	104	3	No information found. Capacity estimates from Appendix A.	28,478	36,531
LAD008161234	Rhodia Eco Services †	2819	1275 Airline Hwy. Baton Rouge, LA 70805	35	1	From RCRIS, 2 incinerators onsite Permit received in February 2000. Capacity estimates from Appendix A.	0	0
LAD010395127	Safety-Kleen (Baton Rouge) †	4953	13351 Scenic Hwy. Baton Rouge, LA 70807	16	1	S-K website does not identify this site as having incineration capability; assumed CLOSED. Capacity estimates reflect this operational status.	0	0
MOD985798164	ICI Explosives USA Inc. †	4953	Highway AA & Newman Rd. Joplin, MO 64802	0	0	State of MO website states that the facility "Incinerates reactive and some non-reactive hazardous wastes." Assumed OPEN. Capacity estimates from Appendix A.	0	6,440

Exhibit C-2. Capacity Analysis of Commercial Incineration								
EPA ID	Facility Name	Primary SIC Code	Location	# of Facilities Sending Waste for Incineration ‡		Notes	Available Capacity (tons/yr) **	
				Non-Captive	Captive		Liquids	Solids
MSD985972074	Hughes Environmental Systems (FTMI)	4953	Hwy 45 South Brookville, MS 39739	0	0	From RCRIS, 1 incinerator onsite. Capacity estimates from Appendix A.	NA	NA
NED981723513	Clean Harbors Environmental Services †	4953	HC 54 Box 2B Kimball, NE 69145	49	3	CHI website identifies facility as open and as having 45,000 tons/yr operating capacity. Capacity estimates from Appendix A.	22,500 ***	22,500 ***
NJD053288239	Safety-Kleen (Bridgeport) †	4953	Rte. 322 & I-295 Bridgeport, NJ 08014	86	4	2001 Phone log and S-K press release confirm CLOSED. Capacity estimates reflect this operational status.	0	0
NYD000632372	Safety-Kleen (BDT), Inc. †	4953	4255 Research Pky. Clarence, NY 14031	2	0	S-K website states that this facility specializes in treatment of lithium batteries, compressed gasses in cylinders, ignitable metals, fuming acids, pyrophoric liquids, OBA canisters and air and water reactives. Therefore, it is assumed that this facility will have no capacity for K178. Capacity estimates from Appendix A.	0	248
OHD048415665	Ross Environmental Services, Inc. †	4953	36790 Giles Rd. Grafton, OH 44044	112	0	Ohio Environmental Service Industries website identifies the site as conducting incineration; assumed OPEN. Capacity estimates from Appendix A.	23,397	10,347
OHD980613541	Von Roll WTI †	4953	1250 St. George St. East Liverpool, OH 43920	154	5	2001 Phone log confirms OPEN. Capacity estimates from Appendix A.	0	0
SCD981467616	Safety-Kleen (Roebuck), Inc.	4953	300-301 Railroad St. Roebuck, SC 29376	1	0	S-K website does not identify this site as having incineration capability; assumed CLOSED. Capacity estimates reflect this operational status.	0	0

Exhibit C-2. Capacity Analysis of Commercial Incineration								
EPA ID	**Facility Name**	**Primary SIC Code**	**Location**	**# of Facilities Sending Waste for Incineration ‡**		**Notes**	**Available Capacity (tons/yr) ****	
				Non-Captive	**Captive**		**Liquids**	**Solids**
TXD000838896	Onyx Environmental Services (formerly Chemical Waste Management) †	4953	Hwy. 73, W. of Taylor Bayou Port Arthur, TX 77643	105	1	2001 phone log confirms OPEN. Capacity estimates are based on personal communication described in Exhibit C-1.		10,000
TXD008099079	Rhodia Eco Services (formerly Rhone Poulenc) †	2819	8615 Manchester Blvd. Houston, TX 77012	37	0	No information found on website. Capacity estimates from Appendix A.	55,880	123
TXD055141378	Safety-Kleen (Deer Park), Inc. †	4953	2027 Battleground Rd. Deer Park, TX 77536	146	13	S-K website identifies as OPEN. Wayne Fisher at Onyx, stated that to the best of his knowledge, Deer Park can handle the largest quantity of bulk solids in the country (one rotary reactor dedicated to bulk solids). Capacity estimates from Appendix A.	131	158
UTD981552177	Safety-Kleen (Aragonite), Inc. * †	4953	11600 N. Aptus Rd., Exit 56 Aragonite, UT 84029	85	8	2001 Phone log confirms OPEN. Capacity estimates are based on personal communication described in Exhibit C-1.	22,000	37,000
UTD982595795	Safety-Kleen (Clive), Inc. †	4953	3 Miles E. 7 Miles N. Exit 41 on I-80 Grantsville, UT 84029	0	0	2001 Phone log confirms incineration has been IDLED, therefore, it is assumed that current capacity is zero. Capacity estimates reflect this operational status.	0	0
WID990829475	WRR Environmental Services Inc. †	4953	5200 State Rd. 93 Washington, WI 54701	97	1	No information on WRR website; State of WI website states that there is currently one commercial HWI in the state. Capacity estimates from Appendix A.	1,709	0
TOTAL							265,144	460,482

* New facility; not in Appendix A, Table A-4

** From Table A-4; for new facilities, data are from phone logs. For closed facilities capacities are shown as zero.

*** Capacity for liquid and solid waste forms assumed to be equal
† Facility reported to TRI in 1999. Note that this indicates that the facility was operating in 1999, but does not indicate facility activities.
‡ Data from 1999 TRI. Numbers note the number of different generators that sent toxic chemicals to the facility for one of the following management methods: M50 Incineration/thermal treatment; M54 Incineration/insignificant fuel value; M56 Energy recovery.
NA= Not available.
CLOSED does not necessarily mean that the entire facility is closed; just that incineration is not being conducted.
Two additional facilities were identified from the 1999 TRI as receiving waste for incineration. These facilities are Rineco (Benton AR) and Clean Harbors Services (Chicago IL). However, further investigation identified that the sites conduct fuel blending, and do not actually conduct incineration. Therefore, they are not presented on this list.

Websites
Onyx Environmental Services: www.onyxes.com
Safety-Kleen: www.safety-kleen.com/how/index_how.htm
Rhodia Eco Services: www.ecoservices.us.rhodia.com
Clean Harbors Inc. (Chicago): www.cleanharbors.com/chtd/Chicago_/chicago_.html
Clean Harbors Inc. (Kimball): www.cleanharbors.com/chtd/Kimball/kimball.html
Von Roll WTI: www.vonrollwti.com
Ohio Environmental Service Industries: www.pirnie.com/bwc/oesi
Autofina: www.atofinachemicals.com
Rineco: www.rineco.com
ENSCO, Inc.: www.enscoinc.com
WRR Environmental Services: www.wrres.com
State of Wisconsin: www.dnr.state.wi.us/org/aw/wm/hazard
State of Missouri: http://www.dnr.state.mo.us/deq/hwp/Enforce.htm#Comfac
State of Utah: www.deq.state.ut.us/eqshw/cffs-1.htm
State of Arkansas: www.adeq.state.ar.us

