NATIONAL CAPACITY ASSESSMENT REPORT:
Capacity Planning Pursuant to CERCLA Section 104(c)(9)

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Executive Summary

Section 104(c)(9) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires States to assure that adequate capacity exists to treat and dispose of hazardous wastes generated in the States for 20 years before EPA can provide any Superfund remedial action in the State. Under a program the Agency has implemented to help States fulfill this statutory mandate, States submitted Capacity Assurance Plans (CAPs) to the Agency as the basis of their assurance. The first CAPs were submitted to the Agency in 1989. Through these CAPs, each State had to demonstrate that it had sufficient in-state capacity or agreements with other States to assure capacity for 20 years. Because of concerns raised by the States over the 1989 CAP process, the Agency worked closely with the States to develop a CAP process focusing on national capacity. On May 1, 1994, the States submitted CAPs to the Agency pursuant to the May 1993 *Guidance for Capacity Assurance Planning*, OSWER Directive 9010.02. This Report describes the outcome of the CAP process pursuant to the Guidance.

Based on the information contained in the CAPs submitted May 1, 1994, along with other information that was available to EPA, the Agency has determined as documented in this report that there exists adequate national capacity in all CAP management categories through the year 2013. This Report assesses the data used during this analysis and presents the resolutions to a number of methodological issues raised in conducting this assessment.

The States' CAP submissions contained data demonstrating knowledge of their existing hazardous waste management systems and projecting through 2013 the demand for commercial management and the commercial management capacity for treating these hazardous wastes. Data was presented for the years 1991, 1993, 1999, and 2013 in 14 different waste management categories and focused primarily on wastes regulated under Subtitle C of RCRA. The Agency reviewed the State-submitted data for consistency and accuracy. EPA then calculated the total national maximum demand on commercial Subtitle C management by aggregating the States' projected demand and commercial capacity for the year 2013.

While the Agency's analysis has shown that there is adequate national capacity through 2013, States, market areas and/or regional groupings of States should continue hazardous waste planning activities. Further planning activities will add to States' knowledge of their hazardous waste management systems, help them implement waste minimization programs, and encourage companies to replace inefficient treatment technologies with safer and more innovative technologies. Moreover, the national hazardous waste management system is dynamic, as shown by the ongoing consolidation and restructuring of the hazardous waste treatment industry. Thus, there is no guarantee that the current projected surpluses of hazardous waste treatment and disposal capacity will continue to exist. Because of this, the Agency will continue to periodically assess the national capacity situation against the “baseline” assessment presented in this report. Accordingly, although the Agency believes the information presented in this Report accurately indicates the presence of significant future treatment and disposal capacity, the Agency will continue to collect and evaluate additional data, if necessary, to ensure that the requirements of CERCLA 104(c)(9) are satisfied. Specifically, EPA will continue to evaluate the effects of final rulemakings on the Subtitle C capacity situation using information in this report as a baseline analysis. EPA currently does not anticipate a need for a large-scale data collection from the states, and will only request additional capacity information from the States if the Agency’s analyses find it necessary. Any additional data collection effort will be performed only after close consultation with the

States.

The Agency provided a draft of this Report to the States and the public for comment on the data and the procedures used to conduct the baseline national assessment. Based on the comments received on the draft Report, the Agency has finalized its assessment.

Introduction

Section 104(c)(9) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Superfund law, requires States to assure that adequate capacity exists to treat and dispose of hazardous wastes generated in states for 20 years before EPA can provide any Superfund remedial action in the States. Under a program that EPA has implemented to help States fulfill this statutory mandate, States submitted Capacity Assurance Plans (CAPs) as the basis of their assurance. EPA then conducted an assessment of data from these plans to analyze the future availability of treatment and disposal capacity nationally through 2013. The statute specifies that adequate capacity must be within a State or outside a State in accordance with an interstate agreement or regional agreement or authority. In evaluating capacity nationwide, the Agency assumes private agreements for the interstate treatment or disposal of hazardous waste have been or will be executed if adequate capacity otherwise exists.

The Agency's baseline national assessment indicates that there exists adequate national capacity through 2013. This assessment is based on the data submitted by the States in their CAPs as well as other information that was available to EPA. In the case of States that did not submit a CAP, EPA used other data submitted by these States.

This Report describes: (1) the Agency's assessment that adequate national capacity exists, (2) the Agency's methodology used to conduct this assessment, and (3) the data used to conduct this assessment. The assessment was finalized with help from comments and new data that was used to supplement the Agency's draft assessment.

CERCLA 104(c)(9) requires that before Superfund remedial action is provided, the State in which the release occurs must first enter into a contract or cooperative agreement providing assurances of the availability of adequate hazardous waste treatment or disposal capacity. Because the hazardous waste universe is dynamic, before contracts or cooperative agreements are signed with States, the Agency will utilize the baseline national assessment detailed in this Report, together with additional more recent data on generation and management trends, as appropriate, to ensure that the requirements of CERCLA 104(c)(9) are satisfied.

Background

The Agency's current policy and process for implementing the CERCLA 104(c)(9) capacity assurance requirement is presented in the *Guidance for Capacity Assurance Planning* document dated May 1993, hereafter referred to as the Guidance. The Guidance describes a three-phased approach for States to assure the future availability of hazardous waste treatment and disposal capacity. The three-phased approach involves assessing capacity on a national level (Phase 1); addressing any projected shortfalls by States that have a demand exceeding their supply of capacity in a shortfall management

category through waste minimization and continued development of both capacity that is permitted but not constructed and capacity with draft permits (Phase 2); and reevaluation of projected national capacity and addressing remaining national shortfalls with further state planning and waste minimization activities (Phase 3). This Report describes only the Phase 1 activities conducted to evaluate national capacity availability. Based on this final assessment, the Agency has determined that States do not need to submit Phase 2 or Phase 3 CAPs.

Overview of State Phase 1 Activities

States prepared Phase 1 CAP submissions that were due to the Agency on May 1, 1994. The submissions consisted primarily of six data tables titled:

Table 1. 1991 Hazardous Waste Generated and Managed On Site;

Table 2. 1991 Management of Hazardous Waste in Captive Systems;

Table 3. 1991 Management of Hazardous Waste in Commercial Systems;

Table 4. Maximum Operational In-state Commercial Subtitle C Management Capacity;

Table 5. Demand for Commercial Hazardous Waste Management Capacity from Recurrent Waste Expected to be Generated in State; and

Table 6. Expected Maximum in-state Commercial Subtitle C Management Capacity.

States' Phase 1 CAP submissions, including these data tables, are available in EPA's RCRA Docket (Docket number F-92-CAGA-FFFFF). The first four tables demonstrate States' knowledge of their existing hazardous waste management systems; the last two tables show projected future demand for commercial management and projected commercial management capacity quantities for hazardous waste, respectively. The data provided by the States in the projection tables (i.e., Table 5 and Table 6), along with additional information on non-hazardous and Small Quantity Generator waste generation, were used by the Agency as the basis for its determination that adequate national capacity exists for the treatment and disposal of hazardous waste pursuant to Section 104(c)(9) through the year 2013. The CAP submissions focused primarily on wastes regulated under Subtitle C of RCRA. The Agency, when assessing capacity, also accounted for the impact of Subtitle D wastes on Subtitle C management capacity.

Some States chose to submit their CAP data collectively so as to be considered a single entity for the purposes of the Phase 1 national assessment. The collective submittals demonstrated these States' commitment to proactive dialogue for addressing regional waste management needs and provided an opportunity for these States to not have to submit a Phase 2 CAP. This opportunity would occur if EPA's national assessment identified projected national shortfalls, but the States submitting collectively had no projected shortfalls themselves, as demonstrated by combining their data.

The Agency provided States wishing to submit Phase 1 collectively the option to have the Agency present their individual data in aggregate form in this Report. The Agency received two collective submittals: one from the Western Regional Agreement, which consists of all the States in EPA Regions 8,

9, and 10, as well as Kansas, Nebraska, and Guam, and the other from the States of EPA Region 6. Only the States in the Western Regional Agreement asked that their data be presented in an aggregate form. In this Report, data from participants in the Western Regional Agreement are presented as the "Western States."

Data Development

Most States used the Biennial Reporting System (BRS) and the methodology in the Guidance to develop their data. Biennial Reports are completed by hazardous waste generators and treatment, storage, and disposal facilities every two years. The types of information requested in the Biennial Report on hazardous waste include the quantity, nature, disposition, and the efforts taken to reduce the volume and toxicity of hazardous waste. Some States used BRS-equivalent data sources to prepare their CAPs.

EPA provided States with instructions on how to use BRS data to produce CAP tables in the Agency's *Using Table Talk to Prepare CAP Tables Instructions Manual* (This document is available for review in the RCRA Docket). Following is a summary of the methodology used by most States to develop their CAP data.

Baseyear Data

The first step in developing data for the CAP submissions was to generate "baseyear" demand and capacity data. The year 1991 is the "baseyear" for most States because it is the most recent year for which States had a complete BRS database. States used the 1991 BRS data to estimate the demand for Subtitle C management capacity for on-site, captive, and commercial systems and the available quantities of commercial Subtitle C management capacity for the 14 CAP management categories. States that had 1992 data available chose to use that data instead, thereby avoiding some of the baseline data adjustments described in the following paragraph.

Baseline Data

After obtaining baseyear data, States had to adjust their demand and capacity data to change it from raw data direct from the BRS to data usable for making CAP projections. This adjusted set of data is referred to as baseline data and was used as the starting point for projecting future hazardous waste generation and management. Developing baseline demand data required adjusting the baseyear data, such as allocating the responsibility for assuring the adequacy of landfill capacity for certain treatment residuals (e.g., incinerator ash and stabilized residues) to those States where the waste was originally generated. Baseline capacity data does not differ from baseyear capacity data. It includes the capacity from operational units, including boilers and industrial furnaces (BIFs) burning hazardous waste, which came under RCRA regulation during 1991 and are currently operating under interim status.

1993 Projection Data

After developing their baseline data, States developed data for the first projection year, 1993.

States made projections only for recurrent wastes; States were not responsible for projecting one-time waste demand. Because of the substantial burden developing the one-time waste projections would have placed on the States, the Agency agreed to develop these projections. The document *One-time Waste Estimates for Capacity Assurance Planning* (available in the RCRA Docket) describes the methodologies used and provides the projections that were developed.

To move from baseline to the 1993 projection year, States adjusted both their baseline demand and commercial capacity data. The 1993 data is the baseline data adjusted to account for:

- The shift in the management of wastes from land disposal and land farming to alternate management practices due to the Land Disposal Restrictions requirements that became effective in 1992 and consequently are not reflected in the 1991 baseyear data;
- Shifts in management caused by the expiration of the F037 and F038 national capacity variances;
- The ultimate management of in-state wastes initially shipped to transfer/storage facilities;
- The closure of facilities and/or the declassification of hazardous wastes;
- The changes in capacity caused by commercial management facilities opening or closing between 1991 (or 1992, for those States using 1992 data) and 1993; and
- The decreases in in-state landfill capacity to reflect the depletion of landfill capacity over time.

