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Background Document For Second Third Wastes To Support 40 CFR Part 268 Land Disposal Restrictions

Final Rule

Second Third Waste Volumes, Characteristics, and Required and Available Treatment Capacity

Volume I

BACKGROUND DOCUMENT
FOR
SECOND THIRD WASTES TO SUPPORT 40 CFR
PART 268 LAND DISPOSAL RESTRICTIONS

FINAL RULE

SECOND THIRD WASTE VOLUMES, CHARACTERISTICS,
AND REQUIRED AND AVAILABLE TREATMENT CAPACITY

Volume I

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Volume II

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EXECUTIVE SUMMARY

This document supports the final rule for the Second Third of the wastes scheduled for restriction from land disposal under section 3004(m) of the Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA). It presents the estimates of the quantities of wastes that will require alternative treatment and recovery prior to land disposal. It also presents estimates of alternative treatment and recovery capacity available to manage wastes restricted from land disposal, taking into account the demands already placed on that capacity by previous land disposal restrictions.

To date, the Land Disposal Restrictions Program has promulgated final rules on the surface disposal (treatment or storage in waste piles; treatment, storage, or disposal in surface impoundments; and disposal in landfills and land treatment units) of solvent and dioxin-containing wastes, California List wastes, and wastes from the First Third of the "scheduled" wastes. It has also promulgated final rules on the underground injection of solvent and dioxin-containing wastes, California List wastes, and certain wastes included within the First Third scheduled wastes. From this point forward, restrictions on surface disposal and underground injection become concurrent. This document, therefore, includes capacity analyses for both surface disposal and underground injection wastes.

All capacity analyses supporting the land disposal restrictions program are now based primarily on data developed from the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling

Facilities (the TSDR Survey). This survey was designed as a census of all RCRA-permitted and interim status hazardous waste treatment, disposal, and recycling facilities. It also contains a representative sample of hazardous waste storage facilities. Data developed from the TSDR Survey provide detailed information on the volume and characteristics of wastes sent to land disposal, as well as on capacity for treatment and recovery. Before the TSDR Survey was available, earlier rules relied primarily on the 1981 Regulatory Impact Analysis (RIA) Mail Survey. Since all analyses using these data have been reevaluated using TSDR Survey data, previous results based on the old data are not mentioned here unless the new data have led to regulatory revisions.

Legal Background

The Hazardous and Solid Waste Amendments (HSWA) to RCRA, enacted on November 8, 1984, set basic new priorities for hazardous waste management. Land disposal, which has been the most widely used method for managing hazardous waste, is now the least preferred option. Under HSWA, the U.S. Environmental Protection Agency (EPA) must promulgate regulations restricting the land disposal of hazardous wastes according to a strict statutory schedule. As of the effective date of each regulation, land disposal of untreated wastes covered by that regulation is prohibited unless it can be demonstrated that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous.

HSWA's schedule divided hazardous wastes into three broad categories. The first category, which contained wastes restricted under regulations issued on November 7, 1986, includes generic solvent and dioxin wastes. The second category, whose final rule was issued on July 8, 1987, covers wastes originally listed by the State of California and adopted intact within HSWA. The "California List" comprises the following classes of wastes: liquid hazardous wastes with a pH of less than or equal to 2.0 (acidic corrosive wastes); all liquid hazardous wastes containing free cyanides, various metals, and polychlorinated biphenyls (PCBs) exceeding statutory concentration levels; and all wastes (liquid, sludge, or solid) containing halogenated organic compounds (HOCs) in concentrations greater than or equal to specified statutory levels. All other hazardous wastes fall into the last category, referred to as "scheduled" wastes. HSWA requires EPA to promulgate regulations for these wastes on a timetable that would restrict at least one-third of them by August 8, 1988, at least two-thirds of them by June 8, 1989 (today's final rule), and the remainder by May 8, 1990, i.e., the First, Second, and Third Third scheduled wastes, respectively.

Under the land disposal restriction program, EPA must identify levels or methods of treatment that substantially reduce the toxicity of a waste or the likelihood of migration of hazardous constituents from the waste. Where possible, EPA prefers to define treatment in terms of performance (i.e., levels of treatment, expressed as a concentration of hazardous constituents in residuals from treatment) rather than in terms of specific treatment methods. HSWA requires, however, that levels specified in the regulations be demonstrated and available. Accordingly, EPA's standards are generally based on the performance of the best demonstrated available technology (BDAT), as documented by treatment data collected at well-designed and well-operated systems using that technology, or are based on data derived from the treatment of similar wastes that are as difficult or more difficult to treat.

The land disposal restrictions are effective immediately upon promulgation unless the Agency grants a national variance from the statutory date because of a lack of available capacity. For every waste group, EPA considers, on a national basis, both the capacity of commercially available treatment or recovery technologies and the quantity of restricted wastes currently sent to land disposal for which onsite capacity is not available. If the Agency determines that adequate alternative treatment or recovery capacity is available for a particular waste or waste group, the land disposal restriction goes into effect immediately. If not, the Agency establishes an alternative effective date based on the earliest date on which adequate treatment or recovery capacity will be available, or 2 years, whichever is less.

Summary of Capacity Analyses for Previous Rules

Estimates of the need for, and availability of, alternative hazardous waste management capacity for previous land disposal restrictions rules are described below.

Solvents and Dioxins

EPA promulgated the first rule under the land disposal restriction program on November 7, 1986 (51 FR 40572). This rule established treatment standards expressed as concentrations in waste extracts for spent solvent wastes (F001-F005) and wastes contaminated with dioxin (F020-F023 and F026-F028). It prohibited land disposal of wastes in these categories unless they contain less than the specified concentrations.

EPA's original capacity analysis for solvent wastes, based on the RIA Mail Survey, indicated shortfalls in available capacity for wastewater treatment and incineration. The Agency therefore granted a 2-year national capacity variance for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) wastes and RCRA corrective action wastes, small quantity generator wastes, and all wastes containing less than 1 percent total F001-F005 solvent constituents. When the initial analysis was later reevaluated using TSDR Survey data, however, EPA found that capacity is adequate for these wastes.

The original capacity analysis for dioxin-containing wastes showed that there was no available incineration capacity for these wastes. The November 7, 1986, rule, therefore, also granted a 2-year national capacity variance for these wastes. Current capacity estimates for these wastes are unchanged.