Appendix D. TRI and BRS Data for Facilities Generating K178 Wastes

Exhibit D-1. Data for DuPont Facility Generating K178 from 1997 BRS					
City	**State**	**EPA ID**	**Generator Status**	**On-Site Waste Mgmt Status Storage**	**On-Site Waste Mgmt Status RCRA T/R/D**
Edgemoor	DE	DED000800284	1 (LQG)	1 (No storage subject to RCRA permitting requirements)	1 (No, the facility did not treat, dispose, or recycle hazardous waste on site in units subject to RCRA permitting requirements during 1997, and had no plans in 1997 to develop an onsite RCRA-permitted treatment, disposal, or recycling system)

Exhibit D-2. Hazardous Wastes Generated by DuPont Edgemoor (DE) From 1997 BRS														
Page #	Waste Form Code	Waste Form Code Description	Waste Origin Code	Origin System Type	On-site Handling	Off-site Handling	Point of Measurement	RCRA-Radioactive Mixed	SIC Code	Source Code	Qty Gen., Short Tons	EPA Hazd Waste Code	Waste Description	Comments
3	B316	Other metal salts/chemicals	1		N	Y	1*	2*	2816	A58	3.203	D002	Waste Corrosive Solid, Acidic, Inorganic, Nos(metal Salts)	
4	B404	Spent carbon	1		N	Y	1*	2*	2816	A78	0.000	D001	Waste Carbon, Activated	
5	B404	Spent carbon	1		N	Y	1*	2*	2816	A99	0.125	D007	Hazardous Waste Solid, Nos(toner), 9,na3077, PgiiiWaste from Site Photocopying Operations	
6	B319	Other waste inorganic solids (Specify in Comments)	2		N	Y	1*	2*	2816	A56	0.003	D009	Waste Mercury from Mercury Thermometers, Mercury from Discarded Process Equipment	
7	B203	Nonhalogenated solvent	1		N	Y	1*	2*	2816	A19	7.179	D039, D008	Waste Petroleum Naptha from Cleaning Parts at Machine Shop	
TOTAL SHORT TONS											10.51			

1 - the hazardous waste was generated onsite from a production process, service activity, or routine cleanup (including off-specification or spent chemicals)
2 - the hazardous waste was the result of a spill cleanup, equipment decommissioning, or other remedial cleanup activity
1* - the hazardous waste was not mixed with any other waste prior to being measured
2* - not mixed with radioactive material

Exhibit D-3. Hazardous Wastes Sent Offsite by DuPont Facility from 1997 BRS						
DuPont Location	**Page #**	**Off-site System Type**	**EPA ID Off-Site Facility**	**Off-site Sequence #**	**Off-Site Avail Code**	**Qty Mged Offsite, Short Tons**
Edgemoor, DE	3	M043	DED003930807	1	2 (the offsite facility is available only to firms owned by the same company)	0.0025
	3	M132	NJD053288239	2	1 (the offsite facility is a commercial treatment, storage, or disposal facility)	3.2
	4	M043	DED003930807	1	2 (the offsite facility is available only to firms owned by the same company)	0.0025
	5	M043	DED003930807	1	2 (the offsite facility is available only to firms owned by the same company)	0.125
	6	M012	DED003930807	1	2 (the offsite facility is available only to firms owned by the same company)	0.0025
	7	M021	PAD000738849	1	1 (the offsite facility is a commercial treatment, storage, or disposal facility)	7.5
TOTAL SHORT TONS (ALL FACILITIES)						**10.8325**

Note: No hazardous wastes are reported to be managed on-site at the Edgemoor Facility.

Exhibit D-4. TRI Data (1998) for DuPont Edgemoor, DE (Metals)

TRI Data Element	Compounds							
	Barium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc
Chemical Storage, pounds								
Max Chemical Onsite	1,000-9,999	10,000-99,999	100-999	100-999	1,000-9,999	100,000-999,999	1,000-9,999	1,000-9,999
Chemical Releases, pounds								
Fugitive Air	NA	NA	NA	NA	NA	NA	NA	NA
Stack Air	NA	NA	NA	NA	NA	NA	NA	NA
Water	547	56	44	264	37	29,095	129	441
Underground injection (Class I well)	No data	No data	No data	No data	No data	No data	No data	No data
Underground injection (Class II-V well)	No data	No data	No data	No data	No data	No data	No data	No data
Onsite Subtitle C Landfill	NA	NA	NA	NA	NA	NA	NA	NA
Other Onsite Landfill	NA	NA	NA	NA	NA	NA	NA	NA
Onsite Land treatment	NA	NA	NA	NA	NA	NA	NA	NA
Onsite Surface Impoundment	NA	NA	NA	NA	NA	NA	NA	NA
Other Onsite Disposal	NA	NA	NA	NA	NA	NA	NA	NA
Release to POTWs	No data	No data	No data	No data	No data	No data	No data	No data
Offsite transfers	52,161	227,694	13,040	8,352	90,550	3,106,245	26,901	35,751
Offsite location	DuPont Cherry Island Landfill, Wilmington DE, for 'Other Offsite Management'							
Source Reduction and Recycling, pounds								
Quanty released, prior year	56,523	245,153	14,068	9,170	97,504	3,363,617	29,047	38,785
Qauntity released, current year	52,708	227,750	13,084	8,616	90,587	3,135,340	27,030	36,192
Qauntity released, following year	43,576	187,471	10,785	7,186	74,572	2,590,907	22,294	29,945
Qauntity released, second following year	40,526	174,348	10,030	6,683	69,352	2,409,544	20,734	27,849
Quanty treated onsite, prior year	NA	NA	NA	NA	NA	NA	NA	NA
Quanty treated onsite, current year	NA	NA	NA	NA	NA	NA	NA	NA
Quanty treated onsite, following year	NA	NA	NA	NA	NA	NA	NA	NA
Quanty treated onsite, second following year	NA	NA	NA	NA	NA	NA	NA	NA
One-time event release	0	0	0	0	0	0	0	0
Production ratio	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Source reduction activities	NA	NA	NA	NA	NA	NA	NA	NA

Exhibit D-5. TRI Data (1998) for DuPont Edgemoor, DE (Non-Metals)						
TRI Data Element	**Phosgene**	**Toluene**	**Carbonyl sulfide**	**Titanium tetrachloride**	**Hydrochloric acid aerosols**	**Chlorine**
Chemical Storage, pounds						
Max Chemical Onsite	0-99	100,000-999,999	0-99	1,000,000-9,999,999	0-99	1,000,000-9,999,999
Chemical Releases, pounds						
Fugitive Air	NA	1,300	NA	30	3	58
Stack Air	800	81	290,000	0	10,400	2,400
Water	NA	NA	NA	NA	NA	NA
Underground injection (Class I well)	No data	No data	No data	No data	No data	No data
Underground injection (Class II-V well)	No data	No data	No data	No data	No data	No data
Onsite Subtitle C Landfill	NA	NA	NA	NA	NA	NA
Other Onsite Landfill	NA	NA	NA	NA	NA	NA
Onsite Land treatment	NA	NA	NA	NA	NA	NA
Onsite Surface Impoundment	NA	NA	NA	NA	NA	NA
Other Onsite Disposal	NA	NA	NA	NA	NA	NA
Release to POTWs	No data	No data	No data	No data	No data	No data
Offsite transfers	No data	1,200	No data	No data	No data	No data
Offsite location	No data	DuPont Newcastle DE; for incineration/thermal treatment	No data	No data	No data	No data
Source Reduction and Recycling, pounds						
Quanty released, prior year	700	1,381	220,000	80	10,693	3,844
Qauntity released, current year	800	1,381	290,000	30	10,403	2,458
Qauntity released, following year	672	1,326	220,000	83	10,080	3,700
Qauntity released, second following year	672	1,326	210,000	81	10,080	3,700
Quanty treated onsite, prior year	40,000	0	0	2,100,000	25,000,000	4,200,000
Quanty treated onsite, current year	40,000	0	0	2,000,000	25,000,000	4,100,000
Quanty treated onsite, following year	40,000	0	0	2,000,000	24,000,000	4,000,000
Quanty treated onsite, second following year	40,000	0	0	2,000,000	23,000,000	4,000,000
One-time event release	0	1,200	0	0	0	0
Production ratio	0.99	0.99	0.99	0.99	0.99	0.99
Source reduction activities	NA	NA	Participative team mgmt	NA	Participative team mgmt	NA