1999 Projection Data

As requested in the Guidance, States also developed recurrent waste projections for 1999. The Agency, in conjunction with a National Governors' Association workgroup, determined that 1999 is the furthest year for which reasonably accurate projections from 1993 could be made. Generally, based on Agency recommendations, States reported in their CAPs that demand and commercial capacity remained constant between 1993 and 1999. Changes in demand and capacity between these years are due to plant closures, the opening of new facilities, and shifts in the kind of management certain wastes receive. As with the 1993 data, States accounted for the depletion of landfill capacity between 1993 and 1999 and the impact of closures of treatment and/or disposal units. States also included as capacity in the 1999 projection year other commercial units that are permitted, constructed, and operating partially, as well as capacity from unopened cells in permitted landfills.

2013 Projection Data

The States' 2013 projections were made consistent with the requirements of

CERCLA 104(c)(9) for a 20-year assurance, and were used by the Agency to conduct its national assessment. As recommended for the 2013 projection year, States held their demand constant from the 1999 levels. States also held their maximum available commercial Subtitle C capacity constant from 1999, again except for commercial landfill capacity, which was depleted over the projection period, or where it was known that a commercial facility will close.

Other Information in the Phase 1 CAP Submittals

Along with the data tables, most States also included in their Phase 1 submittals a narrative description of their current and planned waste minimization programs, written descriptions of changes in their State hazardous waste management systems since their last CAP submissions (in 1992), information regarding collective State planning efforts, and a list of commercial facilities in their State. Some States submitted a discussion of the public participation efforts they undertook to inform citizens about the State's hazardous waste planning activities.

The 1994 CAPs and the 1991 BRS National Report

Although most States used the 1991 BRS data to prepare their 1994 CAPs, there will be differences between the data in the *1991 BRS National Report* and the data contained in this Report. The *1991 BRS National Report* data and the CAP data are not directly comparable for the following reasons:

- The *1991 BRS National Report* identifies quantities of RCRA waste generated based upon the RCRA permit status of the unit managing a hazardous waste and therefore excludes from any national analysis RCRA wastes reported as managed in systems exempt from RCRA permitting requirements. The CAP identifies the potential demand for RCRA Subtitle C capacity and therefore, may include RCRA wastes that were shipped off-site to be managed in systems exempt from RCRA permitting requirements.

- The BRS identifies quantities of hazardous wastewaters generated, which includes direct discharges to POTWs and direct discharges to surface waters under NPDES. These quantities are excluded from the CAP demand estimates because they are managed in RCRA-exempt units.

- For their CAPs, States allocated "other" and "unknown" categories of BRS data to the appropriate management categories using their best judgement or other data sources.

- Some States used information in their own State data systems (usually containing information derived from manifests), not BRS data, to prepare their CAPs.

- The 1991 BRS Report includes data that are excluded from the CAPs, such as mixed radioactive and hazardous waste.

- CAP data contain the capacity from some RCRA-exempt commercial recyclers that the BRS data may not capture.

Overview of EPA Phase 1 Activities

EPA's primary role in Phase 1 was to ensure consistency among State data so that a national aggregation would be meaningful, and to identify problems with the Phase 1 submittals. EPA compiled the data submitted by the States, along with other available information, to assess the total national maximum demand on commercial Subtitle C management by CAP Management Category for all projection years by:

(1) Aggregating State projected demand for management of recurrent waste at commercial management systems;

(2) Reducing this sum by 10 percent[1] in the year 2013 to recognize ongoing waste minimization efforts; and

(3) Adding to this aggregation estimates of demand on commercial hazardous waste management capacity from one-time waste generation.

Once the national aggregate demand was calculated, the Agency assessed the maximum operational commercial capacity available nationwide by aggregating each State's Agency-adjusted maximum capacity projected for all projection years by CAP Management Category. The Agency then compared national demand to national supply to assess the availability of future management capacity for hazardous wastes.

Methodology Issues

Upon reviewing the data submitted by the States, the Agency identified some issues it needed to address before it could complete the assessment of national capacity. The following discussion describes the issues and their resolution. Most of the resolutions err on the side of overestimating demand and underestimating capacity. All adjustments to State data are described in Appendix C.

[1] This figure was obtained after consultation with the States as a conservative estimate of the effects of existing waste minimization activities on the generation of recurrent wastes.

Theoretical versus Practical Capacity

The Agency found that some capacity information reported from the BRS Process System forms was not useful for CAP purposes because the reported capacity was actually the maximum theoretical design capacity of the facility, not the practical operating capacity. To evaluate capacity for the facilities where this happened, the Agency calculated a practical operating capacity reflecting real-time operational limitations, which include such considerations as down-time, permit restrictions, and the optimization of operation for profit.

A confounding variable to the problem of excessive reported capacity is the conversion of capacity estimates into consistent units of measurement. Theoretical management system design capacity estimates are often measured in units such as British Thermal Units (BTU) per hour for incinerators and cubic yards for landfills. Since tonnage was the measurement unit requested for all CAP information, many facility capacities had to be converted to tons. This was done by making assumptions about operating conditions and average waste characteristics. For example, when an incinerator designed on a BTU per hour basis is converted to tons per year, assumptions about average waste heating value and density need to be made. Often the assumptions developed assumed ideal, not real-time operation.

To resolve the issue of theoretical versus practical capacity, the Agency compared the State-reported capacities to other data sources (e.g., the Hazardous Waste Treatment Council Industry Survey and the *EI Digest* -- see References section). The Agency assigned practical capacity amounts to the facilities whose capacities differed most substantially from the data sources available to the Agency. These facilities are noted in Appendix C.

CAP Management Categories

The CAP Management Categories "Incineration - Sludges/Solids" and "Energy Recovery - Sludges/Solids" were developed assuming they would capture capacity only for nonpumpable wastes (i.e., wastes that could not be injection-fed into a combustion unit); however, some liquid injection incinerators reported in the BRS capacity for these categories as well as for "Incineration - Liquids and Gases and "Energy Recovery - Liquids". As the Agency discovered, this double-counting primarily occurred due to the wide interpretations of the term "sludge." To address this issue, the Agency developed pumpable and nonpumpable categories and included in these categories the appropriate system types.

The Agency also found that the BRS system codes for management by "Incineration" and "Energy Recovery" were reported inconsistently by generators and combustion facilities when they described how wastes were being managed. To address this issue for purposes of the capacity assessment, the Agency combined the categories into the two combustion management categories - Combustion - pumpable and Combustion - nonpumpable.

Effects of Regulatory Changes on Capacity

The CAP methodology only incorporates EPA regulations finalized by 1992. In order to conduct a broader capacity assessment, the Agency reviewed the major EPA regulatory developments since 1992 that may effect capacity. This review indicates that the proposed Hazardous Waste Identification Rulemaking (HWIR) and the Land Disposal Restrictions (LDR) rulemakings might have the most impact

on Subtitle C waste management.

HWIR is an ongoing Agency effort which, if finalized, may modify the definition of hazardous waste. HWIR may decrease the demand from one-time and recurrent wastes on commercial Subtitle C capacity. HWIR probably will encompass two proposals. "HWIR-waste" could modify certain regulations regulating "listed" hazardous waste. Certain current regulations, including the "mixture" and "derived-from" rules, apply to listed wastes regardless of the concentration and the mobility of toxicants in the wastes, thereby regulating certain low risk waste - in particular, treatment residuals. The modifications may establish exemption standards for these low risk wastes. Additionally, the exempted wastes may no longer be subject to some of the hazardous waste management requirements. "HWIR-media" may modify the regulations for media contaminated with hazardous wastes (analogous to one-time wastes). This modification may allow media contaminated with hazardous wastes that have low concentrations of hazardous constituents to be regulated under rules less stringent than Subtitle C.

Land Disposal Restrictions (LDR) regulations set treatment standards for the disposal of hazardous wastes. EPA has developed six major LDR rulemakings to date. Most recently, the Agency's LDR Phase II rule (59 FR 47982) set treatment standards for wastes that have been identified as characteristically hazardous due to the presence of 25 organic constituents identified in the recent toxicity characteristic (TC) rule, coke and coke by-product wastes, cholorotoluene wastes and soil contaminated with the above listed wastes. Since the majority of these wastes contain organic constituents, the combustion technologies are most likely to be affected by this new rulemaking (see discussion later in this Report for our assessment.)

Demand from Wastes Generated by Small Quantity Generators

States were not asked to account for the demand from small quantity generators (SQGs) in their CAPs because SQGs are not required by federal law to complete a Biennial Report form. Although most States cannot gather SQG information from their State BRS data bases, EPA was able to obtain estimates of the demand on commercial management from SQGs using the BRS National Oversight Database[2]. EPA identified the generators of waste that was received by commercial hazardous waste management facilities in 1991 by examining the commercial waste management facilities' Biennial Report Waste Received (WR) forms. The Agency deleted from this list the generators who reported on the Biennial Report Information and Certification (IC) forms that they were large quantity generators or did not generate hazardous waste in 1991. The Agency then used information from commercial facilities who reported receiving waste from the remaining list of generators (i.e., the potential SQGs) to determine how SQG wastes were managed. This analysis showed that SQG wastes comprise only about one percent of all hazardous wastes received by commercial treatment facilities nationally.

Demand from Nonhazardous Wastes

As with SQG wastes, many States were unable to obtain the demand from nonhazardous waste from their State BRS databases. Nonhazardous wastes are wastes that are neither characterized as State hazardous nor federally defined as RCRA hazardous. The overall management trend for nonhazardous

[2] The BRS National Oversight Database is maintained by EPA and contains BRS data from all states, including those that do not use the Biennial Report Forms.

wastes is disposal in Subtitle D landfills.

While the demand for capacity from nonhazardous waste varies considerably by CAP Management Category, the demand from nonhazardous wastes as it relates to assessment of future capacity primarily affects the landfill CAP management category since landfill capacity depletes over time. EPA was able to estimate landfill demand from nonhazardous waste through discussions with the treatment industry and using estimates found in literature. The Agency's analysis of this demand appears in Table VI under the column "Non-RCRA Industrial Wastes."

Demand from Mixed Hazardous and Radioactive Wastes

As part of the Low-Level Radioactive Waste Policy Act (LLRWPA) of 1980 and its 1985 amendments, individual states or groups of states that form compacts are responsible for disposing of all the low-level radioactive mixed waste generated within their borders, except for waste produced by federal facilities (which the federal government has taken responsibility for). This Act establishes a waste management planning, treatment, and disposal framework independent of the CAP process that specifically deals with the disposal of non-federal radioactive mixed waste. For federal radioactive waste, the Federal Facilities Compliance Act establishes a planning process to ensure that these wastes are properly managed. In the Agency’s judgment, treatment capacity for radioactive mixed wastes will be met through these planning mechanisms.

Discussion of National Data Aggregated by EPA

The tables which appear on pages 16 - 21 of the Report show EPA's aggregation of State-submitted data. The Agency adjustments to the State-submitted capacity data appear in Appendix C.

Table I, titled "1991 National Baseyear Data Representing Hazardous Waste Generated and Managed On Site," shows a national aggregation of 1991 baseyear demand data for waste managed onsite from their CAP Table 1.

Table II, titled "1991 National Baseyear Data Representing Management of Hazardous Waste in Captive Systems," presents the States' CAP Table 2 data aggregated nationally. This information was obtained by summing the quantities reported by States as wastes generated and managed in-state at captive facilities with the quantities of waste that are exported to captive facilities in other States. Captive facilities are facilities owned by the same company as the generator, but are at a different physical location. Their capacity can only be used by generators under the same ownership or by generators with whom the facility has an agreement to manage their waste.