California List Wastes

The California List defines wastes in terms of general characteristics rather than waste codes. It covers classes of wastes originally listed by the State of California and adopted intact within HSWA, including all liquid hazardous wastes with a pH of less than or equal to 2.0 (acidic corrosive wastes), all liquid hazardous wastes containing free cyanide, metals, or PCBs in concentrations greater than or equal to limits specified in HSWA, and all hazardous wastes (liquid, sludge, or solid) containing HOCs in amounts greater than or equal to limits specified in HSWA.

EPA promulgated its final rule on the California List wastes on July 8, 1987 (52 FR 25760). For HOC wastes, EPA specified incineration as the required treatment and did not set a concentration-based limit for treatment. For PCB wastes, the Agency specified thermal treatment in accordance with 40 CFR 761.60 as the treatment standard. For acidic corrosive wastes, the Agency prohibited all land disposal of wastes with a pH of less than or equal to 2.0, but did not specify a treatment standard. The final rule did not establish prohibition levels for metal or cyanide wastes, so the prohibition limits specified in the statute took effect.

The capacity analysis for the California List rule was originally based on the RIA Mail Survey, which indicated that incineration capacity for HOC wastes was inadequate. The Agency had therefore granted a 2-year national variance for HOC wastes. Capacity was found to be adequate for all other California List wastes. The HOC variance was rescinded on November 8, 1988, however, because the later capacity analysis using the TSDR Survey found incineration capacity to be adequate and the variance unnecessary.

First Third Wastes

EPA promulgated the final rule for certain First Third wastes on August 17, 1988. The remaining First Third wastes, for which treatment standards were not established, thus became covered by the "soft hammer" requirements. Under the soft hammer requirements, such wastes may continue to be disposed of in a landfill or surface impoundment in compliance with the minimum technological requirements specified in RCRA section 3004(o) only after it has been certified to EPA that no treatment capacity is available and that disposal is the only practical alternative. Such continued land disposal is allowed until EPA sets a standard for the waste in question. If the Agency has not set a standard by May 8, 1990, the waste is automatically prohibited from further land disposal.

The capacity analysis for the First Third wastes indicated that adequate treatment capacity exists for all First Third wastes except the following:

- Petroleum refining wastes (K048, K049, K050, K051, K052), for which BDAT is sludge incineration or solvent extraction;
- High zinc (greater than or equal to 15 percent zinc) electric arc furnace dust (K061), for which BDAT is high temperature metals recovery; and
- Mercury cell chlorine production waste (K071), for which BDAT is acid leaching.

The Agency therefore granted 2-year national capacity variances to all these wastes. In the case of high zinc K061 wastes, however, it required these wastes to be treated to meet the standard for low zinc wastes based on stabilization during the variance period.

Underground Injected Wastes

EPA has promulgated two final rules restricting the underground injection of certain wastes and proposed a third. The first final rule, promulgated on July 26, 1988, addressed solvent and dioxin wastes. Using the TSDR Survey data, EPA found that capacity is adequate for underground injected solvent wastes containing greater than or equal to 1 percent total F001-F005 solvent constituents, for which the BDAT technology is incineration; thus, no variance was granted to these wastes.

On the other hand, the TSDR Survey data indicated that alternative treatment capacity is inadequate for underground injected solvent wastes containing less than or equal to 1 percent total F001-F005 solvent constitutents, for which the BDAT technology is wastewater treatment. The Agency therefore granted a national capacity variance for these wastes until August 8, 1990.

In addition, the Agency also found that no dioxin-containing wastes are being underground injected, so no alternative treatment capacity is required for these wastes, and they were not granted a capacity variance.

The second final rule, promulgated on August 16, 1988 (53 FR 30908), addressed underground injection of California List wastes and certain First Third wastes (K049-K052, K062, K071, and K104). This analysis showed inadequate alternative treatment capacity for almost all underground injected California List wastes, the only exceptions being for liquid wastes containing greater than 50 ppm PCBs and liquid and nonliquid wastes containing greater than 1,000 ppm of HOCs, all of which require incineration. It also found that alternative treatment capacity is inadequate for all underground injected First Third wastes covered by the rule. EPA therefore granted national capacity variances until August 8, 1990, for all underground injected First Third wastes and all underground injected California List wastes for which treatment capacity is inadequate.

On October 26, 1988 (53 FR 43400), EPA proposed its regulatory approach for underground injected First Third wastes not included in the August 16 rule. Where BDAT standards had been promulgated under the First Third final rule (August 17, 1988), the approach proposed to adopt those standards by reference. Where BDAT standards had not been promulgated, the wastes will continue to be covered by the soft hammer requirements.

In the case of dilute K016 (<1 percent) wastewaters, EPA found that insufficient capacity exists for treatment and therefore proposed to grant a national capacity variance. In all other cases, adequate treatment capacity exists for all underground injected First Third wastes for which BDAT treatment standards have been promulgated and did not propose to grant any other variances. EPA plans to finalize this rule in June 1989.

Data Sources for the Current Capacity Analysis

TSDR Survey

The TSDR Survey was originally mailed to approximately 2,400 RCRA-permitted or interim status facilities in August 1987. Since that date, an additional 225 new or previously overlooked facilities have been included. By April 1989, the cutoff date for the capacity analysis for the Second Third wastes, over 2,500 surveys had been received, reviewed for completeness and accuracy, and analyzed.

Of the approximately 2,500 facilities, 475 reported onsite land disposal/land placement of 63 billion gallons of RCRA hazardous waste in the baseline year 1986. Of the total facilities, 236 reported having commercially available treatment/recovery technologies onsite in 1988; these facilities accounted for 11.4 billion gallons of treatment capacity in 1988. Of this 11.4 billion gallons of capacity, however, only a subset of facilities offered BDAT treatment technologies applicable to the rules promulgated to date (the final rules summarized above, plus the current Second Third final rule). Some facilities offered various applicable BDAT noncombustion technologies, mostly wastewater treatment, accounting for an estimated total capacity of 8.7 billion gallons per year in 1988. Sixty facilities reported commercial combustion processes, i.e., incineration or reuse as fuel, applicable for burning hazardous wastes currently land disposed. The facilities accounted for a maximum of 579 million gallons of capacity in 1988.