Appendix E. Research on the Management of Contaminated Waste Piles

This appendix provides the results of researching how facilities are regulated when they are found to have waste piles or similar units with hazardous constituents or hazardous wastes. Primarily the examples are meant to show if waste piles can be left in place if properly capped and monitored. Two types of examples are shown: sites under corrective action and sites remediated under Superfund (Records of Decision). Three examples of sites under corrective action were identified through telephone contacts, with additional information from fact sheets obtained with employees from the state. Four Records of Decision are also shown. The Records of Decision (RODs) shown typically indicate that some level of excavation was performed prior to the final cap of the unit. Whether some excavation occurs or not at the sites that are storing K177 and K178 will depend on the level of risk posed by the current piles. It is possible that excavation will not be required. The final decision will rest with the implementing authority.

Telephone Log

Date: August 28, 2001

Gary Dry, Remediation Division, Corrective Action Section, Texas Natural Resource Conservation Commission, 512-239-6080

Recorded by: Jeff Kohn, SAIC

Subject: Identification of generator closures that involve decisions to leave a waste pile in place.

Mr. Dry provided a verbal example of a waste pile that was closed in place. In Southern Texas, in the Big Bend region, there was a silver mine that is currently inactive (due to low silver prices). The mine has a tailings pile that is approximately 500,000 cubic yards. The pile has a host of heavy metals, including antimony oxide. The pile also has runoff that is affecting local waters.

The State of Texas required the facility to cap their waste (performed sometime in 1996 or 1997), and they are now required to perform some minor post-closure care. To maintain the cap, the facility is required to perform on-going erosion control and annual inspections of the cap. No groundwater monitoring is required and no cleanup of the surrounding local waters is required either.

Telephone Log

Date: August 28, 2001

Jim Moore, Illinois EPA Land Permits Division, (217) 524-3295

Recorded by: Jeff Kohn, SAIC

Subject: Identification of generator closures that involve decisions to leave a waste pile in place.

Mr. Moore provided two examples of units that closed in place in Illinois. One is a waste pile that was used as a CAMU and closed as a landfill. The other is a surface impoundment that received a delay in closure interpretation, and is now closing. More detailed descriptions of both facilities are provided below. The Laclede Steel Company description is from a fact sheet that Mr. Moore faxed to SAIC. The Shell Oil, Wood River description is derived from a telephone conversation with Mr. Moore. Excerpts of fact sheets for each site are included in this appendix.

Laclede Steel Company
RCRA ID #: ILD006280606

Laclede Steel Company (Laclede) operated under interim status since 1986. It is now under corrective action order. Ultimately, the steel mill will close after remediation and cleanup. During its operation, Laclede produced a variety of steel products from recycled scrap steel, including bars, strip, pipe, and rods. During the production process, scrap steel is melted in electric arc furnaces, and is then processed into the various steel products. In order to reduce air emissions, dust leaving the furnaces was captured in baghouses. The dust is a K061 listed hazardous waste.

There are three hazardous waste management units (HWMUs) that manage the EAF dust at the facility: 1) a consolidated waste pile, 2) a rod patenting building, and 3) a pelletizer area. Under the closure permit, Laclede will be required to close the rod patenting building and the pelletizer area by removing all hazardous waste, including contaminated soil) and placing all waste on the waste pile. The waste pile has been given a corrective action management unit (CAMU) designation, so the wastes do not require treatment prior to redisposal in the waste pile unit. The waste pile will also receive wastes from three other solid waste management unit (SWMUs) at the site to the extent that the wastes are compatible with the EAF dusts in the waste pile.

When remediation of the rod patenting building, the pelletizer area, and the SWMUs is complete, Laclede will close the waste pile CAMU by placement of a clay cover as a cap. The post-closure care period will be at least thirty years. The post-closure permit requires continued groundwater monitoring for establised monitoring wells. In addition, inspections during the post-closure period must identify any maintenance needed, including, 1) the final cover system and vegetation of the closed disposal area and 2) monitoring wells.

Mr. Moore noted that there have been 3 or 4 CAMUs instituted in Illinois (remedial action permit (RAP) allows CAMU without subjecting the rest of the facility to corrective action).

Shell Oil, Wood River

The Shell Oil, Wood River plant (now Equilon Enterprises) was in operation prior to RCRA in 1980. When the RCRA regulations were promulgated, the facility surface impoundments became subject to regulation because they were handling listed hazardous wastes (K051, K048, and K049, among others). The site also handled nonhazardous wastes, such as lime sludges and DAF waste biosolids. The two waste streams were commingled prior to management in the impoundment.

One of the site's impoundments is a 20 acre unit. In November 1988, the site discontinued management of hazardous waste in the unit, but continued to manage non-hazardous wastes, specifically the lime sludges from the water softening process. These events were precipitated by RCRA and Illinois' adoption of RCRA rules. In 1980, RCRA came into existence, and the facility was forced to get a Subtitle C RCRA permit. Since the minimum technological requirements were not in effect until 1984, it appears that the facility did not need to retrofit or change the unit in any significant way. In 1984, HSWA was established, and the facility chose not to retrofit the unit with MTRs. Thus, in 1988, the unit was closed for hazardous waste purposes. However, the state allowed the facility to engage in delay-of-closure to continue disposal of the nonhazardous lime sludges. The facility has started the closure process (sometime around 1998), and is currently stabilizing the upper portion of the sludge to allow for a multi-layer final cover system. The final cap must be maintained for at least 30 years and groundwater monitoring must be maintained for 30 years.

Eight other facilities were closed as landfills in Illinois since 1980. A post-closure permit is always required.

EXCERPTS OF FACT SHEET FOR
DRAFT RCRA POST CLOSURE PERMIT
LACLEDE STEEL COMPANY, ALTON, ILLINOIS
ILD006280606
STATE ID #1190100004
POST CLOSURE PERMIT LOG N0. B-160

This Fact Sheet has been prepared pursuant to the requirements of Title 35 Illinois Administrative Code (35 IAC) Section 705.143. The fact sheet is intended to be a brief summary of the principal facts and significant factual, legal, methodological, and policy questions considered in preparing a draft RCRA Post-Closure permit. This permit requires Laclede Steel Company to close three hazardous waste management units (HWMUs), provide corrective action for several solid waste management units, and provide at least 30 years post-closure care (including groundwater monitoring) for one of the HWMUs, a hazardous waste landfill unit. Pursuant to 35 IAC 705.143(a), this Fact Sheet is sent to the applicant and to any other person who requests it.