Table III, titled "1991 National Baseyear Data Representing Management of Hazardous Waste in Commercial Systems," shows data from the State-submitted CAP Tables 3 and 4. These data were used as the starting point in developing projections. National demand figures for the baseyear were calculated by adding exports to wastes generated and managed in-state from State-submitted CAP Table 3 and then adding the maximum operational in-state commercial management from State-submitted CAP Table 4.

Table IV, titled "National Baseline and Projected Demand for Commercial Hazardous Waste Management Capacity," reports aggregated State demand for commercial capacity. This table shows the sum of each State's baseline and projection year recurrent waste demand data. The data, which has been adjusted by the Agency, is from CAP Table 5. Attached in Appendix A are the individual State-submitted tables showing this information. Also included in Table IV are the nationally aggregated one-time waste estimates that were developed by the Agency.

Table V, titled "National Baseline and Projected National Commercial Subtitle C Management Capacity," shows capacity data for the baseline and projection years submitted by States in their CAP Table 6, with Agency adjustments (which appear in Appendix C). Appendix B contains the individual State-submitted tables showing this information. Appendix D lists the commercial management facilities that make up this capacity.

National Assessment of Future Capacity

Table VI, titled "National Capacity Assessment of Projected Remaining Commercial Subtitle C Capacity Not Utilized by Hazardous Wastes," shows in the first column maximum available commercial capacity from Table V minus the demand for 2013 from Table IV. The second, third, and fourth columns estimate the impact of the additional increases in demand that States were not asked to account for in their CAP submissions. The Land Disposal Restrictions Phase II rulemaking and demand from Small Quantity Generators and Industrial Subtitle D wastes will place additional demand on capacity. The final column shows the Agency's assessment of future capacity when considering the impacts of future Agency regulatory activities and the impact of waste demand not included in the State CAPs.

Assessment of New Rulemakings on Projected National Capacity

Although the LDR Phase II rulemaking will probably increase the demand for all treatments, the solids combustion category will be most affected by this rulemaking. Table VI indicates that, based on information made available with the rulemaking, there will exist sufficient combustion capacity for managing the hazardous wastes expected to be generated nationwide. In the next few years, the LDR program plans to finalize Phase III and Phase IV rulemakings. Both these rulemakings may increase the need for treatment capacity; however, EPA anticipates that future increases in demand for treatment of hazardous wastes due to the impact of the LDR program may be offset by the impact of HWIR. Regardless of the impact of the LDR Phase II and HWIR rulemakings, EPA believes the States have shown for the purpose of CERCLA 104 (c) (9) that there is adequate national capacity.

Assessment of EPA Demand Estimates on Projected National Capacity

An Agency analysis of the 1991 national BRS data showed that the demand from SQGs accounts for only 1 percent of the total demand on commercial Subtitle C management across all CAP Management Categories. The percentage contribution of SQGs on demand varies by CAP Management Category but is generally less than 4 percent of the total waste managed in each category.

During the development of the CAP Guidance, several States raised concerns about the demand being placed on commercial facilities by non-RCRA, non-state hazardous waste. The Agency found, based on a trade journal study, that about 20 percent of the waste going to landfills is neither RCRA nor State-hazardous. Again, however, this demand is more than covered by the available capacity, as can be

seen in Table VI.

Conclusions

Based on its analysis of the data in this report and from other sources, the Agency has determined as documented in this report that adequate national capacity for the treatment and disposal of hazardous waste exists through the year 2013. Although EPA believes there is national capacity, States and regional groupings of States should continue hazardous waste management planning activities to assist EPA in ensuring that adequate capacity exists in the future. Further hazardous waste planning efforts may be important to a State and regional groupings of States for a number of reasons, including furthering and updating knowledge of hazardous waste management systems, helping to implement waste minimization programs, and encouraging companies to replace inefficient treatment technologies with safer and more innovative technologies.

While each State has demonstrated that there is adequate hazardous waste treatment and disposal capacity, there is the potential for unforeseen circumstances (e.g., new federal regulations, taxes on management, statutory limitations on landfills, and changing market conditions) that could affect the future availability of management capacity. Nationally, the industry is consolidating and restructuring. The hazardous waste market's dynamism makes it difficult to guarantee that the current surpluses of hazardous waste management capacity will continue to exist. These factors should also prompt States to monitor the hazardous waste universe and continue their planning activities.

EPA recognizes that many States included as available capacity for 2013 facilities that were not in full-scale commercial operation or were operating under interim status in 1993. The inclusion of such facilities in CAPs is not evidence of a commitment on the part of the Agency or the States to bring these facilities on-line or to grant them part B permits. Capacity planning is intended to project into the future based on historical data and current knowledge. Including management facilities not yet fully operational or operating under interim status does not imply a State certification or intention that these facilities will receive their permits or become fully operational but rather is an attempt to evaluate future capacity based on the information representing waste management today. States and the Agency will continue to analyze capacity information, removing facilities that have dropped from the permitting process. Accordingly, although the Agency believes the information presented in this Report demonstrates the presence of significant treatment and disposal capacity, the Agency will continue to periodically collect and evaluate data to ensure that the requirements of CERCLA 104(c)(9) are satisfied.

References

Guidance for Capacity Assurance Planning, U.S. EPA, Office of Solid Waste and Emergency Response, OSWER Directive 9010.02, May 1993

One-Time Waste Estimates for Capacity Assurance Planning, U.S. EPA, Office of Solid Waste and Emergency Response, OSWER Directive 530-R-94-002, August 1994

Using Table Talk to Prepare CAP Tables, U.S. EPA, Office of Solid Waste and Emergency Response, OSWER, October 1992

Background Document for Capacity Analysis for Land Disposal Restrictions Phase II - Universal Treatment Standards, and Treatment Standards for Organic Toxicity Characteristic Wastes and Other Newly Listed Wastes, Office of Solid Waste and Emergency Response, August 1994

Hazardous Waste Treatment Council 1993 Survey of Commercial Hazardous Waste Incineration Capacity, in *Phase II Background Document* cited above

EI Digest, April 1993

Appendix A

Demand Data Submitted by States

The following tables show for each state the recurrent demand on commercial Subtitle C capacity for each CAP Management Category and each projection year. The data in these tables are directly from Table 5 in the states' CAPs.

Appendix B

Commercial Capacity Data Submitted by States

The following tables show for each state the quantities of commercial Subtitle C management capacity for each CAP Management Category and each projection year. The data in these tables are directly from Table 6 in the States' CAPs.

Appendix C

Adjustments to Commercial Capacity Data

Ë The Agency adjustments to state-submitted data in the following table apply to each year as presented in the State CAPs: 1991, baseline, 1993, 1999, and 2013, except for adjustment for the National Cement facility, which applies to 1999 and 2013.

Facilities	State CAP Data (tons)	Agency Adjustment (tons)	Agency Adjusted Data (tons)	Reason for Change
Organics Recovery				
Marine Shale, LA	55,000	-55,000	0	Permit was denied
Clean Harbors, MA	11,318,278	-11,301,278	17,000	Error in BRS data
Energy Recovery--Liquids				
National Cement, CA	37,000	-37,000	0	Permit was denied
Marine Shale, LA	31,000	-31,000	0	Permit was denied
Energy Recovery--Sludges/Solids				
Marine Shale, LA	73,000	-73,000	0	Permit was denied
Rhone Poulenc, LA	155,338	-155,338	0	Sludges/solids capacity was reclassified as liquids capacity
Incineration--Liquids and Gases				
Rhone-Poulenc, LA	775,099	-715,099	60,000[a]	Prior estimates did not reflect real operating conditions
Rollins, LA	540,599	-479,599	61,000[b]	Prior estimates did not reflect real operating conditions
Incineration--Sludges/Solids				
Rhone-Poulenc, LA	371,124	-371,124	0	Sludges/solids capacity was reclassified as liquids and gases capacity
Rhone-Poulenc, TX	40,000[c]	-40,000	0	Sludges/solids capacity was reclassified as liquids and gases capacity
Rollins, LA	117,714	-76,714	41,000[b]	Prior estimates did not reflect real operating conditions

[a] *EI Digest*, June 1994. EPA is unable to release to the public its facility-level LDR program capacity information for this or other incinerators because it has been claimed as confidential business information.

[b] Based on *EI Digest*, June 1994, which reported 102,000 tons/year of capacity. EPA Land Disposal Restrictions (LDR) program data indicate that 60 percent of commercial incineration capacity treats liquids and gases and 40 percent treats sludges and solids. Thus, EPA allocated 61,000 (0.6 x 102,000) tons to Incineration--Liquids and Gases and 41,000 (0.4 x 102,000) tons to Incineration--Sludges/Solids.

[c] Texas did not report the capacity of specific facilities in its Phase 1 CAP. EPA assumed this facility's (double counted) capacity is 40,000 tons, based on *EI Digest*, May 1993.

Landfill Adjustments

- EPA also manipulated commercial landfill capacity data for Alabama and South Carolina to make the data employable in the CAP Phase 1 Data System, which EPA used to do the National Assessment calculations.

- These manipulations were consistent with the information provided by the states. They were necessary because the landfills in these states have statutorily-imposed limits on the amount of wastes that can be disposed of per year. The CAP Phase 1 Data System is structured to use data, not on the rate of disposal, but rather on the total stock of landfill capacity that can be utilized over the landfill's life.

- The Alabama and South Carolina landfill capacity data were also manipulated to be consistent with the System's methodology for depleting landfill capacity. This methodology distinguishes between states with and without landfill capacity.

  - States with landfills. For projection year estimates of the maximum available supply of capacity in Table 6 of the state's submissions, the model requires figures representing the amount of capacity available during the projection period (e.g., start of 1994 through start of 1999 for one-time waste generated in the state and both recurrent and one-time wastes from other states). Preparing these estimates requires subtracting the state's recurrent demand for landfill capacity during the projection period from the state's maximum available capacity at the end of the prior period.

  - States without landfills. In contrast, the model shows no available capacity for states without landfill capacity. In the national assessment, these states' demand for capacity is subtracted from the maximum available capacity for states with landfills.

- The landfill adjustments described below did not change the meaning of the data submitted by Alabama and South Carolina, but merely manipulated its form to be useable in the CAP Phase 1 Data System.

Alabama

- **Background**

  - The Chemical Waste Management landfill in Emelle, Alabama can receive no more than 600,000 tons/per year, as specified by State law.

  - The facility's estimated maximum available permitted capacity at the end of 1993 was 20,000,000 tons, which will last until 2027 at the maximum utilization rate.

  - In 1991, the facility disposed of about 520,000 tons of hazardous waste.

  - The State's projected recurrent landfill demand is 16,536 tons in 1993 and 16,361 tons/year from 1994 through 2013 (based on the reported demand for 1999 and 2013).

- **Adjusted Maximum Landfill Capacity in Tons for Use in the State's Table 6**

  - 1999: 4,101,659 = (7 x 600,000) - (16,536 + (5 x 16,361))

  - 2013: 12,272,605 = (21 x 600,000) - (16,536 + (19 x 16,361))

Ë What These Figures Mean

- < The 1999 calculation represents the maximum capacity available between the start of 1993 and the end of 1999 that has not been used, prior to the start of 1999, by Alabama recurrent waste demand. This maximum amount can be utilized only if the 600,000 limit is reached during each year between 1993 and 1999.

- < The calculation for 2013 represents the maximum capacity available between the start of 1993 and the end of 2013 that has not been used, prior to the start of 2013, by Alabama recurrent demand. This maximum amount can be utilized only if the 600,000 limit is reached during each year between 1993 and 2013.