Generator Survey

EPA recently conducted the National Survey of Hazardous Waste Generators (the Generator Survey). The Generator Survey was designed to gather data on waste generation and exempt hazardous waste treatment and recovery capacity, and it includes detailed hazardous waste characterization data. Although the majority of these data are not yet available, EPA used a small subset of the data to evaluate the amount of alternative treatment capacity required by electroplating wastes, i.e., F006 waste streams.

Data available for the F006 analysis included about 550 Generator Surveys from facilities not having a RCRA permit or interim status but with exempt hazardous waste treatment capacity onsite (non-TSDRs).

The Agency also reviewed preliminary waste characterization data from the Generator Survey for about 950 TSDR facilities with land disposal or commercial treatment/recovery operations (these data have not yet undergone comprehensive technical review and QA/QC procedures).

Methodology for Capacity Analysis

To evaluate the adequacy of alternative treatment capacity for specific waste categories, EPA first puts restricted wastes into "treatability groups" that require similar treatment or management practices; for instance, all wastes requiring sludge incineration would be placed in the same treatability group. Where wastes present particular problems in treatment, the Agency may identify "treatment trains" of multiple technologies operating in sequence. Volumes of wastes in each treatability group are adjusted to reflect the November 1988 deadline regarding minimum technology requirements for surface impoundments. The net total volume of currently land disposed hazardous waste requiring alternative treatment capacity becomes the required capacity for that treatability group. EPA then assigns the volumes of waste in each treatability group to treatment technologies or treatment trains.

Determinations of available capacity take several factors into account. Some treatment processes will generate various treatment residuals, which then have to be assigned to, and accounted for within, other treatability groups. Available capacity--the difference between currently utilized capacity and the total capacity of the treatment system--must take into account the commercial status of each facility managing waste within a treatability group:

- Available treatment capacity at onsite facilities used exclusively by the waste generator cannot be considered available to other generators.
- All commercially available capacity at commercial facilities is considered fully available to any generator.

Capacity analysis begins at the facility level and aggregates upward toward the national level, assigning available excess capacity by observing the above rules. For example, available capacity at private treatment systems applies only to wastes currently land disposed at the same site. Remaining wastes are assigned to commercial capacity.

Each regulation within the Land Disposal Restrictions Program accounts for the sequential and cumulative effects of all previous regulations and for projected capacity changes after 1986, as reported in the TSDR Survey. Solvents and dioxins were considered first, followed by California List wastes, First Third promulgated wastes, and, finally, the Second Third wastes. Available capacity has been assigned first to all affected surface disposed wastes and then to all underground injected wastes. EPA sets this priority because it believes that land disposal in surface units may represent a greater threat to human health and the environment than does underground injection.

Revisions to Proposed Rule

Since publication of the Second Third proposed rule, EPA has made a number of revisions to the capacity determinations for wastes subject to the Second Third final rule. Major revisions are summarized below.

Recently, EPA amended the schedule for prohibiting hazardous wastes from land disposal to include multisource leachates (and residuals from their treatment) under the same schedule as Third Third wastes. As a result, one 16 million-gallon solvent waste stream, which required sludge incineration, is no longer subject to the solvent land disposal restrictions. Consequently, the 16 million gallons of sludge/solid incineration capacity previously assigned to this waste is now available for the Second Third final rule.

For the proposed rule, EPA included capacity from several commercial incinerators and industrial kilns that were scheduled to be operational prior to promulgation of the Second Third final rule. However, EPA was unable to confirm that these units have in fact become operational and therefore has not included this capacity in its determinations for this final rule.

In addition, EPA has included, for the sake of completeness, the capacity of commercial industrial boilers and furnaces previously excluded. Consequently, this final rule reflects an increase in the amount of liquids combustion capacity.

EPA has also revised its determination of available stabilization capacity, based on new data from late reporting facilities and updated data received since publication of the proposed rule. Although not affecting any capacity variance determination, the data were included for the sake of completeness.

Finally, EPA is continually revising and adding to the TSDR Survey capacity data base to reflect the addition of new data from late reporting facilities and any corrections made during further evaluation of the data. Again, although none of these revisions have affected any capacity determinations, they have been included for the sake of completeness. The data contained in this document, therefore, represent the most complete data currently available to EPA.

Results of the Capacity Analysis

Table 1 shows commercial capacity remaining to manage all Second Third wastes, taking into account the capacity already allocated to other wastes under all previous land disposal restrictions. Remaining Second Third capacity is estimated by subtracting requirements for previously restricted wastes from the capacity available in 1988. This table represents the most current data available to the Agency and includes all revisions described in the previous subsection.

Using the remaining capacity for Second Third wastes as a base, Table 2 shows the capacity needs for all Second Third wastes that are not underground injected. This table shows that sufficient capacity exists to treat all wastes that are currently land disposed in surface units. However, in order to allow time, if needed, for modifications to treatment systems, EPA is delaying implementation of the cyanide standards for the electroplating wastes (F006, F007, F008, and F009) for 30 days. In addition, for heat treating wastes (F011 and F012), EPA is delaying implementation of the cyanide standards until December 8, 1989, to allow time for generators to segregate these wastes for proper treatment. Between July 8, 1989, and December 8, 1989, however, heat treating wastes will be subject to the cyanide standards applicable to electroplating wastes.

Subtracting out capacity for surface-disposed wastes, Table 3 allocates remaining capacity to underground injected Second Third wastes. In this case, the table shows that capacity shortages exist for underground injected wastes requiring liquids combustion, steam stripping followed by biological treatment, and alkaline chlorination and chemical precipitation. Consequently, EPA has granted a 2-year national capacity variance to underground injected F007 wastes requiring alkaline chlorination and chemical precipitation; K009 wastes requiring steam stripping followed by biological treatment; and K011, K013, and K014 wastes requiring liquids combustion. Furthermore, in order to allow time, if needed, for modifications to treatment systems, EPA is delaying implementation of the cyanide standards for the electroplating wastes (F006, F007, F008, and F009) for 30 days. In addition, for heat treating wastes (F011 and F012), EPA is delaying implementation of the cyanide standards until December 8, 1989, to allow time for generators to segregate these wastes for proper treatment. Between July 8, 1989, and December 8, 1989, however, heat treating wastes will be subject to the cyanide standards applicable to electroplating wastes.