I. INTRODUCTION

The draft permit for Laclede Steel Company contains all of the standard conditions required by 35 IAC Parts 702, 703 and 724 and the applicable conditions of 35 IAC Part 724 for closure and post-closure care of hazardous waste landfill units (this includes among other things, monitoring the groundwater). Laclede Steel Company is an existing facility that has been operating under RCRA interim status since February 13, 1986.

II. DESCRIPTION OF FACILITY

A. General

Laclede Steel Company (Laclede) produces a variety of steel products from recycled scrap steel; including bars, strip, pipe, and rods. During the production process, scrap steel is melted in electric arc furnaces, and is then processed into the various steel products. In order to reduce air emissions, dust leaving the furnaces is captured in baghouses. This electric arc furnace dust (EAF dust) is a listed hazardous waste bearing the waste code of K061.

There are currently three HWMUs that manage the EAF dust at the Laclede facility. These units are identified by Laclede as (1) Consolidated Waste Pile, (2) Rod Patenting Building, and (3) Pelletizer Area. Under the conditions of this permit, Laclede will be required to close the Rod Patenting Building and the Pelletizer Area by removing all hazardous waste (including contaminated soil) and placing all waste on the Consolidated Waste Pile. Laclede will also be investigating and remediating contamination at various Solid Waste Management Units

(SWMUs) at the facility. Some waste from those SWMUs (if similar in nature to the EAF dust) will also be deposited on the Consolidated Waste Pile. When these activities are complete, the Consolidated Waste Pile will be closed by placing a clay cover (three foot minimum depth) over the pile. These remedial activities will be carried out in accordance with the requirements of 35 IAC 724.652, Subpart S. Under the RCRA hazardous waste regulations, when a waste pile is closed in place, it is considered to be a landfill for purposes of determining Post-Closure requirements.

The purpose of this RCRA post-closure permit is to ensure that the consolidated Disposal Area receives post-closure care for at least thirty (30) years. At a minimum, groundwater monitoring must continue through the post-closure care period for established monitoring wells. Inspections during this post-closure period must identify any maintenance needed, including, but not limited to 1) the final cover system and vegetation of the closed Disposal Area and 2) monitoring wells. Any necessary maintenance identified during the inspections must be performed in a timely manner. A written record of the post-closure inspections and maintenance activities performed must be kept at the facility.

B. Site Location

Laclede Steel company is located at 5 Cut Street on the south side of Alton, Illinois.

III. HAZARDOUS WASTE MANAGEMENT ACTIVITIES

A. Closure

The portion of the permit dealing with closure is separated into two Sections as follows.

1. Consolidated Waste Pile Corrective Action Management Unit

For the purposes of implementing remedies under corrective action, the Agency has designated the consolidated waste pile as a Corrective Action Management Unit. The Consolidated Waste Pile Corrective Action Management Unit (CWP CAMU) is dealt with in Section I.A. It covers approximately six acres and consists of a waste pile containing electric arc furnace dust. Additional waste from the Rod Patenting Building, the Pelletizer Area, and certain on-site Soild Waste Management Units (SWMUS) that contain waste similar in composition to the electric arc furnace dust will be deposited onto the CWP CAMU. When remediation of the Rod Patenting Building, the-Pelletizer Area, and the SWMUs is complete, Laclede will close the CWP CAMU by placement of a clay cover over the waste pile.

2. RCRA Closure

In conjunction with prior agreements between the Agency and Laclede Steel, RCRA closure at two hazardous waste management units, 1) the Rod Patenting Building and 2) the Pelletizer Area has been delayed in order that wastes similar to the waste in CDF may be placed in the CDF.

B. Corrective Action

This portion of the permit is concerned with corrective action at SWMUs identified by the Agency and the facility which the Agency feels may require additional work to meet a RCRA Closure equivalency.

C. Post-Closure Care

The following hazardous waste management units shall be provided with post-closure care as required by Section III of this permit:

Type of Waste Unit	Unit Name	Capacity (yd^3)	Wastes Contained
Landfill	CWP CAMU	76,000	K061 - Electric Arc Furnace Dust

Post-closure permit conditions deal with monitoring, maintaining, and recordkeeping of the hazardous waste management unit(s) described above in accordance with the provisions of the post-closure care plan. Section III contains conditions specific to post-closure care and implement the regulatory requirements of 35 IAC Part 724, Subpart G.

EXCERPTS OF REVIEW NOTES
EQUILON, ROXANA, IL

1.0 INTRODUCTION

Site: Equilon Enterprises
[formerly Shell Oil Company Wood River Manufacturing Complex (WRMC)]
Roxana, Madison County
State ID#1191150002
Federal ID#ILD080012305
Log No. C-426-M-3

Contact:		
Contact:	Eric Petersen	Scott M. Luettich, P.E.
	Equilon Enterprises, LLC	GeoSyntec Consultants
	900 South Central Avenue	1100 Lake Hearn Drive, NE, Suite 200
	Roxana, IL 62084	Atlanta, GA 30342-1523
	618/255-3190	404/705-9500
	Fax: 618/255-2690	Fax:404/705-9400

Project: RCRA Closure of a Surface Impoundment referred to as "Site 15 Solid Waste Disposal Basin (SWDB)"

Document: A document entitled:

Basis for Design Report
Final Closure
Site 15 Solid Waste Disposal Basin
Roxana, Illinois

This document was submitted by Mr. J. N. Brewster of Equilon Enterprises, LLC, on November 30,1998 and was received at the Agency on December 3, 1998.

2.0 BACKGROUND

2.1 Site Description

Wood River Refining Company (WRRC) is a division of Equilon Enterprises LLC. The WRRC facility, formerly owed by Shell Oil Company, is located at 900 South Central Avenue in Roxana, Illinois. The facility location is shown on Figure 1 [Note: this Capacity Background Document does not include the figures referenced]. The WRRC is a 2020 acre facility which covers portions of Sections 33, 34, 35 and 36 in T5N, R9W, Third Principal Meridian, and Sections 2 and 3 in T4N, R9W, Third Principal Meridian, in Madison County, Illinois. The

WRRC is a petroleum refinery complex which produces principally propane, motor gasolines, aviation fuels, diesel oils, heating oils, lubricating oils, heavy fuel oil and asphalt. Several hazardous and non-hazardous wastes are generated during the course of the various refining processes carried out at this facility.

A RCRA Permit (Log No. B-43) was issued to the facility on September 1989 to maintain and operate a waste management facility involved *in the* storage of hazardous waste. A portion of the RCRA permit also deals with the groundwater monitoring for the Site 15 Solid Waste Disposal Basin (SWDB) that was once operated at the facility.

2.2 Site 15 Description

Site 15 SWDB is an approximately 20-acre surface impoundment located on the eastern side of the WRRC North Property. Figure 2 shows that the SWDB is located just east of a tank storage field, and is approximately 0.75 miles northeast of the main refinery processing area.

Site 15 SWDB is a rectangular-shaped area that contains sludge wastes from refinery operations and is surrounded by approximately 30-ft high perimeter berms constructed with approximately 2 horizontal to 1 vertical (2H:1V) sideslopes. The sludge enters Site 15 SWDB through a discharge pipe located at the northwest end of the site. The approximate dimensions of the SWDB are 1200 ft in the north-south direction by 750 ft in the east-west direction as measured from crest of berm to crest of berm. A topographic map showing the current Site 15 SWDB configuration and existing surface features is provided on Figure 3.