South Carolina

Ë Background

- < The Laidlaw/GSX landfill in Pinewood, South Carolina can receive up to 135,000 tons/per year, as specified by State law.

- < At the end of 1993, the facility's total remaining capacity was 1,800,000 tons, according to *EI Guide to Hazardous Waste Landfills in Canada and the United States*, Environmental Information Ltd, 1994.

- < South Carolina state statute requires the landfill to close January 1,2000.

- < In recent years, the facility has disposed of close to 135,000 ton/year.

- < The State's projected recurrent landfill demand is 39,662 tons/year during the projection years.

Ë Adjusted Maximum Landfill Capacity in Tons for Use in the State's Table 6

- < 1999: 707,028 = (7 x 135,000) - (6 x 39,662)

- < 2013: 707,028 = (7 x 135,000) - (6 x 39,662)

Ë What These Figures Mean

- < The 1999 calculation represents the maximum capacity available between the start of 1993 through the end of 1999 that has not been used, prior to the start of 1999, by South Carolina recurrent waste demand. This maximum amount can be utilized over this time period only if the 135,000 limit is reached during each year between 1993 and 1999.

- < The 2013 calculation represents the maximum capacity available between the start of 1993 through the end of 2013 that has not been used, prior to the start of 2013, by South Carolina recurrent waste demand. It is identical to the 1999 value because any additional wastes generated after the landfill closes in 1999 will not go to that landfill; that is, no new landfill capacity is available after 1999, but no new in-state utilization of landfill capacity occurs either. The consolidation equations in the national aggregation database system take care of placing this unmatched demand for landfill capacity (from 2000 and 2013) on the national supply of landfill capacity during that time.

Appendix D

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

This list shows all facilities that managed RCRA hazardous waste commercially in 1994. These facilities comprise the capacity reported in the national assessment. The list includes Subtitle C permitted and interim status facilities and RCRA-exempt facilities. Facilities identified on this list will not necessarily correspond to the facilities identified in State CAPs because States reported information for 1991 and some facilities have opened or closed between 1991 and 1994.

A variety of sources were used to compile this list: the 1991 Biennial Reporting System National Oversight Database, the Resource Conservation and Recovery Information System (RCRIS), "EI Environmental Services Directory 1994", internal Agency information, and state information. The facilities in the list were confirmed with information provided in state CAP submissions and then verified by the states.

The type of management at each facility is identified by CAP management category. Each CAP Management Category is comprised of a number of waste management technologies that are generally interchangeable for managing broad types of wastes (e.g., organics, inorganics including metals, and wastewaters), based on treatment performance. The CAP management categories are comprised of the following system types (as defined in U.S. Environmental Protection Agency, 1991 Hazardous Waste Report Instructions and Forms, EPA Form 8700-13A/B, pp. 90-91.

RECOVERY

Metals Recovery

M011	High temperature metals recovery
M012	Retorting
M013	Secondary smelting
M014	Other metals recovery for reuse: e.g., ion exchange, reverse osmosis, acid leaching
M019	Metals recovery - type unknown

Inorganics Recovery

M031	Acid regeneration
M039	Other recovery - type unknown

Organics Recovery

M021	Fractionation/distillation
M022	Thin film evaporation
M023	Solvent extraction
M024	Other solvent recovery
M029	Solvents recovery - type unknown
M032	Other recovery: e.g., waste oil recovery, nonsolvent organics recovery

COMBUSTION

Pumpable

M051	Energy recovery - liquids
M059	Energy recovery - type unknown
M041	Incineration - liquids
M044	Incineration - gases
M049	Incineration - type unknown

Nonpumpable

M052	Energy recovery - sludges
M053	Energy recovery - solids
M059	Energy recovery - type unknown
M042	Incineration - sludges
M043	Incineration - solids
M049	Incineration - type unknown

TREATMENT

Stabilization/Chemical Fixation

M111	Stabilization/chemical fixation using cementitious and/or pozzolanic materials
M112	Other stabilization
M119	Stabilization - type unknown

Fuel Blending

M061	Fuel blending

Hazardous Wastewaters and Sludges Treatment

M071	Chrome reduction followed by chemical precipitation
M072	Cyanide destruction followed by chemical precipitation
M073	Cyanide destruction only
M074	Chemical oxidation followed by chemical precipitation
M075	Chemical oxidation only
M076	Wet air oxidation
M077	Chemical precipitation
M078	Other aqueous inorganic treatment: e.g., ion exchange, reverse osmosis
M079	Aqueous inorganic treatment - type unknown
M081	Biological treatment
M082	Carbon adsorption
M083	Air/steam stripping
M084	Wet air oxidation
M085	Other aqueous organic treatment
M089	Aqueous organic treatment - type unknown
M091	Chemical precipitation in combination with biological treatment
M092	Chemical precipitation in combination with carbon adsorption
M093	Wet air oxidation
M094	Other organic/inorganic treatment
M099	Aqueous organic and inorganic treatment - type unknown
M101	Sludge dewatering
M102	Addition of excess lime
M103	Absorption/adsorption
M104	Solvent extraction
M109	Sludge treatment - type unknown
M121	Neutralization only
M122	Evaporation only
M123	Settling/clarification only
M124	Phase separation (e.g., emulsion breaking, filtration) only
M125	Other treatment
M129	Other treatment - type unknown

DISPOSAL

Landfill

M132	Landfill
M133	Surface impoundment (to be closed as a landfill)
M137	Other disposal

Deepwell/Underground Injection

M134	Deepwell/underground injection
M137	Other disposal

KEY ABBREVIATIONS AND SYMBOLS

** = capacity restricted to incineration residuals generated on-site.
BIF: Boiler and Industrial Furnaces;
Incin: Incinerator
AK: Aggregate Kiln
BLR: Boiler
CK: Cement Kiln

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
REGION I											
CONNECTICUT											
Bridgeport United Recycling (Hitchcock Gas Engine Co.)	CTD002593887						X	X			
Clean Harbors	CTD000604488						X	X			
East Coast Environmental Services Corp.	CTD089631956						X	X	X		
Enthone	CTD001169010							X			
Environmental Waste Resources, Inc. [BLR]	CTD072138969		X				X	X	X		
Macdermid Inc	CTD001164599							X			
PGP Industries Inc	CTD097220883	X									
United Oil Recovery, Inc.	CTD021816889						X	X			
MASSACHUSETTS											
Clean Harbors of Natick, Inc.	MAD980523203	X					X				
Clean Harbors Of Braintree, Inc.	MAD053452637		X								
General Chemical Corporation	MAD019371079		X								
Hampden Color & Chemical Co	MAD001114214		X								
Jet-Line Services, Inc.	MAD047075734						X				
Jet-Line Services, Inc.	MAD062179890						X				
Laidlaw Environmental Services (NE), Inc.	MAD000604447		X								
Zecco Inc	MAD052924495										
MAINE											
Jet-line Services, Inc.	MED019051069							X			
NEW HAMPSHIRE											
No Facilities											
RHODE ISLAND											
Chem Pak Corp.	RID084802842		X				X				
Eticam	RID980906986	X									

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Northland Environmental Inc.	RID040098352			X				X			
VERMONT											
No Facilities											
REGION II **NEW JERSEY**											
Chemical Waste Management Of NJ	NJD089216790							X			
C P Chemical	NJD002141950							X			
CPS Chemical Co., Inc.	NJD002141190		X								
Degussa Corp, Metz Division [RCRA Exempt]	NJD002195303	X						X			
Dupont E I De Nemours & Co	NJD002385730							X			
Johnson Matthey, Inc.	NJD000692194	X									
Johnson Matthey, Inc. [RCRA Exempt]	NJD980755367	X						X			
Marisol, Inc.	NJD002454544						X				
RFE Industries	NJD055090815	X									
Rollins Environmental Services (NJ), Inc.	NJD053288239				Incin	Incin	X				
S & W Waste, Inc.	NJD991291105						X	X	X		
Safety-Kleen Corp.	NJD002182897		X				X				
Safety-Kleen Corp.	NJD069039626		X								
Vangard Research [RCRA Exempt]	NJD990753493	X									
NEW YORK											
Ashland Chemical	NYD046877775							X			
AT&T Nassau Metals [RCRA Exempt]	NYD086225596					Incin					
Berkman Bros.	NYD001236017							X			
Cecos International Inc.	NYD080336241							X			
Ceranaseal	NYD002066173		X								
Chemical Management, Inc.	NYD000691949							X	X		

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
CWM Chemical Services	NYD049836679						X	X	X	X	
KBF Pollution [RCRA Exempt]	NYD981182769	X						X			
Laidlaw (BDT)	NYD000632372		X		Incin	Incin		X			
LEA Ronal	NYD001325661	X				Incin					
Mercury Refining Company, Inc.	NYD048148175	X									
Norlite Corporation (ThermalKem)	NYD080469935				BIF						
Northeast Environmental Services Inc.	NYD057770109						X	X			
Photocircuits Corp.	NYD096920483							X			
Pride Solvents And Chemical Co.inc.	NYD057722258		X								
SCI Systems, Inc.	NYD982271793		X								
Solvents And Petroleum Service Inc.	NYD013277454		X								
State University of NY	NYD071600100	X									
Weksler Instruments	NYD005920194		X								
PUERTO RICO											
Safety Kleen Environsystems Co.	PRD090399718		X				X				
Safety Kleen Environsystems (Dorado)	PRD981182421						X				
REGION III **DISTRICT OF COLUMBIA**											
No Facilities											
DELAWARE											
No Facilities											
MARYLAND											
Clean Harbors Env. Svcs. Co., Inc.	MDD980555189							X			
PENNSYLVANIA											
Bethlehem Apparatus Company, Inc.	PAD002390961	X									
Calgon Carbon Corp	PAD000736942		X								

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Capital Parts Washers, Inc.	PAD987332343		X								
Chemical Waste Mgt. (Delaware Container Co. Inc.)	PAD064375470						X				
East Penn Manufacturing [RCRA Exempt]	PAD002330165	X									
Envirite Corporation	PAD010154045							X	X		
Envirotrol Inc.	PAD980707087		X								
Gemchem, Inc.	PAD009439662						X				
Exide (General Battery Corp.)	PAD990753089	X						X			
Harcros Pigments, Inc.	PAD002391548	X									
Horsehead Resource Dev. Co., Inc.	PAD002395887	X									
Inmetco [RCRA Exempt]	PAD087561015	X									
Keystone Cement Company [CK]	PAD002389559				BIF						
Medusa Cement Co. [CK]	PAD083965897				BIF						
Mill Service, Inc.	PAD004835146							X			
Molycorp, Inc.	PAD030068282	X									
Republic Environmental Systems, Inc. (Waste Conversion)	PAD085690592							X	X		
WRC Processing	PAD981038227	X									
VIRGINIA											
Belpar Environmental (Chemical Waste Management, Inc.)	VAD988175055		X								
Dynachem, Inc.	VAD105838874		X								
ERC Pre-Treatment Facility	VAD086293719							X			
Prillaman Chemical Corporation	VAD003111416		X								
Solite [AK]	VAD046970521				BIF						
Solite (Old Plant) [AK]	VAD042755082				BIF						
WEST VIRGINIA											
Adsorption Systems, Inc	WVD981107600							X			