Table 4 further summarizes the results of Tables 2 and 3 by waste code, indicating the capacity needs for each surface-disposed or underground injected waste, and whether or not available capacity is adequate.

Table 1 Determination of Available Capacity for Second Third Wastes[a]
(million gal/yr)

Technology	1988 Available capacity	Required capacity by: Solvents rule	CA List HOCs	Solvents[b] UIW	First Thirds	First Third and CA List UIW[c]	Remaining capacity for Second Thirds
Combustion:							
- liquids	340	1	<1	57	<1	<1	282
- sludge/solids	47	22	2	0	6	0	17
Stabilization	751	4	<1	<1	231	<1	516
Wastewater treatment for organics							
- steam stripping	2	0	0	0	0	0	2
- carbon adsorption	2	0	0	0	0	0	2
- wet air oxidation	2	0	0	0	0	0	2
- biological treatment	53	2	7	0	0	<1	44
Alkaline chlorination and chemical precipitation	46	<1	0	0	13 [d]	0	33
Chromium reduction and chemical precipitation	149	0	0	0	40	0	109
Carbon adsorption, chromium reduction, and chemical precipitation	31	0	0	0	1	0	30

Source: TSDR Survey unless otherwise noted.

[a] All numbers in millions of gallons per year.
[b] Extracted from 53 FR 28118-28155.
[c] Extracted from 53 FR 30908-30918 and 53 FR 43400-43408.
[d] Required capacity for F006 wastes based on the need for capacity resulting from the promulgation of the cyanide standard on June 8, 1989.

UIW = Underground Injected Wastes

Table 2 Summary of 1988 Capacity Analysis for Second Third Promulgated Wastes[a]

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)	Comment
Combustion			
- Liquids	282	<1	No capacity variance
- Sludges/solids	17	9	No capacity variance
Wastewater treatment			
- Alkaline chlorination	33 [c]	2	No capacity variance
- Steam stripping followed by biological treatment	0	0	No capacity variance
- Electrolytic oxidation followed by alkaline chlorination	0	0 [b]	No capacity variance
- Carbon adsorption	2	0	No capacity variance
- Biological treatment	44	<1	No capacity variance
Stabilization	516	2	No capacity variance

[a] Volumes do not include underground injected waste and soils/debris.

[b] These wastes have been included with the waste requiring alkaline chlorination.

[c] Alkaline chlorination capacity has been adjusted to account for 13 million gallons of capacity that may be needed for F006 wastes

Table 3 Summary of 1988 Capacity Analysis for Underground Injected Second Third Promulgated Wastes

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)	Comment
Combustion			
- Liquids	282	379	National capacity variance (K011 and K013)
Wastewater treatment			
- Alkaline chlorination	31	126	National capacity variance (F007)
- Biological treatment	44	<1	No capacity variance
- Steam stripping followed by biological treatment	0	79	National capacity variance (K009)
- Carbon adsorption	2	<1	No capacity variance
Stabilization	514	1	No capacity variance

Table 4 Summary of 1988 Capacity Analysis for Second Third Wastes by Waste Code

	Wastes streams other than soil and debris				
Waste Code	Surface disposed volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Underground injected volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Total (million gal/yr)
F007	1.3	yes	127.6	no	128.9
F008	2.7	yes	<0.1	yes	2.7
F009	0.3	yes	<0.1	yes	0.3
F010	0.2	yes	0	yes	<0.1
F011	0.1	yes	0	yes	0.1
F012	0.1	yes	0	yes	0.1
F024	<0.1	yes	0	yes	<0.1
K005	0	yes	0	yes	0
K007	0	yes	0	yes	0
K009	0	yes	79	no	79
K010	0	yes	5	yes	5
K011	0.2	yes	173.4	no	173.6
K013	0.1	yes	173.4	no	173.5
K014	<0.1	yes	0	yes	<0.1
K023	0	yes	0	yes	0
K027	7.6	yes	0	yes	7.5
K028	0	yes	0	yes	0
K029	0	yes	0	yes	0
K036	0	yes	0	yes	0
K038	0	yes	0	yes	0
K039	0	yes	0	yes	0
K040	0	yes	0	yes	0
K043	0	yes	0	yes	0
K093	<0.1	yes	0	yes	<0.1
K094	<0.1	yes	0	yes	<0.1
K095	0	yes	0	yes	0
K096	0	yes	0	yes	0
K113	0	yes	0	yes	0
K114	0	yes	0	yes	0

Table 4 (Continued)

Waste Code	Wastes streams other than soil and debris: Surface disposed volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Underground injected volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Total (million gal/yr)
K115	0.2	yes	0	yes	0.2
K116	0	yes	0	yes	0
P013	0	yes	0	yes	0
P021	0	yes	0	yes	0
P029	0	yes	<0.1	yes	<0.1
P030	<0.1	yes	<0.1	yes	<0.1
P039	<0.1	yes	0	yes	<0.1
P040	0	yes	0	yes	0
P041	0	yes	0	yes	0
P043	0	yes	0	yes	0
P044	<0.1	yes	0	yes	<0.1
P062	0	yes	0	yes	0
P063	<0.1	yes	<0.1	yes	<0.1
P071	<0.1	yes	<0.1	yes	<0.1
P074	0	yes	0	yes	0
P085	0	yes	0	yes	0
P089	<0.1	yes	<0.1	yes	<0.1
P094	<0.1	yes	0	yes	<0.1
P097	0	yes	0	yes	0
P098	<0.1	yes	<0.1	yes	<0.1
P099	0	yes	0	yes	0
P104	0	yes	0	yes	0
P106	<0.1	yes	0	yes	<0.1
P109	0	yes	0	yes	0
P111	0	yes	0	yes	0
P121	0	yes	0	yes	0
U028	<0.1	yes	0	yes	<0.1
U058	0	yes	0	yes	0
U069	<0.1	yes	0	yes	<0.1

Table 4 (Continued)

Waste Code	Wastes streams other than soil and debris				
	Surface disposed volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Underground injected volume requiring alternative capacity (million gal/yr)	Adequate alternative capacity available (yes/no)	Total (million gal/yr)
U087	0	yes	<0.1	yes	<0.1
U088	0	yes	0	yes	0
U102	0	yes	0	yes	0
U107	0	yes	0	yes	0
U190	<0.1	yes	<0.1	yes	<0.1
U221	0.3	yes	26.8	yes	27.1
U223	<0.1	yes	<0.1	yes	<0.1
U235	0	yes	0	yes	0
Total	13.1		585.5		598.3

1. INTRODUCTION

This section contains a brief summary of the legal background on the Land Disposal Restrictions Program, a summary of the results of capacity analyses to support prior restrictions, and an introduction to the capacity analysis for those wastes analyzed for this rule.