2.3 Site 15 Operational History .

The Site 15 SWDB was constructed in two phases. The first phase was completed in 1973 with the construction of the north, east and south berms along the current alignment shown on Figure 3. The berms were built to a crest elevation of approximately 443 ft msl which is about 20 ft higher than the surrounding ground surface. When constructed in 1973, the north and south berms were built to join with the existing west berm that formed the eastern containment berm of what is now a closed fly ash and sludge pond (see Figure 3). The second phase of Site 15 SWDB was completed in fall of 1986 with a 10 ft vertical increase of the north, east and south berms to a crest elevation of approximately 453 ft msl.

Disposal in Site 15 SWDB began in August 1973 shortly after the completion of the first phase construction. From approximately 1973 through November 1988, the waste stream into the SWDB consisted of the following:

API separator sludge (K051); dissolved air floatation (DAF) solids (K048); slop oil emulsion solids (K049); lime sludges; and DAF waste biosolids.

The hazardous and non-hazardous sludges combined into a common pipeline that discharged into Site 15. Thus, between 1973 and November 1988, the hazardous and non-hazardous sludges were discharged in a mixed form into Site 15 SWDB. In November 1988, hazardous waste disposal into Site 15 SWDB was discontinued, and since then only non-hazardous lime sludge has been deposited in the SWDB.

The non-hazardous wastes discharged into Site 15 SWDB consist of lime sludges from the water softening process. The lime softening process is used to soften raw water used for non-contact cooling water and boiler feed water. This occurs by reacting slaked lime in cold and hot lime treaters. The hot lime process is used to treat boiler feed water and the cold lime process is used to soften cooling water. In September 1990, disposal of cold lime sludge into Site 15 was discontinued; disposal of hot lime continues to date.

2.4 Project Background Information

- On September 29, 1972, Shell Oil Company (i.e., WRRC) was issued Permit #1972-EB-1241 by the Illinois EPA to install, own and operate a settling pond (Site 15 SWDB) for the disposal of lime slurry from the treatment of boiler feedwater, cooling water, and separator box solids.

- In November 1980, Shell submitted a RCRA Part A permit application to the USEPA for Site 15 SWDB as well as other units at the WRRC facility.

- In September 1984, Shell submitted a revised Part A RCRA Permit Application to USEPA, to increase the height of the perimeter berms around Site 15 SWDB, thereby increasing the capacity from 112 million gallons to 175 mullion gallons.

- The increase was approved by USEPA on September 17, 1985, and the vertical expansion was completed in 1986.

- On December 30, 1988, Illinois EPA granted approval of an interim status closure plan for Site 15 SWDB (with conditions and modifications) under the provisions of 35 Ill. Adm. Code Part 725.

- Shell and Illinois EPA met and discussed these items, and in October 1989, Shell submitted final responses in the form of a Basis for Design Closure Plan.

- On September 29,1989, Illinois EPA issued a RCRA permit to the facility. The effective date of this permit was November 3, 1989.

- The design approach proposed in the 1989 Basis for Design Closure Plan included vacuum-consolidation to increase the strength of the sludge within the basin, followed by placement of a final cover over the sludge.

- On December 29,1989, Illinois EPA issued conditional approval of the 1989 closure plan.

- However, based on anticipated difficulties in construction and uncertain performance of the design approach, WRRC submitted a letter to Illinois EPA on July 23, 1998 formally requesting that the 1989 closure plan be replaced with this new submittal.

- This 1998 Basis for Design (BFD) Report presents an alternative approach for final closure of Site 15 SWDB. The proposed 1998 design calls for solidification of the upper portions of the sludge, followed by placement of a multi-layer final cover system over the SWDB.

3.4 Section 4--Closure Plan

This section presents the technical (engineering design), construction, and financial aspects of the proposed "solidification/consolidation" approach for final closure of Site 15 SWDB.

3.4.1 Summary of Final Closure Plan and Permit Drawings

3.4.1.1 Final Closure and Cover System

- The proposed final closure of Site 15 SWDB involves solidifying the upper portion (approximately half the existing thickness) of sludge. This will be accomplished by blending in reagents such as cement, cement kiln dust (CKD), hydrated lime, and/or flyash using in-situ or ex-situ mixing methods. After curing, the solidified material will be graded (shaped) into a mounded configuration that will support a multi-layered final cover system. The proposed final cover system components, as shown on Figure 10, are (from bottom to top):

  - 1 ft (min) thick layer of fine-grained compacted soil barrier layer having hydraulic conductivity no greater than 1 x 10^{-5} cm/sec;

  - 40-mil thick polyethylene geomembrane;

  - geocomposite (i.e., geonet with overlying geotextile filter) drainage layer;

  - 1.5 ft (min) thick layer of protective cover soil; and

  - 0.5 ft (min) thick layer of vegetated topsoil.

- Unsolidified sludge remaining in the lower portions of the basin will be allowed to consolidate under the weight of the solidified material until static conditions are achieved. This will result in controlled settlement of the final cover system. The mounded configuration was developed such that the final cover system will accommodate the calculated settlements without experiencing grade-reversal, depressions, or excessive tensile strain.

Record of Decision (ROD) Abstract

ROD Number: EPA/ROD/R02-93/201
ROD Date: 09/27/93

Site: **REYNOLDS METALS CO** ***EPA ID Number:*** **NYD002245967**

Location: **MASSENA, NY** ***Operable Unit:*** **01**

Abstract:

The 1,600-acre Reynolds Metals site is an active aluminum production plant located in Massena, St. Lawrence County, New York. Land use in the area is predominantly residential and industrial. The site is bordered to the north by the Grasse and St. Lawrence Rivers, to the east by the New York Central Railroad, to the west by Haverstock Road, and to the south by the Raquette River. The St. Regis Mohawk Indian Reservation, with approximately 3,500 residents, is located 0.5 miles from the site. In 1985, the Reynolds Metals Company (RMC) plant was constructed for the production of aluminum from alumina. The main components of the plant include the reduction plant and supporting structures and facilities (approximately 20.5 acres), the solid waste landfill (11.5 acres), and the Black Mud Pond (approximately 6 acres). The contamination detected in the waste, ground water, leachate, and surface water is characterized by elevated concentrations of cyanides (up to 300 ppm), fluorides (up to 8,500 ppm), sulfates (up to 13,000 ppm), aluminum (up to 87,000 ppm), and polyaromatic hydrocarbons (PAHs) (up to 2,200 ppm). PCBs also are detected in both areas at concentrations as high as 690 ppm. Ground water from these areas drains to wetlands RR-6, south of the landfill area. A leachate collection system on the landfill intercepts some, but not all, of the contaminated ground water from the landfill to the wetlands. Remediation of this wetland is being overseen by the State. As a result of production activities and years of continuous operations and expansion, various types of industrial and hazardous waste were generated, disposed of, and spread throughout the facility. RMC also discharged contaminants into the St. Lawrence River through four outfalls, known as Outfalls 001, 002, 003, and 004; three of which are still in use. In 1987, the State required RMC to investigate the contamination at the facility not including the river system surrounding the facility. In 1989, RMC completed an initial study of sediment contamination in the St. Lawrence River adjacent to its plant. This ROD provides a first and final remedy for the site and addresses the principal threat posed by contaminated sediment, as OU1. The primary contaminants of concern affecting the sediment are organics, including PAHs and PCBs; and metals, including lead. SELECTED REMEDIAL ACTION: The selected remedial action for this site includes dredging and/or excavating 51,500 yd[3] of contaminated sediment with PCBs greater than 1 mg/kg, PAHs greater than 10 mg/kg, and TDBF greater than 1 mg/kg; treating approximately 14,500 yd[3] of the sediment, with PCB levels greaterthan 25 mg/kg, using thermal desorption controlling the emissions for the thermal desorption system using venturi scrubbers; transporting condensed