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
REGION IV											
ALABAMA											
Allied Chemical Corp. (Allied-Signal Tar Prod.)	ALD031499833					Incin		X			
All-Worth Enterprises, Inc.	ALD094476793		X								
Chemical Waste Management, Inc.	ALD000622464						X		X	X	
Fisher Industrial Service, Inc.	ALD981020894						X				
Lafarge (Medusa)	ALD067119966				BIF						
M&M Chemical & Equipment Company, Inc.	ALD070513767		X				X				
Sanders Lead Company	ALD046481032	X									
Systech Environmental Corporation	ALD981019045						X				
FLORIDA											
Ashland Chemical Co	FLD067230771		X				X				
Chemical Pollution Control, Inc.	FLD984168112	X									
Envirotech S E Inc	FLD101877876		X								
Florida Solite [AK]	FLD004059085				BIF						
Industrial Water Services, Inc.	FLD981928484		X								
Integrated Resource Recovery Inc	FLD981018273							X			
Laidlaw Environmental Services Of Bartow	FLD980729610		X				X				
Oldover Corporation	FLD000737312						X				
Sparkle Corp	FLD982121592		X								
GEORGIA											
Alternate Energy Resources, Inc.	GAD033582461		X				X	X			
Chemical Conservation Of Georgia, Inc.	GAD093380814		X				X				
MCF Systems Atlanta, Inc	GAD981269095		X								
Chemical Waste Mngt (Ohm Resource Recovery Corp.)	GAD096629282						X		X		
Tri-state Steel Drum, Inc.	GAD033842543						X		X		

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
KENTUCKY											
Atochem (M & T Chemical)	KYD006373922				Incin	Incin		X			
Calgon Corp	KYD005009923		X								
Environmental Conservation Systems, Inc. (Oldover)	KYD000770313						X				
Kentucky Solite Corporation [AK]	KYD059568220			X							
Kyana Oil Inc.	KYD000821942						X	X	X		
Louisville Envrionmental Services (B-T Energy)	KYD079661146						X				
L.W.D., Inc.	KYD088438817				Incin	Incin			X		
Safety-kleen Corp.	KYD053348108		X				X				
MISSISSIPPI											
Enterprise Recovery	MSD000693176		X								
United Cement/Holnam [CK]	MSD077655876				BIF		X				
NORTH CAROLINA											
Carolina Solite [AK]	NCD003152642				BIF						
Ecoflo, Inc.	NCD980842132						X				
Detrex (Gold Shield Solvents Div.)	NCD049773245		X								
Heritage Environmental Services, Inc.	NCD121700777						X	X			
Laidlaw Environmental Services (ts), Inc.	NCD000648451								X		
Oldover Corporation	NCD000773655						X				
SOUTH CAROLINA											
CP Chemicals	SCD070371885	X									
Engelhard Corporation	SCD981866007	X									
Giant Cement Company, Inc. [CK]	SCD003351699				BIF	BIF					
GSX Servcies Of South Carolina, Inc.	SCD070375985								X	X	
Laidlaw Environmental Services, Inc.	SCD981467616				Incin						
Safety-kleen Corp.	SCD077995488		X								

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Safety-kleen/Holman Cement	SCD003368891				BIF		X				
Southeastern Chemical Company - Omni	SCD036275626		X				X	X			
ThermalKEM, Inc.	SCD044442333				Incin	Incin					
TENNESSEE											
Allworth (Southdown Environmental Systems, Inc.)	TND981920119						X				
Dixie Cement Company, Inc. [CK]	TND106203375				BIF	BIF					
General Smelting & Refining, Inc.	TND004048690	X									
Horsehead Resource Dev. Co., Inc. [RCRA Exempt]	TND982144099	X									
Laidlaw Environmental Services (gs), Inc.	TND000614321		X				X				
Laidlaw Environmental Services of Nashville (Osco, Inc.)	TND981922826		X					X			
Laidlaw Env. Serv. (WT) Inc. (Tricil Env. Serv.)	TND000772277							X			
Refined Metals	TND067690040	X									
REGION V **ILLINOIS**											
American Chemical & Refining	ILD000675249	X									
American Waste Processing, Ltd.	ILD000716894							X			
Baron Blakeslee	ILD051937068		X								
Beaver Oil Co., Inc.	ILD064418353						X	X			
Behr Precious Metals	ILD006935571	X						X			
Century (Southdown Environmental Systems, Inc.)	ILD099215303		X			BIF					
Chemical Waste Management, Inc. - CID	ILD010284248							X	X	X	
Clayton Chemical Company	ILD066918327		X				X				
Entech (CP Inorganics)	ILD062480850							X			
Envirite Corporation	ILD000666206							X	X		
Heritage Environmental Services, Inc.	ILD085349264						X				
Horsehead Resource Dev. Co., Inc.	ILD040891368	X									

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Mar-Cor Industries, Inc.	ILD984774695	X									
Peoria Disposal Co. (pdc)	ILD000805812								X	X	
Recontek, Inc.	ILD984766279	X									
Safety-kleen Corp.	ILD005450697		X								
Safety-kleen Corp.	ILD000805911		X								
Safety-kleen Corp.	ILD980613913		X				X				
Trade Waste Incineration (Chemical Waste Manag.)	ILD098642424				Incin	Incin					
United Refining & Smelting	ILD005087630	X						X			
INDIANA											
ESSROC (Cemtech, Lp)	IND005081542				BIF						
Chemical Waste Management Of Indiana Inc.	IND078911146								X	X	
Consolidated Recycling Co., Inc.	IND098958283		X								
Dupont-ecco	IND981783681	X									
General Battery Corp (EXIDE)	IND000717959	X									
Detrex (Gold Shield Solvents Div.)	IND085616837		X								
Heritage Environmental Services, Inc.	IND093219012		X				X	X	X		
Hydrite Chemical Co. (Avangic Industries)	IND984865541		X								
Indiana Industrial Plating Inc.	IND005261623							X			
Industrial Fuels & Resources, Inc.	IND980590947						X	X			
Lone Star Industries (Systech Env.) [CK] [NOT USED IN CAP]	IND006419212				BIF	BIF					
Mason Metals	IND005460209	X									
Metal Working Lubricants Co.	IND000646950		X								
Pollution Control Of Indiana, Inc.	IND000646943						X				
Quemetco [RCRA Exempt]	IND000199653	X									
Reclaimed Energy	IND000780403		X				X				

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Refined Metals	IND000718130	X									
Rhone-Poulenc Basic Chemical Co. (SAF)	IND001859032				BIF						
Safety Kleen Oil Recovery	IND077042034						X	X			
MICHIGAN											
Ag Hog, Inc.	MID981094618	X									
Chem-met Services, Inc.	MID096963194								X		
City Environmental, Inc.	MID054683479								X		
City Environmental, Inc.	MID980991566							X	X		
City Environmental Inc. - Calahan	MID006523385		X								
Cyanokem	MID098011992							X			
Drug & Laboratory Disposal, Inc.	MID092947928							X	X		
Dynecol, Inc.	MID074259565			X				X			
Edwards Oil Service, Inc.	MID088754688			X				X			
Environmental Waste Control Inc.	MID057002602		X					X			
Gage Products [BLR]	MID005338801		X								
Detrex - Gold Shield Solvents Div.	MID091605972		X								
Lafarge [CK]	MID005379607				BIF						
Meridan Environmental Services, Inc.	MID981192081			X							
Michigan Disposal, Inc.	MID000724831								X		
Michigan Recovery Systems, Inc.	MID060975844		X				X				
Petro-Chem Complex	MID980615298						X				
Petro-Chem Complex Solvent Distillers	MID980684088		X								
PVS Chemicals Inc Michigan	MID981195936			X							
RTR Inc	MID985566629		X								
Verbrugge Oil Inc.	MID006410377		X								
Wayne Disposal, Inc.	MID048090633									X	

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
MINNESOTA											
Envirochem Inc.	MND980996805	X						X			
Gopher Smelting And Refining Co [RCRA Exempt]	MND006148092	X									
Pennzoil	MND006224612		X								
U.S. Filter Recovery Services, Inc.	MND981098478	X						X			
OHIO											
Chemical Solvents	OHD980897656		X								
Chemical Waste Management, Inc.	OHD020273819							X			X
Chemtron Corp.	OHD066060609		X				X	X			
Clark Processing, Inc.	OHD004274031		X				X	X			
Clean Harbors Env. Svcs. Co., Inc.	OHD000724153							X			
CWM Resource Recovery, Inc.	OHD093945293		X								
Eaglebrook, Inc.	OHD000724088			X				X			
Ecolotec (Republic Env. Systems)	OHD980700942						X	X	X		
Envirite Corporation	OHD980568992							X	X		
Environmental Enterprises, Inc.	OHD083377010						X	X	X		
Environmental Purification Industries [BLR]	OHD986983237				BIF	BIF		X			
Envirosafe Services Of Ohio, Inc.	OHD045243706								X	X	
Evergreen Environmental Group, Inc.	OHD055522429		X				X	X	X		
Hukill Chemical Corporation	OHD001926740		X				X	X			
Klor Kleen Inc.	OHD980821862		X				X	X			
Lafarge (CK)	OHD005048947				BIF	BIF	X				
Liberty Solvents & Chemicals Co., Inc.	OHD052324548		X								
Master Metals	OHD097613871	X									
North East Chemical Corporation	OHD980681571		X				X	X			
Research Oil Company	OHD004178612		X					X			

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Ross Incineration Services, Inc.	OHD048415665				Incin	Incin	X				
Safety-Kleen Corp.	OHD980587364		X				X				
Spring Grove Resource Recovery (Southdown Env. Sys)	OHD000816629							X			
Systech	OHD005048947						X				
Tricil Environmental Services Inc.	OHD081290611							X	X		
Waste Technologies Industries (WTI)	OHD980613541				Incin	Incin					
WCI Steel Inc.	OHD060409521			X							
WISCONSIN											
Ashland Chemical	WID053689196										
Chemical Waste Management, Inc.	WID003967148								X		
EOG Environmental Incorporated	WID988580056						X	X	X		
Hydrite Chemical Co.	WID000808824		X								
Milwaukee Solvents And Chemicals Corp.	WID023350192		X				X				
Mineral Springs Corporation	WID988566543						X	X			
Safety-kleen Corp.	WID980896633										
Safety-kleen Corp.	WID981097769										
Waste Research & Reclamation Co., Inc.	WID990829475		X		Incin		X	X			
Wis Fineblanking	WID102220704							X			
REGION VI ARKANSAS											
Ash Grove Cement Co. [CK]	ARD981512270				BIF	BIF					
Ensco, Inc.	ARD069748192				Incin	Incin					
Rineco Chemical Industries	ARD981057870		X				X				
LOUISIANA											
Alfred's Processor Sales/Services [RCRA Exempt]	LAD087029872	X									
AMAX Metal Recovery, Inc.	LAD058472721	X									