Section 2 contains the detailed results of the capacity analysis for the Second Third promulgated wastes, including a capacity analysis for each waste code (Subsection 2.2.10). Section 3 details the Agency's capacity analysis methodology. Section 4 lists the references used to prepare this document.

1.1 Legal Background

1.1.1 General Requirements Under HSWA

The Hazardous and Solid Waste Amendments of 1984 (HSWA), enacted on November 8, 1984, amended the Resource Conservation and Recovery Act (RCRA) of 1976 in several significant ways. Among other initiatives, the amendments require the Environmental Protection Agency (EPA) to promulgate regulations restricting the land disposal of hazardous wastes according to a strict, detailed schedule. This effort is generally referred to as the Land Disposal Restrictions Program.

1.1.2 Schedule for Developing Restrictions

HSWA set a strict schedule for establishing treatment standards, based generally on priorities related to the volume and intrinsic hazards of different types of wastes. Two groups received early attention: (1) solvent and dioxin wastes, to be regulated within 24 months of HSWA's passage, and (2) the so-called "California List" wastes, to be regulated within 32 months. The solvent/dioxin waste group identified in HSWA includes those solvent wastes covered under waste codes F001, F002, F003, F004, and F005, as well as the dioxin-containing wastes covered under waste codes F020, F021, F022, and F023 (RCRA section 3004(e)). The final dioxin regulation also established treatment standards for F026, F027, and F028.

The California List wastes, a group of wastes originally listed by the State of California and adopted intact within HSWA, include liquid hazardous wastes containing metals, free cyanides, PCBs, acidic corrosives (pH of less than or equal to 2.0), and any liquid or nonliquid hazardous waste containing halogenated organic compounds (HOCs) above 0.1 percent (1,000 ppm) by weight.

Priorities for all other hazardous wastes listed under RCRA section 3001 were established separately, based on considerations of volume and intrinsic hazard, in a formal schedule submitted to Congress on November 8, 1986 (RCRA section 3004(g)(1)). This schedule requires all final land disposal restrictions to be in place by May 8, 1990. Consistent with the requirements of HSWA, EPA divided all other listed hazardous wastes into three groups (the "Thirds"), to be regulated in successive stages over a period of 66 months from the passage of HSWA on November 8, 1984.

The overall schedule for the Land Disposal Restriction Program is as follows:

- Solvents and dioxins: Final standards promulgated on November 7, 1986.

- California List wastes: Final standards promulgated on July 8, 1987.
- "First Third" scheduled wastes: Final standards promulgated on August 8, 1988.
- "Second Third" scheduled wastes: Final standards to be promulgated on or before June 8, 1989.
- "Third Third" scheduled wastes: Final standards to be promulgated on or before May 8, 1990.

1.1.3 Variance from the Schedule

The land disposal restrictions are effective when promulgated unless the Administrator grants a national capacity variance and establishes a different date, not to exceed 2 years beyond the statutory deadline, based on "the earliest date on which adequate alternative treatment or recovery capacity which protects human health and the environment will be available" (RCRA section 3004(h)(2)).

In addition, if EPA fails to set a treatment standard by the statutory deadline for any hazardous waste, the waste becomes subject to the so-called "soft hammer" requirements. Under the soft hammer requirements, the waste may continue to be disposed of in a landfill or surface impoundment, but only if the facility is in compliance with the minimum technological requirements specified in RCRA section 3004(o). Furthermore, prior to such disposal, generators must certify to EPA that they have "investigated available treatment capacity and [have] determined that the use of such landfill or surface impoundment is the only practical alternative to treatment currently available to the generator" (RCRA section 3004(g)(6)). Such continued land disposal is allowed until EPA sets a standard for the waste in question, or until

May 8, 1990, whichever is sooner. If the Agency has not set a standard by May 8, 1990, the waste is automatically prohibited from further land disposal. The only exceptions are for facilities performing land disposal in a unit that has made a successful "no migration" demonstration and facilities that meet the requirements for a case-by-case extension. "No migration" demonstrations are based on case-by-case petitions that must show that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous. Case-by-case extensions are granted by the Agency for up to 1 year (renewable once) from a ban effective date if the applicant demonstrates that a binding contract has been entered into to construct or otherwise provide alternative capacity that cannot reasonably be made available by the applicable effective date because of circumstances beyond the applicant's control.

1.2 Summary of Previous Land Disposal Restrictions

Capacity analyses to support previous land disposal restrictions were performed using the best data available at the time to develop national estimates of both the amount of waste land disposed and the available alternative commercial treatment and recovery capacity. Analyses of affected wastes considered the combination of waste code, physical/chemical form, and type of restricted management practice to determine the amount of alternative capacity required.

1.2.1 Solvents and Dioxins

The Land Disposal Restriction Program began with the promulgation of the solvents and dioxins rule on November 7, 1986 (51 FR 40572). The final rule included spent solvent wastes (F001-F005) and dioxin-containing wastes (F020-F023 and F026-F028), and established treatment standards expressed as concentrations in the waste extract. The rule prohibits land disposal of solvent and dioxin wastes unless the wastes contain less than the specified concentrations of hazardous constituents.

Initially, the Agency used the 1981 Regulatory Impact Analysis (RIA) Mail Survey (Ref. 1) to identify the volume of land disposed solvent wastes subject to the restrictions. Although EPA did not establish required treatment technologies for these wastes, the Agency used the physical and chemical characteristics that were reported for each waste stream to identify the technology or technologies that EPA assumed would be used to meet the treatment standards. The waste volumes were distributed among the applicable technologies as shown below:

Waste stream	Applicable treatment and recovery technologies
Solvent-water mixtures	Wastewater treatment
Organic liquids	Distillation Fuel substitution Incineration
Organic sludges	Fuel substitution Incineration
Inorganic sludges or solids	Incineration

After identifying the required alternative capacity for solvent wastes, the Agency analyzed the available commercial capacity for these technologies.