contaminants recovered during thermal desorption offsite for incineration; treating water removed from the sediment onsite using flocculation and activated carbon adsorption, with discharge of all water removed from the sediment or generated during the treatment process onsite to the St. Lawrence River; pretreating dredged sediment to remove water; disposing of the untreated sediment and treated residuals onsite in the Black Mud Pond; and capping the Black Mud Pond area. The estimated present worth cost for this remedial action is $35,100,000, which includes an estimated annual O&M cost of $250,000 for 30 years. PERFORMANCE STANDARDS OR GOALS: Chemical-specific sediment cleanup goals are risk-based and include Aroclor 1016 1 mg/kg; Aroclor 1221 1 mg/kg; Aroclor 1248 1 mg/kg; Aroclor 1254 1 mg/kg; Aroclor 1260 1 mg/kg; and dibenzofurans 1 ug/kg. INSTITUTIONAL CONTROLS: Not provided.

Remedy:

This action or "operable unit" is the first and only operable unit planned by the U. S. Environmental Protection Agency for the Reynolds Metals Company Site Study Area and addresses the principal threat posed by contaminated sediments in this Area by utilizing a mixed treatment/containment remedy for these contaminated sediments. The major components of the selected remedy include the following: Dredging and/or excavation of approximately 51,500 cubic yards of sediments with polychlorinated biphenyl (PCB) concentrations above 1 part per million (ppm), total polyaromatic hydrocarbon (PAH) concentrations above 10 ppm, and total dibenzofuran (TDBF) concentrations above 1 part per billion (ppb) from contaminated areas in the St. Lawrence River and from the associated riverbank; ùù Treatment of approximately 14,500 cubic yards of dredged/excavated material with PCB concentrations above 25 ppm by thermal desorption. Untreated sediments (with PCB concentrations between 1 ppm and 25 ppm) and treatment residuals (which are expected to be non-hazardous and to have PCB concentrations below 10 ppm) will be disposed on-site, in the Black Mud Pond, and covered. The Black Mud Pond will be capped in conformance with the requirements of the January 22, 1992 New York State Record of Decision for the state lead Reynolds Metals Site, which encompasses the entire Reynolds facility. Contaminants condensed in the thermal desorption process will be transported off-site and burned at a commercial incinerator.

Record of Decision (ROD) Abstract

ROD Number: EPA/ROD/R05-90/129
ROD Date: 09/20/90

Site: **OCONOMOWOC ELECTROPLATING CO INC** ***EPA ID Number:*** **WID006100275**

Location: **ASHIPPUN, WI** ***Operable Unit:*** **01**

Abstract:
the 10.5-acre Oconomowoc electroplating site encompasses a 5-acre active electroplating facility and 5 acres of adjacent wetlands in Dodge County, Ashippun, Wisconsin. The Oconomowoc electroplating company's (OEC) facility includes a main building that houses process lines, a wastewater treatment building, two formerly used wastewater treatment lagoons, and various storage tank and container deposit areas. Recreational facilities, and residences and business that use groundwater for their drinking water supply, are in proximity to the OEC facility. In addition, davy creek, a small creek and warm water sport fishery, flows through the wetlands 500 feet south of the site. Electroplating, finishing, and degreasing processes performed since 1957 at the OEC facility produce a multi-source effluent stream contaminated with heavy metals and vocs. The effluent, as well as accidental spills and leaks around the property, have resulted in widespread site contamination. Prior to 1972, untreated wastewaters were discharged directly into the davy creek wetlands, and even after the construction of two treatment lagoons, untreated wastes and sludges overflowed the lagoons and continued to accumulate in the wetlands. Lagoon sludge removal was initiated by OEC in 1979 but was never completed, and therefore, discharge of contaminants, including RCRA-listed hazardous waste (F006), continued into the wetlands. An estimated 10,000 square yards of wetlands are contaminated with metals and cyanide. Hazardous waste was also found in between the walls and floor of the wastewater treatment building (where it was placed as a sealant), leaking from waste containers, and spilled in a north parking lot area. Due to its complexity, the site has been divided into four operable units for remediation; the surface water, sludge and contaminated soil associated with the two lagoons (OU one); all other contaminated soil around the OEC facility not associated with the lagoons or found beneath the manufacturing building, including a fill area, a lowlands area, the drainage ditches and the parking lot area (OU two); the associated contaminated groundwater (OU three); and the highly contaminated sediments in the davy creek wetlands area (OU four). All remedial actions for the operable units are final except for operable unit four, which is an interim action. Futher wetland investigation will delineate the final removal area. In addition, if, after further investigation, the building foundation and underlying soil will need remediating, an appropriate remedial action will be developed to accompany the wetland remedial action. The primary contaminants of concern affecting the soil, sediment, debris, sludge, groundwater and surface water are vocs including tce, toulene, and xylene; and metals including chromium and lead. The selected remedial action for this site includes clean closing the lagoon by excavating 650 cubic yards of lagoon sludge and surrounding soil, followed by stabilization and offsite disposal of the material and pumping 72,000 gallons of contaminated lagoon water (which will be hauled offsite and treated) (OU one); excavating 700 cubic yards of soil and debris with offsite treatment and disposal (OU two); onsite groundwater pumping and treatment using filtration, ion exchange, air

stripping, and carbon adsorption, followed by onsite discharge to surface water (a treatability study will be conducted to determine the effectiveness of the ion exchange and to determine the disposition of the resin) (OU three); excavating 6,000 cubic yards of contaminated sediments from davy creek and adjacent wetlands to a depth of two feet, followed by offsite stabilization, treatment, and disposal of the contaminated sediments and monitoring of the area; and performing additional bioassay and risk assessment work to determine final exposure levels (OU four). The estimated present worth cost for this remedial action is $7,576,196, which includes an annual o&m cost of $90,569. The present worth costs associated with each of the four operable units are $490,302 (OU one); $258,667 (OU two); $1,831,805 (OU three), which includes an annual o&m cost of $90,569; and $4,995,422 (OU four). Performance standards or goals; the lagoon soil excavation levels for the OEC site OU one will attain background levels consistent with state and federal (RCRA) clean closure levels; excavation of OU two soil will attain a 10-6 cumulative carcinogenic risk and a cumulative hi less than 1 for noncarcinogens. Groundwater treatment (OU three) will attain federal and state groundwater cleanup standards and are based on state preventative action limits (PALS). Chemical-specific groundwater goals includes chromium 5.0 ug/l (PAL); and tce 0.18 (PAL). Cleanup levels for Davy Creek and adjacent wetlands have not been determined.