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Catalyst Recovery	LAD980622161					X					
Chemical Waste Management, Inc.	LAD000777201						X	X	X	X	
Evangeline Medical & X-ray Distributors [RCRA Exempt]	LAD981589542	X									
Laidlaw Environmental Services, Inc.	LAD079464095						X				
Laidlaw Environ. Services (R&D Fabricating & Mfg)	LAD981055791					X					
Louisiana X-Ray Accessories, Inc [RCRA Exempt]	LAD985191447	X									
New Orleans Silversmiths [RCRA Exempt]	LAD981152903	X									
Pure Solve, Inc. [RCRA Exempt]	LAD981512627		X								
Rhone-Poulenc Basic Chemicals Co.	LAD008161234				Incin		X	X			
Rollins Environmental Services Of La, Inc.	LAD000778514										X
Rollins Environmental Services (la), Inc.	LAD010395127				Incin	Incin			**	**	
Schuylkill Metals (MRE)	LAD008184137	X									
UOP Shreveport Plant [RCRA Exempt]	LAD057109449	X									
X-ray Unlimited, Inc. [RCRA Exempt]	LAD981513021	X									
X-ray Unlimited Inc. [RCRA Exempt]	LAD985170299	X									
NEW MEXICO											
Chino Mines Company [RCRA Exempt]	NMD007396930	X									
Southwest Radiographics	NMD097138382	X									
OKLAHOMA											
Chief Supply Corporation	OKD089761290		X			BIF	X				
Hydrocarbon Recyclers (USPCI-HRI)	OKD000632737		X				X	X	X		
Residual Technologies Inc.	OKD000402396		X					X	X		X
USPCI-Lone Mountain	OKD065438376						X	X	X	X	
TEXAS											
Allwaste Recovery	TXD102599339							X			
Alpha Omega Recycling Inc	TXD981514383	X									

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Chemical Reclaimation Serv. (Southdown Env. Sys.)	TXD046844700		X								
Chemical Waste Management, Inc.	TXD000761254										X
Chemical Waste Management, Inc.	TXD000838896				Incin	Incin				X	X
Detrex (Gold Shield Solvents Div.)	TXD980626154		X								
Disposals Systems, Inc. (GNI Group, Inc.)	TXD000719518		X						X		X
Empak	TXD097673149						X				X
Encycle/Texas, Inc.	TXD008117186	X						X			
Eurecat U.s. Incorporated	TXD106829963	X									
GNB Batteries Inc [RCRA Exempt]	TXD006451090	X									
Gibraltar Chemical Resources, Inc.	TXD000742304		X				X				X
Gulf Chemical & Metallurgical Corporation [RCRA Exempt]	TXD074195678	X									
Gulf Coast Waste Disposal Authority	TXD000895249									**	
Heat Energy Advanced Technology, Inc. (HEAT)	TXD980624035		X				X				
Horsehead Recovery	TXD988087052	X									
Malone Service Co.	TXD005948740										X
NSSI/Recovery Services, Inc.	TXD982560294		X				X	X			
Olin (IF)	TXD008097487				BIF						
Parkans	TXD008105959	X									
Recovery and Reclamation	TXD981514268							X			
Rhone-Poulenc Basic Chemicals Co.	TXD008099079				Incin						
Rollins Environmental Services (tx), Inc.	TXD055141378				Incin	Incin			**	**	
Safety-kleen Corp. Denton Recycle Center	TXD077603371		X				X				
Southern California Chemicals	TXD047823265	X									
SDC (Southwest Env. Services, Inc.)	TXD030923361										
Texas Ecologist, Inc.	TXD069452340								X	X	
TXI, Inc.(Texas Industries) [CK]	TXD007349327				BIF	BIF					

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Treatment One	TXD055135388						X	X			
USPCI	TXD052649027		X				X				
REGION VII											
IOWA											
Northland Products	IAD022365480		X								
John Deere Waterloo Works	IAD005289806							X			
KANSAS											
Aptus, Inc.	KSD981506025				Incin	Incin	X				
Ash Grove Cement Plant [CK]	KSD031203318				BIF	BIF					
Heartland/Summit Env. Corp. [CK]	KSD980739999				BIF	BIF	X				
Lafarge Corp. [CK]	KSD007148034				BIF	BIF					
Systech Environmental Corporation	KSD980633259						X				
USPCI	KSD007246846		X				X				
MISSOURI											
Burlington Environmental	MOD000610766		X			BIF	X				
Continental Cement (MFR, Inc.) [CK]	MOD054018288		X		BIF	BIF	X				
Doe Run Co. [RCRA Exempt]	MOD059200089	X	X								
Essex Waste Mgmnt. Services, Inc.	MOD980962849						X	X			
Hazardous Waste Recovery, Inc.	MOD981123391				BIF	BIF	X	X			
Heritage Environmental Services, Inc.	MOD981505555						X				
ICI Explosives	MOD077887909			X							
Industrial Fuels And Resources, Inc.	MOD980632954						X				
Lone Star Industries [CK]	MOD981127319				BIF	BIF	X				
River Cement Co., Selma Park (Chemtech, LP) [CK]	MOD050232560				BIF	BIF	X				
Safety-kleen/Holman Cement	MOD029729688				BIF	BIF	X				
NEBRASKA											

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Ash Grove Cement Plant	NED007260672				BIF	BIF					
Ecova (Waste Tech Services)	NED981723513				Incin	Incin					
REGION VIII											
COLORADO											
Enviroserve, Inc.	COD983788688	X					X	X			
Hwy. 36 Land Development Co.	COD991300484							X	X	X	
Chemical Waste Management (Oil & Solvent Process Co.)	COD980591184		X				X	X	X		
MONTANA											
Asarco	MTD006230346	X									
NORTH DAKOTA											
No Facilities											
SOUTH DAKOTA											
No Facilities											
UTAH											
Aptus, Inc.	UTD981552177				Incin	Incin					
Engelhard Corporation (catalyst recovery)	UTD009073800	X									
USPCI	UTD991301748							X	X	X	
USPCI Clive	UTD982595795				Incin	Incin					
WYOMING											
No Facilities											
REGION IX											
ARIZONA											
Allied Precious Metals Recyc, Inc.	AZT050010685	X						X			
Cyprus Miami Mining Corporation	AZD060624251	X									
Recycling Resources, Inc.	AZD049318009		X				X				
Rinchem Co	AZD980892731		X				X	X			
Romic Chemical Corp.	AZD009015389		X								

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NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Westates Carbon-arizona	AZD902441263							X			
World Resources Co. (WRC)	AZD980735500							X			
CALIFORNIA											
AAA Distribution/Dry Clean Serv.	CAD981397417		X								
American Diversified Silver, Inc.	CAD982524613	X									
Appropriate Technologies (APTEC)	CAT080010101							X			
Bayday Chemical	CAT080012263		X								
Boliden Metech, Inc. Western D [RCRA Exempt]	CAD077182239	X									
Broco, Incorporated	CAT080022148							X			
Chem-tech Systems, Inc.	CAT080033681							X			
Commodity Refining Exchange, Inc	CAD981402522	X									
Crosby & Overton, Inc.	CAD028409019							X			
Detrex/Gold Shield Solvents	CAD020161642		X								
Drew Resource Corp	CAD070148432	X									
ECS Refining	CAD003963592	X									
Engelhard West, Inc.	CAT000612150	X									
Entech Recovery, Inc (CP Organics)	CAD981160948	X									
GNB Incorporated	CAD097854541			X							
Holchem Inc (DBA Services Chemical)	CAT000612333		X								
J & B Enterprises	CAD069138899	X									
Kettleman Hills Treatment Facility - CWM	CAT000646117							X	X	X	
Kinsbursky Bros Supply Inc	CAD088504881			X							
Laidlaw Environmental Services, Inc.	CAD000633164									X	
Laidlaw Environmental Services, Inc.	CAD980675276									X	
Micro Metallics Corporation	CAD069124717	X									
Norris Environmental Services	CAD097030993							X			

1994 COMMERCIAL TREATMENT AND DISPOSAL FACILITIES OF RCRA HAZARDOUS WASTE

NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Oil & Solvent Process Co. (OSCO)	CAD008302903		X					X			
Omega Recovery Services Corporation	CAD042245001		X					X			
Pepper Oil Co.	CAL000041748							X			
Pete's Metal Reclamation	CAD981685472	X									
P G P Industries Inc	CAD060398229	X									
Photo Waste Recycling Co., Inc.	CAD981161367	X									
Quemetco	CAD066233966			X							
Quick Silver Products	CAD981424732	X									
Oil Process Co. (Rollins OPC) Inc.	CAD050806850							X			
RhoChem	CAD008364432		X								
Romic Chemical Corp.	CAD009452657		X								
Safety-kleen Corp.	CAD093459485		X								
Southern California Chemicals	CAD008488025	X									
Summit Environmental Corporation	CAD089446710		X								
Superior Industries Internatio	CAD050809177										
Systech Environmental Corp./National Cement	CAT080031628				BIF						
Technichem, Inc.	CAD981375983		X								
TSM Recovery and Recycling Co.	CAD108040858	X									
USPCI Solvent Service Co., Inc.	CAD059494310		X					X	X		
HAWAII											
Unitek Environmental Service, Inc.	HIT000603514		X			BIF	X				
NEVADA											
Eticam [MR NOT USED IN CAP]	NVD980895338	X						X			
US Ecology, Inc.	NVT330010000								X	X	
REGION X ALASKA											

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NAME	EPA ID	CAP MANAGEMENT CATEGORIES									
		RECOVERY			COMBUSTION		TREATMENT			DISPOSAL	
		Metal	Organic	Inorganic	Pumpable	Nonpumpable	Fuel Blend.	Waste Water	Stabilization	Landfill	Deepwell
Alaska Pollution Control	AKD983068685							X			
IDAHO											
Envirosafe Services Of Idaho, Inc.	IDD073114654							X	X	X	
OREGON											
Chemical Waste Mgmt. of the Northwest	ORD089452353								X	X	
Larry Freepons Inc. (RCRA Exempt)	ORD980979546		X								
Tektronix, Inc.	ORD009020231							X			
WASHINGTON											
Bay Zinc	WAD027530526	X									
Burlington Environmental	WAD000812917							X	X		
Burlington Environmental	WAD991281767						X	X	X		
Burlington Environmental	WAD020257945							X			
Burlington Environmental	WAD092300250		X					X			
Burlington Environmental - Georgetown Facil.	WAD000812909		X				X	X			
Cameron-Yakima Inc	WAD009477175			X							
Northwest Enviro Service, Inc.	WAD058367152		X								
CleanCare (Northwest Processing)	WAD980738512		X								
Petroleum Reclaiming Services, Inc.	WAD980511729		X								
SOL-PRO, Inc.	WAD981769110		X				X				

Appendix E

CAP Management Categories

Discussion of Technologies

For each of the 12 CAP Management Categories, the main technologies used for each category are described, including the types of waste recovered, treated or disposed. Each CAP Management Category is comprised of a number of waste management technologies that are generally interchangable for managing broad types of wastes based on treatment performance.

Metals Recovery

Metals Recovery Technologies

Metals recovery technologies are designed to separate desired metals from other constituents of hazardous wastes. The most common technologies, which are described below, are high temperature metals recovery, retorting, secondary smelting, ion exchange, and acid leaching.

High temperature metals recovery is used to treat hazardous wastes that contain metals such as cadmium, chromium, lead, nickel, and zinc compounds. Metals are separated from the waste at high temperatures through a thermochemical process using carbon, limestone, and silica as the chemical agents. The constituents being recovered from the waste are heated so that they melt and/or volatilize and can be recovered in metallic or oxide form from process vapors or from a molten bath. The high temperature metals recovery process typically consists of a mixing unit, a high temperature processing unit, a product collection system, and a residual treatment system. Other volatile metals, such as arsenic or antimony, may be difficult to separate from the desired metal products and may adversely affect the ability to reuse the recovered materials. Slag, the primary residual from the process, is sometimes cooled in a quench tank and reused either directly or after further processing, or, if the material has no recoverable value, it is land disposed after necessary treatment.