Analysis of available commercial capacity (supply) and required capacity (demand) showed shortfalls in available capacity for wastewater treatment and incineration. Consequently, the Agency granted a 2-year national capacity variance to CERCLA and RCRA corrective action wastes; small quantity generator (SQG) wastes; and all wastes containing less than 1 percent total F001-F005 solvent constituents, i.e., solvent-water mixtures, solvent-containing sludges, and solvent-contaminated soil (40 CFR 268.30 and Ref. 2).

EPA determined the volume of dioxin-containing waste generated annually and affected by the restrictions. Incineration capacity for these dioxin wastes was determined to be nonexistent; therefore, a 2-year national capacity variance was granted (51 FR 40617).

The final rule for the First Third Wastes, published on August 17, 1988 (53 FR 31138), included a reanalysis of available and required treatment capacity for solvent wastes using data from EPA's new data set based on the results of EPA's National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (the TSDR Survey). The results of this reanalysis demonstrated that adequate capacity exists for solvent wastes. The Agency therefore allowed the capacity variances to expire on November 8, 1988.

1.2.2 California List

Unlike the solvents and dioxins rule, the California List rule is not waste code specific. The California List includes all liquid hazardous waste with a pH of less than or equal to 2.0 (i.e., acidic corrosive waste); all liquid hazardous wastes containing free cyanide, metals, or polychlorinated biphenyls (PCBs) in concentrations greater than or equal to those specified in 40 CFR 268.32; and all hazardous wastes (liquid or nonliquid) containing halogenated organic compounds (HOCs) in amounts greater than or equal to the levels specified in 40 CFR 268.32.

The California List final rule was promulgated on July 8, 1987 (52 FR 25760). This rule required the use of specific technologies rather than the establishment of performance-based standards for California List PCB wastes and certain California List HOC wastes. Specifically, the rule requires incineration in accordance with 40 CFR Part 264, Subpart O, or Part 265, Subpart O, for HOC wastes (except HOC wastewaters) and thermal treatment in accordance with 40 CFR 761.60 or 761.70 for PCB wastes. EPA codified the statutory prohibition level (RCRA section 3004(d)(2)) for acidic corrosive wastes (those with a pH of $\leq$2.0), but did not promulgate a treatment standard for these wastes. The final rule did not establish prohibition levels for metal or cyanide wastes; therefore, upon promulgation, the RCRA section 3004(d)(2) statutory levels became effective.

The Agency originally used data from the 1981 RIA Mail Survey (Ref. 1) to determine the maximum potential volume of land disposed waste subject to the California List restrictions. To determine the required alternative treatment capacity for these waste volumes, EPA identified those technologies that it believed would generally be used to treat California List wastes. The Agency then determined the commercially available alternative treatment capacity for these wastes.

A comparison of required and available treatment capacity for the California List wastes for which BDAT has been established showed that incineration capacity for HOC wastes was inadequate. Consequently, the Agency granted a 2-year national capacity variance to HOC wastes requiring incineration. On the other hand, the Agency determined that adequate capacity for PCB wastes did exist and thus did not grant a variance for these wastes. EPA believes that acidic corrosive, cyanide, and metal wastes can be treated to below the California List statutory levels by tank treatment methods including neutralization, cyanide oxidation, chromium reduction, and chemical precipitation. Furthermore, since the rule applies only to liquid wastes, they may still be land disposed after being rendered nonliquid. Consequently, the Agency believes that adequate capacity for these wastes exists and did not grant a capacity variance for them (Ref. 3).

The final rule for the First Third wastes, however, included a reanalysis of required and available treatment capacity for California List HOC wastes based on the TSDR Survey data. The results indicated significant changes in waste management practices and capacity, specifically, substantial increases in commercial incineration capacity. As a result, the Agency determined that capacity variances were no longer needed for HOC wastes, except for HOC-contaminated soils, and therefore rescinded the California List HOC variance effective November 8, 1988.

1.2.3 First Third Wastes

On August 17, 1988, the Agency published the final rule for the First Third wastes. This final rule promulgated treatment standards for some of the First Third wastes. The remaining First Third wastes for which treatment standards were not established were covered by the soft hammer requirements.

The Agency used the TSDR Survey data set to determine affected waste volumes requiring alternative capacity and available commercial treatment/ recovery capacity. Required alternative capacity was then compared with available commercial treatment/recovery capacity. This comparison showed adequate capacity for all First Third wastes except petroleum refining wastes (K048, K049, K050, K051, and K052) for which BDAT is sludge incineration or solvent extraction; high zinc (greater than or equal to 15 percent zinc) electric arc furnace dust (K061) for which BDAT is high temperature metals recovery; and mercury cell chlorine production waste (K071) for which BDAT is acid leaching. Consequently, the Agency granted a 2-year national capacity variance to K048-K052 and K071 wastes. The Agency also granted a 2-year national variance from the high temperature metals recovery-based standards to high zinc K061 wastes, but in the interim is requiring these wastes to meet the standard for low zinc K061 based on stabilization (Ref. 4).

1.2.4 Underground Injected Wastes

To date, the Agency has promulgated two final rules restricting the underground injection of certain wastes and has proposed a third. The first of these rules, published on July 26, 1988 (53 FR 28118), restricted solvent and dioxin wastes. For this final rule, the Agency used the results of the TSDR Survey to perform an analysis of required and available treatment/recovery capacity. The results of the analysis showed that inadequate capacity exists for the volume of underground injected solvent wastes containing less than 1 percent total F001-F005 solvent constituents for which the BDAT standard is based on wastewater treatment (steam stripping, biological treatment, wet air oxidation, or carbon adsorption). Consequently, the Agency granted a 2-year national capacity variance from the treatment standard until August 8, 1990, to underground injected solvent wastes containing less than 1 percent total F001-F005 solvent constituents that are disposed of by injection in Class I wells.