Remedy:

This rod addresses four operable units, or discrete actions at the site. The selected remedies are final remedies for the first three operable units, and will address the principal threats at the site-the groundwater contaminant plume and its source (i.e., contaminated soils and sludge lagoons). The selected remedy for the fourth operable unit is an interim remedy and will address contamination in Davy Creek and the wetlands. The selected remedy consists of the following components;

* Clean close the RCRA Subtitle C lagoons by excavation of approximately 650 cubic yards of lagoon sludge and surrounding soils to be treated and disposed of at an off-site RCRA Subtitle C facility. Treatment of 72,000 gallons of contaminated lagoon water at a groundwater treatment system installed on site;

* Excavation of approximately 700 cubic yards of contaminated soil and debris at the site. The contaminated soil will be treated and disposed of at an off site RCRA Subtitle C disposal facility;

* Extraction of the groundwater contaminant plume to state groundwater quality standards with subsequent treatment. The treated water shall be discharged into the adjacent Davy Creek in compliance with the substantive requirements of the Wisconsin Pollutant Discharge Elimination System (WPDES);

* excavation of approximately 6,000 cubic yards of contaminated wetland and davy creek sediment to be treated and disposed of at a RCRA Subtitle C disposal facility. Additional monitoring of Davy Creek and the wetland will be performed after the remediation to determine the effectiveness of the remedy.

Record of Decision (ROD) Abstract

ROD Number: EPA/ROD/R04-86/008
ROD Date: 03/12/86

Site: **PEPPER STEEL & ALLOYS, INC.** ***EPA ID Number:*** **FLD032544587**

Location: **MEDLEY, FL** ***Operable Unit:*** **01**

Abstract:
The Pepper's Steel and Alloys site occupies 30 acres known as tracts 44, 45, and 46 in the town of Medley, Florida. Medley is located in Northern Dade County, approximately 10 miles northwest of Miami and 13 miles inland from the Atlantic ocean. Additionally, the pepper's steel site is located in the "unsewered industrial area" and near three other superfund sites referenced in the Biscayne Aquifer rod. Since the mid-1960s the Pepper's Steel site has been the location of several businesses, many of which are still operating onsite. Operations have included the manufacture of batteries, pre-cast concrete products and fiberglass boats, as well as the repair and service of trucks and heavy equipment. Also, sandblasting and painting services, a concrete batching plant and an automobile scrap operation have been or are located on the site. Various trash and waste products from these activities, including parts of rusted machinery, vehicles, aircraft, oil tanks, transformers, underground storage tanks and batteries have been deposited at the site. The contaminants that have been identified within the soil, sediments, and ground water in and around the site include PCBs, organic compounds and heavy metals such as; lead, arsenic, cadmium, chromium, copper, manganese, mercury, zinc, and antimony. The selected remedial action for this site includes; collection and offsite disposal of all free oil according to TSCA regulations; excavation of soils exceeding 1 ppm PCB, 1,000 ppm lead, and 5 ppm arsenic; solidification/stabilization of these soils with a cement-type mixture and placement onsite; institutional controls to ensure future land uses compatible with the remedy; and ground water monitoring to ensure the effectiveness of the remedy. Total capital cost for the selected remedial alternative is estimated to be $5,212,000 with o&m costs approximately $42,500 per year.

Remedy:
The selected alternative for the Pepper's Steel and Alloys, Inc. site includes:

- Collection of all free oil and disposal offsite according to tsca regulations;
- Excavation of soils exceeding 1 ppm PCB, 1,000 ppm lead and 5 ppm arsenic;
- Solidification/stabilization of these soils with a cement-type mixture and placement on site;
- Institutional controls to ensure future land uses compatible with the remedy;
- Monitoring of the effectiveness of the remedy. The solidification/stabilization agent has undergone a development and testing program and a mixture exhibiting satisfactory performance has been determined.

Record of Decision (ROD) Abstract

ROD Number: EPA/ROD/R05-86/036
ROD Date: 09/26/86

***Site:* ARCANUM IRON & METAL** ***EPA ID Number:* OHD017506171**

***Location:* ARCANUM, OH** ***Operable Unit:* 01**

Abstract:

The Arcanum Iron and Metal (AIM) site is a 4.5 acre site located in Twin Township, Darke County, OH just southeast of the city of Arcanum and 25 miles northwest of Dayton. The AIM site operated as a lead battery reprocessing facility from the early 1960s until 1982. During this operation, battery casings were split to extract lead cores for smelting. Battery acids generated from this operation were dumped in a large steel trough and allowed to drain to a low area. Reprocessing of the plastic and black rubber battery casings generated lead oxide sludge and lead particulates which collected on the ground surface and surface ponds onsite. Past practices at the facility included burial of some materials in onsite pits. Results of the surface soil and soil boring samples taken during the RI indicate that lead is the primary contaminant of concern with antimony and arsenic leading the contaminants of secondary concern. Lead was detected in onsite and offsite monitoring wells but not in the six offsite residential wells sampled. Lead contamination was also found in onsite and offsite surface water and sediments and three onsite buildings. In addition, an estimated 3,800 cubic yards of shredded battery casings exist onsite. The cost effective remedy selected includes; removal of onsite contaminated soils to 500 ppm lead and disposal in offsite RCRA Subtitle C landfill; removal of offsite soils to background lead concentrations and disposal of soils above 500 ppm in offsite RCRA Subtitle C landfill and soils between background and 500 ppm onsite; continued ground water monitoring semi-annually; improvement of site drainage; removal of battery casings, conduction of treatability studies, and placement in RCRA Subtitle C landfill; cleaning or demolishing contaminated onsite facilities; and deed restrictions on site land use and aquifer use in the affected areas. Total capital cost of the selected alternative is estimated to be $9,929,000 with annual O&M costs approximately $37,000.

Remedy:

- Remove onsite contaminated soils to 500 ppm lead. Dispose of soils offsite in RCRA Subtitle C landfill.
- Remove offsite soils to background lead concentrations. Dispose of soils above 500 ppm in RCRA Subtitle C landfill. Soils between background and 500 ppm placed onsite.
- Continue monitoring the groundwater semi-annually.
- Improve site drainage.
- Remove remaining battery casings and place in a RCRA Subtitle C landfill.
- Demolish or clean contaminated facilities onsite.
- Deed restrictions on the site land use and aquifer use in the affected areas.

Appendix F. Response to Capacity-Related Public Comments to Proposed Rule

ICMP-00007 (CPMA), 7-3: With respect to the economic impact of the proposal to list manganese as a universal treatment constituent for characteristic wastes, the time allowed for comment on this Proposed Rule would not allow our members to complete such an analysis. It is clear however, that EPA has not even started to make a rational analysis of the impact of this proposal. EPA states that:

> "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 other metals that may be present in the wastes. The volumes of wastes for which additional treatment is needed solely due to the addition of manganese to the F039 and UTS lists are therefore expected to be very small." 65 Fed. Reg. 55771/3

This statement can only lead the reader to conclude that EPA has not investigated likely consequences of this proposal on business. Indeed, EPA has no actual knowledge of the waste quantities or treatment requirements impacted as a result of the Proposed Rule.

Response 7-3: EPA is deferring final action on all elements of the proposal that are specifically related to the waste constituent manganese. Although EPA continues to believe that manganese poses significant issues that ultimately should be resolved, the court ordered schedule under which EPA is operating provides the Agency with no flexibility to take additional time to explore these topics more fully. As a result, EPA anticipates no economic or treatment capacity impacts to characteristically hazardous wastes subject to UTS. However, the cement stabilization or other primary treatment method for K178 should immobilize most of the manganese in the ferric chloride solids.