Retorting is similar to high temperature metals recovery in that it provides for recovery of metals from wastes primarily by volatilization and subsequent collection an condensation of the volatilized components. It is used primarily to remove elemental mercury, as well as mercury present in the oxide, hydroxide, and sulfide forms from hazardous wastes.

Secondary smelting is also very similar to high temperature metals recovery, but is generally used for processes that recover lead from hazardous wastes. In this process, waste passes through a smelting furnace where the lead is concentrated into a bullion and separated from slag in molten form.

Ion exchange is primarily used to treat aqueous hazardous wastes with dissolved metals. These wastes might also contain nonmetallic anions such as halides, sulfates, nitrates, and cyanides, and water soluble ionic organic compounds. In ion exchange metals recovery, hazardous metal ions are removed and replaced by nonhazardous ions.

Acid leaching is used to treat hazardous wastes in solid or slurry form that either contain metal constituents that are soluble in a strong acid solution or can be converted by reaction with a strong acid to a soluble form. The acid leaching process is most effective with wastes that have high levels (over 1,000 parts per million) of metal constituents[3]. Leachate from acid leaching generally requires further processing (e.g., ion exchange) to recover metals from the solution.

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[3] *Treatment Technology Background Document*, January 1991, U.S. EPA, Office of Solid Waste, page 184

Inorganics Recovery

Inorganics Recovery Technologies

Acid regeneration is the primary technology for inorganics recovery and is used to recover mainly halogen and sulfuric acids. These acids are recovered by halogen acid furnaces and sulfur recovery furnaces, respectively, which are regulated under the Boilers and Industrial Furnaces (BIF) Rule. Halogen acid furnaces typically process chlorinated and brominated secondary waste streams, with 20 to 70 percent halogen content by weight, to produce either hydrogen chlorine or hydrogen bromine[4]. Sulfur recovery furnaces are used by sulfuric acid plants to process used sulfuric acid and other sulfur-containing wastes. Typical acid contaminants include organics, inorganics, and water. The contaminated acids and other halogen- or sulfur-containing compounds are thermally decomposed at elevated temperatures and the desired halogen or sulfur compounds captured from the exhaust gases, such as by passing the gases through converted catalyst beds.

Organics Recovery

Organics Recovery Technologies

Organics recovery technologies are used to separate liquid organic wastes, primarily spent solvents (both halogenated and nonhalogenated), for full or partial recovery. The most common technologies, described below, are distillation and solvent extraction. Other technologies include waste oil recovery and non-solvents organic recovery.

Distillation is a thermal treatment technology applicable to the treatment of wastes containing organics that are volatile enough to be removed by the application of heat. Constituents that are not volatilized may be reused or incinerated, as appropriate. Distillation is the process of separating volatile materials using evaporation followed by condensation. The liquids to be separated must have different volatilities and the degree of separation of these liquids is limited by the difference in their volatilities. Distillation for recovery can be limited by the presence of either volatile or thermally reactive suspended solids.

Important distillation technologies are:

CFractionation. This technology uses tray columns or packed towers equipped with a reboiler, condenser, and an accumulator. The process is not applicable for liquids with high viscosity at high temperature, liquids with a high concentration of solids, polyurethanes, and inorganics. In general, the process is used where recovery of multiple constituents is desired and the waste contains minimal amounts of suspended solids. This process achieves a high product purity.

CSteam Stripping. This process is essentially fractionation with steam as heat source. It is typically applied to wastes with less than 1 percent volatile organics[5].

CBatch Distillation. This technology uses a steam-jacketed vessel, a condenser, and a product receiver. Pressurized steam is usually the source of heat.

CThin Film Evaporation. This technology uses a steam-jacketed cylindrical vessel and condenser, where the material trickles down the inside cylinder walls in thin streams, and a distribution device that spreads the film over the heated surface. It can be

[4] 56 FR 7140

[5] *Treatment Technologies Background Document*, page 135

used to treat highly concentrated organic wastes that contain low concentrations of suspended solids.

Solvent extraction is used to treat wastes with a broad range of total organic content, such as certain oil refinery wastes. Constituents are removed from the waste by mixing it with a solvent that will preferentially dissolve the constituents of concern. The selection of a solvent depends on its solubility with the organic compounds to be removed and the other constituents in the waste. The waste and solvent must be physically immiscible so that after mixing the two immiscible phases can be physically separated by gravity. The process can be either batch or continuous. The simplest, least effective solvent extraction unit is a single-stage system (mixer-setter system). Other types of solvent extraction systems include multi-stage contact extraction (basically a series of single-stage units), countercurrent multi-stage extraction columns, and centrifugal contactors.

Stabilization/Chemical Fixation

Stabilization and chemical fixation refer to treatment processes that chemically or physically immobilize the hazardous constituents in a waste by binding the hazardous constituents into a solid mass. The resulting product has a low permeability that resists leaching.

Stabilization is used to treat wastes containing leachable metals and having a high filterable solids content, low organic carbon content, and low oil and grease content. The leachable metals in a waste are immobilized following the addition of stabilizing agents and other chemicals, and the resulting lattice structure and/or chemical bonds bind the metals to the solid matrix and thereby limit the amount of metal constituents that can be leached. The process normally requires a weighing device, a mixing unit (typically commercial concrete mixers), and a curing vessel or pad. Advantages of stabilization include inexpensive and plentiful raw materials and minimal pretreatment requirements. The main disadvantage is that the large volumes of additives required greatly increase the waste volume to be disposed. The main stabilization technologies are:

CLime-Based Pozzolan Process. This technology treats sludges and contaminated soils by adding large amounts of siliceous (silica) materials combined with a setting agent such as lime, forming a dewatered stabilized solidified product. Contaminants can include metals, waste oils, and solvents. Materials such as borates, sulfates, and carbohydrates interfere with the process.

CPortland Cement Pozzolan Process. This technology is similar to the lime-based pozzolan process except that the waste is mixed with portland cement. The process is effective for metal cations, latex and solid plastic wastes. Large amounts of dissolved sulfate salts or metallic anions (such as arsenate and borates) can interfere with solidification. Organic material, lignite, silt, or clay in the wastes will increase setting time.

CSorption. This technology, suitable for organics and inorganics, is commonly used to treat metal sludges removed from aqueous waste streams. Contaminants are bound up in pozzolan-type matrices by physical or chemical sorption, yielding a stabilized, easier to handle material. After treatment, the material is permeable and contains a high concentration of contaminants at its surface; consequently, contaminants may leach.

Two types of ***high temperature stabilization*** include vitrification and high temperature calcination. The vitrification process involves dissolving the waste at high temperatures into glass or glasslike matrix. It is applicable to nonwastewaters containing arsenic (usually in form of arsenate salts), other characteristic toxic metal constituents that are relatively nonvolatile at operating temperature of the process, and certain wastes containing organometallic compounds. The process is not applicable to volatile metallic compounds or wastes containing high levels of constituents that will interfere with the vitrification process, such as chlorides and halogen salts. High temperature calcination, applicable to inorganic wastes that do not contain volatile constituents, involves merely heating the material at high temperatures. The waste is sometimes blended with lime before heating. The process removes water from the waste, converts hydroxides to oxides, and converts the waste into a coherent mass, reducing surface area to minimum.

Fixation processes are applicable to liquid, semi-liquid, or solid wastes that may leach hazardous constituents. The processes can effectively treat a variety of hazardous wastes containing heavy metals, such as sludges from electroplating operations, ion-exchange resins from water demineralization, spent activated carbon, pesticides, nickel-cadmium battery sludge, and pigment production sludge. The process involves grinding a dewatered waste, mixing the resulting particles with a hardening resin, placing the mixture in a mold, and heating the material until it fuses. The product is hard, solid block with reduced leachability potential, improved handling, and minimal volume increase (unlike conventional stabilization techniques). The most serious drawback is uncertainty about long-term effectiveness.

In the main fixation technologies, asphalt-based and thermoplastic encapsulation, the dewatered waste is mixed within either an asphalt bitumen, paraffin, or polyethylene matrix. These technologies are applicable to hazardous wastes that are complex and difficult to treat, but should not be used for waste with high-water content, strongly oxidizing contaminants, anhydrous inorganic salts, tetraborates, iron and aluminum salts, or volatile organics.

Another stabilization/fixation technology is ***polymerization***. This technology has been applied to spills and used catalysts to convert a monomer or a low-order polymer of a particular compound to a larger polymer. Larger polymers generally have greater chemical, physical, and biological stability. The process is used to treat organics, including aromatics, aliphatics, and oxygenated monomers such as styrene, vinyl chloride, isoprene, and acrylonitrile.

These technologies expand the volume of hazardous wastes to be disposed. The stabilization/fixation of characteristic hazardous waste often generates residuals that are not characteristically hazardous and therefore can be disposed of in Subtitle D landfills.

Combustion-Pumpable and Combustion-Nonpumpable

As explained in the text of the Report, EPA has reorganized the four incineration and energy recovery CAP Management Categories into two categories: Combustion-pumpable and Combustion-Nonpumpable combustion. Combustion-Pumpable includes energy recovery for liquids and incineration of liquids and gases. Combustion-Nonpumpable includes energy recovery and incineration for solids and sludges.

Combustion Technologies

Energy recovery systems burn hazardous waste for its fuel value. The capacity to burn liquids as fuel dominates at a national level, as sludges and solids are not often burned for recovery. Types of energy recovery systems are discussed below. See the discussion of inorganics recovery and of fuel blending for related topics.

C<u>Industrial Kilns</u>. Cement and lightweight aggregate kilns can burn liquid hazardous wastes for their heat value. (A few cement kilns also burn small containers of viscous or solid hazardous waste fuels.) Typically, cement kilns blend the wastes with fossil fuels while aggregate kilns burn 100 percent liquid hazardous waste.

C<u>Industrial Boilers</u>. Some industrial boilers can use limited amounts and types of hazardous wastes as supplements to fossil fuels. The wastes are commonly blended before using as fuel.

All of these units which are currently burning hazardous waste are operating under interim status and have applied for RCRA Part B permits.

Incineration uses controlled, high-temperature combustion processes to break down the organic compounds in a hazardous waste. The incineration of hazardous waste must be performed in accordance with the incinerator design and emmissions regulations in 40 CFR, Subpart O. Incinerators can burn pumpable waste (liquids and gases), nonpumpable waste (solids and sludges), or both.

Several types of incinerators are discussed below.

CLiquid Injection Incinerators. These incinerators are used widely for destruction of liquid organic wastes. They operate by spraying the waste mixed with air into a chamber where flame oxidation occurs.

CRotary Kilns. Rotary kilns can treat most types of solids, liquids, and gases. They consist of a long inclined tube where the waste is placed and rotated slowly as heat is applied. The process is intended for solids, but liquids and gases can be mixed with the solids.

CFluidized-bed Incinerators. Air is blown through a granular bed (usually sand) until the particles are suspended and move and mix like a fluid. The heated particles come in contact with the wastes to be incinerated and improve the heat transfer. This type of incineration is ideal for sludge and slurries.

Other types of incinerators include two-stage and fixed hearth.

The ash produced from the combustion of hazardous waste also may be hazardous, and therefore must be further treated by stabilization before disposed in a landfill.

Fuel Blending

Fuel blending is the process of blending hazardous waste streams together, generally in tanks, to obtain a fuel that meets the specifications of fuel burners (e.g., energy recovery systems). Fuel blending is not a stand-alone treatment technology; the resulting fuels are subsequently burned, either on or off site, by the systems described under the Combustion-Pumpable and Combustion-Nonpumpable CAP Management Categories.