Conversely, the analysis also showed that adequate capacity did exist for the volume of solvent wastes containing greater than or equal to 1 percent total F001-F005 solvent constituents for which the BDAT standard is based on incineration. Consequently, these wastes were restricted from underground injection on August 8, 1988. Furthermore, available data showed that no dioxin wastes are being injected, and thus the Agency did not grant a variance from the August 8, 1988, effective date for restricting the underground injection of these wastes.

The second final rule (53 FR 30908) restricted the underground injection of California List wastes and certain First Third wastes, specifically K062, K049-K052, K071, and K104. For this rule, the Agency used data from the Hazardous Waste Injection Well Data Base (HWIWDB) and the TSDR Survey to perform a capacity analysis for these wastes. This analysis showed inadequate capacity for all underground injected California List wastes except for those containing greater than 50 ppm polychlorinated biphenyls (PCB) requiring thermal treatment and wastes containing HOCs greater than 1,000 ppm requiring incineration or reuse as fuel. Furthermore, the analysis identified insufficient capacity for all the First Third wastes subject to the rulemaking (K062, K049-K052, K071, and K104). The Agency granted a 2-year national capacity variance to underground injected California List wastes (except PCB wastes greater than 50 ppm and HOC wastes greater than 1,000 ppm) and K049-K052, K062, K071, and K104 wastes.

The Agency published its proposed approach for the remainder of the underground injected First Third wastes on October 26, 1988 (53 FR 43400). Underground injected First Third wastes (including P and U wastes) for which EPA has not set treatment standards will continue to be subject to the soft hammer provisions of RCRA.

This proposed rule also identified those First Third wastes for which BDAT has been established but which current data indicate are not being underground injected. EPA proposed to ban these wastes from underground injection upon the date of final promulgation of this rule. These wastes include: K001, K015, K018, K020, K024, K037, K044, K045, K047, K048, K087, K099, K101, and K102 wastes; nonwastewater forms of K004, K008, K021, K022, K025, K036, K060, K061, and K100; the no ash nonwastewater component of K083; the noncalcium sulfate nonwastewater form of K069; and K086 solvent washes.

Finally, EPA proposed to establish effective dates for those underground injected First Third wastes for which BDAT has been established but were not addressed in the August 16, 1988, final rule for underground injection wastes discussed previously. The Agency determined that sufficient capacity exists for K019 and K030 wastes for which BDAT is biological degradation, and for concentrated K016 wastes (≥1 percent) and K103 for which BDAT is liquid incineration. For dilute K016 (<1 percent) wastes for which BDAT is biological treatment followed by wet air oxidation, however, the Agency determined that sufficient capacity does not exist. Consequently, for K019, K030, K103, and concentrated K016 (≥1 percent) underground injected wastes, the Agency did not propose to grant a national capacity variance. For dilute K016 (<1 percent) underground injected wastes, however, the Agency did propose to grant a national capacity variance until August 8, 1990. EPA plans to finalize this proposed rule in June 1989.

1.3 Introduction to the Second Third Final Rule

Today the Agency is finalizing treatment standards for some of the Second Third wastes, for some of the First Third wastes previously subject to the soft hammer provisions, and also for some of the wastes that were originally Third Third wastes. These wastes, hereafter referred to as Second Third "promulgated" wastes, are listed in Table 1-1. This table also identifies into which of the Thirds the waste was originally placed.

1.3.1 Summary of the Second Third Proposed Rule

For the Second Third proposed rule (54 FR 1056), the Agency used the TSDR Survey to estimate the volume of affected wastes requiring alternative capacity and the amount of available commercial capacity. The results of this analysis showed that adequate commercial capacity does exist for all Second Third proposed wastes currently surface disposed (i.e., treatment or storage in waste piles; treatment, storage, or disposal in surface impoundments; and disposal by land treatment and landfills). The Agency, therefore, did not propose to grant a capacity variance to any surface disposed Second Third proposed wastes. The analysis also showed that inadequate commercial capacity existed for the volume of underground injected wastes requiring liquid incineration or reuse as fuel, cyanide destruction, and wastewater treatment for organics.

Table 1-1 Second Third Promulgated Waste Codes

Waste code	Description	Original Third
F006[a,b]	Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc, and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum	1
F007	Spent cyanide plating bath solutions from electroplating operations	1
F008	Plating sludges from the bottom of plating baths from electroplating where cyanides are used in the process	1
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process	1
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process	2
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations	2
F012	Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process	2
F024	Wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor cleanout wastes from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes	2
K005[c]	Wastewater treatment sludge from the production of chrome green pigments	3
K007[c]	Wastewater treatment sludge from the production of iron blue pigments	3

[a] Standards for metal constituents were promulgated in the First Third rule. Cyanide standard is promulgated in the Second Third rule.

[b] Standards for nonwastewaters only. Wastewater will continue to be subject to the soft hammer requirements since this is a First Third waste.

[c] Standards for nonwastewaters only, wastewaters will be regulated as a Third Third as originally scheduled.

Table 1-1 (Continued)

Waste code	Description	Original Third
K009	Distillation bottoms from the production of acetaldehyde from ethylene	2
K010	Distillation side cuts from the production of acetaldehyde from ethylene	2
K011[b]	Bottom stream from the wastewater stripper in the production of acrylonitrile	1
K013[b]	Bottom stream from the acetonitrile column in the production of acrylonitrile	1
K014[b]	Bottoms from the acetonitrile purification column in the production of acrylonitrile	1
K023	Distillation light ends from the production of phthalic anhydride from naphthalene	3
K027	Centrifuge and distillation residues from toluene diisocyanate production	2
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane	2
K029[d]	Waste from the product steam stripper in the production of 1,1,1-trichloroethane	2
K036[e]	Still bottoms from toluene reclamation distillation in the production of disulfoton	1
K038	Wastewater from the washing and stripping of phorate production	2
K039	Filter cake from the filtration of diethylphosphorodithioil acid in the production of phorate	2
K040	Wastewater treatment sludge from the production of phorate	2
K043	2,6-Dichlorophenol waste from the production of 2,4-D	2

[d] Wastewaters are being soft hammered.

[e] Only wastewaters are being regulated as a Second Third waste, nonwastewaters were regulated as First Third wastes.