ICMP-00022 (DuPont), 22-9e: EPA believes there is adequate combustion capacity for the proposed inorganic wastes. This assumption is based on volumes of potential wastes that are not in line with actual generated volumes.

Under Section N, "Proposed Treatment Standards Under RCRA's Land Disposal Restrictions", 65 FR 55771, EPA proposes not to grant a capacity variance for nonwastewater forms of K178. This determination is based on 300,000 tons of available commercial combustion capacity for sludge and solids versus the calculated need for 7,300 tons of needed capacity (65 FR 55770) for this proposed new waste.

DuPont has shown in previous comments that the amount of waste potentially needing treatment by this rule could be as high as 167,000 tons because of the overreaching manner in which the proposed rule has been written. DuPont believes that based on potential volumes needing treatment versus available capacity that it will not be feasible to incinerate these proposed wastes.

It is DuPont's understanding that the only incinerator in the United States that will have permitted capacity for dioxin containing wastes is the Aragonite facility in Utah (permitting in progress). The maximum permitted capacity for bulk solids at this facility will be 16,200 pounds per hour (8 tons per hour). If the facility incinerated 8 tons an hour, 24 hours a day, 365 days a year, it could consume 70,000 tons per year. Thus there is not sufficient capacity in the United States to incinerate all of the waste DuPont would generate under this proposed rule.

Response 22-9e: Since the finalized listing definition is narrower in scope than what was proposed, only one facility (rather than three) are expected to generate the waste, and the one facility will reduce the amount generated per year to approximately 50 tons per year (identified in a subsequent submission to EPA from the same commenter).[39] The commenter has also indicated that there is approximately 500,000 tons of waste in storage at the facility (Comment No. 22-7d-5-1). EPA is considering these wastes a one-time quantity that will not affect the annual generation rate of K178.

EPA notes that DuPont's revised estimated volume of waste requiring incineration is still well below the estimated 1,000,000 tons of available commercial combustion capacity for sludge and solids (See Section 2.1 of the Capacity Background Document for this rulemaking). EPA disagrees with DuPont's claim that K178 can only be managed at one incinerator, with available commercial treatment capacity of only 70,000 tons. EPA notes that the land disposal restrictions for K178 are identical to those finalized for F032 (wood preserving wastes, 62 FR 26000, May 12, 1997) and K174 (chlorinated aliphatics wastes, 65 FR 67110, November 8, 2000). These treatment standards (as well as the treatment standards proposed for K178) can be met by the technology-specific standard of CMBST, defined as '(1) combustion units operating under 40 CFR 266, (2) combustion units permitted under 40 CFR part 264, subpart O, or (3) combustion units operating under 40 CFR 265, subpart O, which have obtained a determination of equivalent treatment under 268.42(b). Additionally, EPA verified through telephone conversations that several facilities can, in fact, accept wastes with such a treatment standard (this information is presented in the Capacity Background Document).

For the wastes already present and being stored onsite, EPA believes that it is unlikely that the entire quantity will require offsite treatment capacity after the effective date. For example, the facility could work with the State Implementing Agency to close the unit in place without actively managing the units. Even if the entire 500,000 ton quantity becomes subject to the K178 listing after the effective date, we expect that commercial facilities could store this quantity of material and subsequently manage it using treatment such as combustion or non-combustion technologies over a period of several years should the demand for such capacity arise. In addition, because this is a non-HSWA rule and will take effect only after authorized states adopt parallel listings under state law and EPA authorizes revisions to the codified state programs, there will be additional time (beyond six months) for the facility to identify and implement

[39]The generation figure is based on a May 4, 2001 letter (Greg Martin (Dupont to Lillian Bagus and Stephen Hoffman (US EPA))

management options for the stored K178 waste. We anticipate that commercially available combustion capacity is adequate to meet the demands. For more information on the Agency's research on combustion capacity for K178, please refer to the Capacity Background Document.

ICMP-00022 (DuPont), 22-9f: DuPont believes a capacity variance will be essential if the proposed rule is promulgated as written.

The Agency has proposed that the land disposal restriction treatment standards for the affected wastes covered under the rulemaking would become effective when the listing determinations become effective per 3004(h)(1) presuming that there is sufficient protective treatment capacity for the waste available. The nature of this waste and the likely resistance of available incineration capacity to accept this waste for combustion lead DuPont to the conclusion that a capacity variance will be necessary if the listing is finalized as proposed and if the land disposal restriction treatment standard remains based on combustion.

Other incineration and disposal permitting issues for mining wastes, as were recently raised in FMC's Case-By-Case extension to Land Disposal Restrictions (65 FR 12233, March 8, 2000), will also make it difficult to impossible to comply with the proposed treatment standards.

DuPont believes a capacity variance will be essential if the proposed rule is promulgated as written.

Response 22-9f: For the reasons described in its response to Comment 22-9e, EPA is not granting a national capacity variance for K178. EPA does not agree that insufficient treatment capacity exists, and the commenter has not presented information supporting its claim that commercial facilities would resist accepting this waste for combustion. EPA also disagrees that the issues identified in the proposal to extend the LDR effective date for FMC are necessarily relevant in this case. In the FMC proposal, EPA identified that the presence of elemental phosphorous, the potential for generating phosphine gas, the presence of Naturally Occurring Radioactive Material (NORM), and the volume of wastes to be managed resulted in FMC's finding that no commercial facilities would accept these wastes for treatment (65 FR 12239, March 8, 2000). In contrast, neither EPA nor the commenter has identified such concerns with regard to K178.

ICMP-00025 (Steel Trade Associations), 25-2: EPA Has Failed To Consider The Impact Of The Manganese Proposals On Other Industries

The proposed actions involving manganese will have significant impacts on industries other than inorganic chemical manufacturing, including the iron and steel industry. Indeed, the proposals, if finalized, would require a number of characteristic hazardous wastes generated by the steel industry that contain manganese to be treated to meet the UTS for manganese as an underlying hazardous constituent ("UHC") prior to being land disposed. *See* 40 C.F.R. § 268.48. Similarly, the manganese UTS would have broad implications for RCRA corrective actions undertaken at steel facilities involving solid wastes that contain manganese. The proposal also would impose significant additional costs for treating, storing, and disposing of a variety of steel industry characteristic hazardous wastes under 40 C.F.R. § 261.24.

Despite these and other such impacts, EPA has failed to consider the economic impact of the proposals on industries other than inorganic chemical manufacturing, including the steel industry. EPA also has failed to determine whether and to what extent manganese will be present as a UHC in other wastes, or to assess the treatment capacity for handling the additional volume of wastes from all industries that would require treatment to meet the manganese UTS. These failures reflect EPA's incomplete consideration of the proposed manganese actions and render the Agency's actions arbitrary and capricious.

Response 25-2: EPA is deferring action on the proposed addition of manganese to the table of Universal Treatment Standards at 40 CFR 268.48. As a result EPA anticipates no economic or treatment capacity impacts to characteristically hazardous wastes subject to UTS. EPA notes that preliminary analyses for estimating impacts to the proposed addition of manganese as a UHC were available in the docket for the proposed rule. These analyses were presented in EPA's *Background Document for Capacity Analysis for Land Disposal Restrictions: Inorganic Chemical Production Wastes (Proposed Rule)*, August 2000.