Hazardous Wastewaters and Sludges Treatment

This CAP Management Category covers a broad range of treatment technologies and treats the largest volume of hazardous waste of any CAP Management Category. Wastes that are treated in this category either undergo further treatment (under this or other CAP Management Categories) or are sent for disposal. Many of these technologies are used together in one treatment system (e.g., chrome reduction followed by chemical precipitation). The discussion of these technologies is organized by the principal type of waste treated: aqueous inorganic, aqueous organic, aqueous inorganic and organic, sludge, and other.

Aqueous Inorganic Treatment

Chrome reduction (hexavalent) is applicable to wastes containing hexavalent chromium wastes, including plating solutions. The process uses a chemical reaction with a reducing agent, such as sulfur dioxide or sodium bisulfite, to reduce chromium from a hexavalent to a trivalent state, so that the chromium can be more easily precipitated. The reduced chromium compounds are precipitated from the solution by raising the pH and the resulting insoluble form of chromium is allowed to settle from the solution.

Cyanide destruction is applicable to wastes containing high concentrations of cyanide, such as concentrated spent plating solutions. This technology is often applied as pretreatment prior to chemical oxidation. The waste is subject to electrolytic reaction with dissolved oxygen in an aqueous solution and broken down into carbon dioxide, nitrogen, and ammonia. The procedure is conducted at elevated temperature, depends on the conductivity of waste, and occurs in a closed cell.

Chemical oxidation changes the chemical form of hazardous material through a chemical reaction with an oxidizing agent that

produces carbon dioxide, water, salts, and simple organic acids. Principal chemical oxidants include hypochlorite, chlorine gas, chlorine dioxide, hydrogen peroxide, ozone, and potassium permanganate. This technology is used to treat wastes containing organics, sulfide wastes, and certain cyanide and metal wastes.

Chemical precipitation is used to treat wastewaters containing metals and other inorganic substances such as fluoride. The process removes these metals and inorganics from solution in the form of insoluble solid precipitate by adding a precipitating agent (e.g., lime, caustic (NaOH), sodium sulfide). The solids that form are then separated from the wastewater by settling, clarification, and/or polishing filtration. Pretreatment may be required for some wastewaters, such as those that contain chromium or cyanide.

Ion exchange is used to treat hazardous wastewaters with metals that are present as soluble ionic species, nonmetallic anions such as halides, sulfates, nitrates, and cyanides, and water soluble ionic organic compounds. Typically, the waste constituents are removed when a waste solution is percolated through a granular bed of the ion exchanger, in which ions from the waste are exchanged with those in the ion exchanger.

Reverse osmosis involves a dilute solution and concentrated solution separated by a semi-permeable membrane. When high pressure is added to the concentrated side, the solution flows through the membrane to the more dilute side, collecting waste constituents that are unable to pass through the membrane.

Aqueous Organic Treatment

Biological treatment processes are used to decompose hazardous organic substances with microorganisms. These processes require stable operating conditions and usually take place in tanks or lagoons. The most common type is aerobic biological treatment, including activated sludge treatment. This method treats wastewaters with low levels of nonhalogenated organics and certain halogenated organics.

Carbon adsorption is used to treat aqueous organic wastewaters with high molecular weights and boiling points and low solubility and polarity, chlorinated hydrocarbons, and aromatics (e.g., phenol). The wastewater is passed through activated carbon beds which attract and hold (adsorb) the organic waste constituents (and possibly inorganics and metals), removing them from the water.

Air stripping is a process used to treat aqueous organic waste with relatively high volatility and low water solubility. The volatile contaminants are evaporated into the air and captured for subsequent treatment. ***Steam stripping*** is used to treat aqueous organic wastes contaminated with chlorinated hydrocarbons, aromatics, ketones, alcohols. This technology can treat less volatile and more soluble wastes than air stripping and can handle a wide concentration range. First, steam is used to evaporate volatile organics. The evaporated organics are then captured, condensed, and reused or further treated.

Aqueous Inorganic/Organic Treatment

Wet air oxidation is used to treat aqueous waste streams with less than five percent organics, pesticides wastes, and wastewaters containing sulfur, cyanide, or phenolic compounds. It is not recommended for treating aromatic halogenated organics, inorganics, or large volumes of waste. The aqueous solution is heated in the presence of compressed air and dissolved or finely divided organics are oxidized. These oxidized products usually remain in the liquids phase. These liquids can then further treated or sent for disposal. An important advantage of wet air oxidation is that it accepts waste with organic concentrations ranging between those considered ideal for biological treatment or for incineration.

Sludge Treatment

Sludge dewatering (sludge filtration) is used for wastes with high concentrations of suspended solids (generally higher than 1 percent). Sludges can be dewatered to 20 to 50 percent solids. The solid particles are separated from the waste through a filter that permits fluid flow but retains the particles. For this technology, waste can be pumped through a porous filter, drawn by vacuum through a cloth filter, or gravity-drained and mechanically pressured through two continuous fabric belts.

Solvent extraction is used to treat wastes with a broad range of total organic content, such as certain oil refinery wastes. Constituents are removed from the waste by mixing it with a solvent that will preferentially dissolve the constituents of concern. The waste and solvent must be physically immiscible so that after mixing the two immiscible phases can be physically separated by gravity.

Other sludge treatment methods include addition of excess lime or caustic to increase the alkalinity of the waste and absorption/adsorption processed to remove liquid from the sludge.

Other Wastewaters Treatment

Neutralization is used to treat waste acids and alkalies (bases) in order to eliminate or reduce their reactivity and corrosiveness. In this process, an excess of acidic ions (H^+) is balanced with an excess of base ions (OH^-) to form a neutral solution.

Evaporation is physical separation of a liquid from a dissolved or suspended solid by adding energy to volatilize the liquid. It can be applied to any mixture of liquids and nonvolatile solids. The liquid should volatilize at reasonable temperature.

There are many types of ***settling/clarification*** processes. One type is sedimentation, which is a gravity-settling process that allows heavier solids to separate from fluid by collecting at bottom of a containment vessel such as settling ponds or a circular clarifier. Additional treatment is needed for the liquid and separated sludge. Flocculation is the addition of a chemical to a waste to enhance sedimentation and centrifugation, primarily for inorganic precipitation.

Phase separation refers to processes such as emulsion breaking and filtration. Emulsion breaking uses gravitational force to separate liquids with sufficiently different densities, such as oil and water. This process is enhanced by adding certain acids. Filtration is process of separating and removing suspended solids from a liquid by passing the liquid through a porous medium (see sludge dewatering). Polishing filtration, applied to wastewaters containing relatively low concentrations of solids, is used after chemical precipitation and settling/clarification of wastewaters containing inorganic precipitates to remove additional particles, such as those that are difficult to settle because of their shape or density.

Landfill

Land Disposal Methods

The ***landfill*** category includes landfill and surface impoundment disposal. Waste disposed in a landfill is placed on or beneath the surface of the ground and covered with soil or other material, to isolate the wastes from the environment. Landfills are required to have double liners, leachate collection systems, and ground-water monitoring programs. Wastes not permitted to be disposed in landfills include bulk or non-containerized liquid nonhazardous and hazardous waste, or free liquids containing hazardous waste. In addition, wastes such as acids must be segregated to prevent reactions with other wastes or waste constituents.

A surface impoundment is a natural topographic depression, man-made excavation, or diked area, such as a pond, pit, or lagoon, that can be used for disposal if the closure requirements for a landfill are followed. Surface impoundments are open on the surface and are designed to accumulate organic and inorganic liquid wastes, sludges, and slurries. Surface impoundments are

now required to have double liners, leachate collection systems, and routine inspections[6].

Under the RCRA Land Disposal Restriction (LDR) program, hazardous wastes generally cannot be disposed in landfills or surface impoundments until after the waste has been properly treated. Thus, disposal facilities receive treatment residuals, such as incinerator ash or stabilized wastes[7].

Data Issues

Unlike other CAP Management Categories, landfill capacity is non-renewable; that is, landfill capacity used in one year is not available in the next. (Thus, the units for capacity data are in tons not tons/year.) Without the addition of new landfill capacity by the siting of new facilities or expansion of existing facilities, landfill capacity declines over time.

The landfill capacity data include landfill cells that are not yet permitted, but are at landfills that are permitted and operating. Also, two states have imposed annual limits on the amount of hazardous waste that commercial landfills in their states can receive. The national assessment methodology assumes that these annual limits reflect the actual capacity in these states.

Deepwell/Underground Injection

Deepwell/underground injection is the disposal of hazardous wastewaters by injection into underground rock formations. Wastes are injected through bored, drilled, or driven wells, or through dug wells where the depth of the well is greater than its largest surface dimension. The disposal method relies on hydrogeological principles of the movement of liquids in layers of deep underground rock; the most desirable injection zone has sedimentary rocks with sufficient permeability, thickness, depth, and areal extent. Underground injection is most suitable for wastewaters that are low in volume and high in concentration, difficult and costly to treat by surface methods, biologically inactive, noncorrosive, free of suspended solids, and unlikely to react adversely with the rock strata or the fluid used to pressurize the wells. Much of the waste is pretreated to remove suspended solids or adjust the pH. As noted for the Landfill category, hazardous wastes generally cannot be disposed in underground injection wells unless the applicable LDR treatment standards are met[8]. Capacity amounts are determined by permit. Note that many of the wastewater treatment technologies are technically capable of also treating the wastes being disposed through deepwell and underground injection.

Land Treatment/Farming

Wastes disposed by ***land treatment/farming*** must meet LDR treatment standards and land treatment facilities must meet minimum technology standards[9]. his disposal method is only used at onsite and captive facilities; it is not used commercially and the National Assessment does not include projections for this CAP Management Category. Land treatment/farming is used to dispose of biodegradable hazardous wastes by depositing the wastes on or near the soil surface, mixing the wastes with the soil using conventional plow techniques, and allowing the wastes to be naturally decomposed by microbes such as algae and bacteria. The

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[6] 40 CFR 268.4

[7] 40 CFR 268.40

[8] 40 CFR 148.1

[9] 40 CFR 264.271

hazardous wastes, including organic liquid wastes and sludges, often require pretreatment before disposal to reduce or eliminate their hazardous attributes. The effectiveness of waste degradation is affected by many factors including the density and makeup of the microbe populations, which vary with soil depth and geographic location, and the care given to the waste after being deposited. The regulatory standards for this technology require the owner or operator to establish a program to ensure that hazardous constituents placed within the facility's treatment zone are degraded, transformed, or mobilized within that zone[10].

Transfer/Storage

This CAP Management Category captures those hazardous wastes that are shipped off site to transfer facilities which store the waste for short periods of time, sometimes bulking the waste with other shipments, and then shipping the waste to hazardous waste management facilities. The hazardous waste must be stored for less than 90 days, or the transfer facility becomes subject to the standards and permitting requirements for hazardous waste management facilities. If the waste is stored more than 10 days (but less than 90 days), the transfer facility is subject to the storage requirements of RCRA Subtitle C. If the waste is stored 10 days or less, the facility is subject only to transporter regulations[11]. Transporters that mix hazardous wastes with different Department of Transportation (DOT) shipping descriptions in the same container are classified as generators and must comply with the relevant RCRA Subtitle C regulations.

[10] 40 CFR 264.271

[11] 40 CFR 268.50