Table 1-1 (Continued)

Waste code	Description	Original Third
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene	3
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene	3
K095[d]	Distillation bottoms from the production of 1,1,1-trichloroethane	2
K096[d]	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane	2
K113	Condensed liquid light ends from the purification of toluenediamine in the production of toleunediamine via hydrogenation of dinitrotoluene	f
K114	Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene	f
K115	Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene	f
K116	Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine	f
P013	Barium cyanide	3
P021	Calcium cyanide	3
P029	Copper cyanides	2
P030	Cyanides (soluble cyanide salts), not elsewhere specified (t)	1
P039	Disulfoton(t); 0,0-Diethyl S-[2-(ethylthio)ethyl] phosphorothioate(t)	1
P040	Phosphorothioic acid, 0,0-diethyl 0-pyrazinyl ester; 0,0-Diethyl 0-pyrazinyl phosphorothioate	2

[f] Newly listed hazardous wastes.

Table 1-1 (Continued)

Waste code	Description	Original Third
P041	Diethyl-p-nitrophenyl phosphate; Phosphoric acid, diethyl-p-nitrophenyl ester	1
P043	Diisopropyl fluorophosphate; Fluoridic acid, bis(1-methylethyl) ester; Phosphorofluoridic acid, bis(1-methylethyl) ester	2
P044	Dimethoate (t); Phosphorodithioic acid, 0,0-dimethyl S-(2(methylamino)-2-oxoethyl)ester (t)	2
P062	Hexaethyl tetraphosphate; Tetraphosphoric acid, hexaethyl ester	2
P063	Hydrocyanic acid; Hydrogen cyanide	1
P071	0,0-Dimethyl 0-p-nitriphenyl phosphorothioate; Methyl parathion	1
P074	Nickel (II) cyanide; Nickel cyanide	2
P085	Diphosphoramide, octamethyl-; Octamethylpyrophosphoramide	2
P089	Parathion (t); Phosphorothioic acid,0,0-diethyl 0-(p-nitrophenyl)ester (t)	1
P094	Phosphorothioic acid, 0,0-diethyl S-(ethylthio)methyl ester (t); Phorate (t)	1
P097	Famphur; Phosphorothioic acid, 0,0-dimethyl 0-[p-((dimethylamino)-sulfonyl)phenyl]ester	1
P098	Potassium cyanide	2
P099	Potassium silver cyanide	3
P104	Silver cyanide	2
P106	Sodium cyanide	2
P109	Dithiopyrophosphoric acid, tetraethyl ester; Tetraethyldithiopyrophosphate	3
P111	Tetraethylpyrophosphate; Pryophosphoric acid, tetraethyl ester	2
P121	Zinc cyanide	3

Table 1-1 (Continued)

Waste code	Description	Original Third
U028	Bis(2-ethylhexyl)phthalate; 1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)]ester	2
U058	2H-1,3,2-Oxazaphosphorine,2-[bis(2-chloroethyl)amino]-tetrahydro-2 oxide; Cyclophosphamide	2
U069	Dibutyl phthalate; 1,2-Benzenedicarboxylic acid, dibutyl ester	3
U087	Phosphorodithioic acid,O,O-diethyl-, S-methyl-ester; O,O-Diethyl-S-methyl-dithiophosphate	3
U088	1,2-Benzenedicarboxylic acid, diethyl ester; Diethyl phthalate	3
U102	Dimethyl phthalate; 1-2-Benzenedicarboxylic acid, dimethyl ester	3
U107	Di-n-octyl phthalate; 1-2-Benzenedicarboxylic acid, di-n-octyl ester	2
U190	Phthalic anhydride; 1,2-Benzenedicarboxylic acid, anhydride	3
U221	Toluene diamine; Diaminotoluene	1
U223	Toluene diisocyanate (r,t); Benzene, 1,3-diisocyanantomethyl-(r,t)	1
U235	1-Propanol, 2,3-dibromo-,phosphate (3:1); Tris(2,3-dibromopropyl) phosphate	2

Consequently, the Agency proposed to grant a 2-year national capacity variance to underground injected K011, K013, and K014 wastes, for which BDAT was proposed as incineration or wet air oxidation followed by biological treatment; to underground injected K009 and K010 wastes, for which BDAT was proposed as steam stripping and/or biological treatment; and to underground injected F007 wastes, for which BDAT was proposed as cyanide destruction (Ref. 5).

1.3.2 Response to Major Capacity-Related Comments on the Second Third Proposed Rule

Several commenters questioned the Agency's stated belief that F006 wastes were being pretreated onsite for cyanides and therefore no additional treatment capacity was needed. In response to these comments and reevaluation of data, the Agency has significantly raised the BDAT treatment standards for cyanides in F006 (from 110 mg/kg total cyanides and 0.064 mg/kg amenable cyanides to 590 mg/kg total cyanides and 30 mg/kg amenable cyanides). In addition, the Agency performed an analysis of TSDR Survey and Generator Survey data from approximately 1,500 facilities to estimate the volume of F006 wastes that may require treatment for cyanides as a result of this rule.

The TSDR Survey contained data on 358 facilities generating F006 waste in 1986. Of the total volume generated, 69 percent is generated at facilities with onsite cyanide treatment, and 27 percent was determined to be noncyanide-bearing F006. Consequently, only 4 percent of the F006 waste reported as generated in the TSDR Survey would probably need alternative offsite treatment capacity for cyanides.

EPA also evaluated a subset of Generator Survey data currently available. This subset consisted primarily of large facilities. The analysis involved evaluating data from almost 1,500 facilities. The analysis identified 322 facilities generating F006 waste. Since the Generator Survey contains waste concentration data, EPA was able to identify the volume of wastes with the following: cyanide concentrations above and below the treatment standards; with unknown cyanide concentration; and where the presence of cyanide is unknown. This analysis showed that only 7 percent of the F006 waste for this data subset was not analyzed for the presence of cyanide, or the cyanide concentration in the waste was unknown or had a cyanide concentration in excess of the treatment standard. However, about 1 percent of the volume of the F006 waste had a cyanide concentration above the treatment standard or had cyanides with unknown concentration levels. In other words, a minimum of 93 percent of this sample reported generating F006 sludge with total cyanide concentrations that already meet the treatment standard. This percentage of compliance could be as high as 99 percent. (For instance, EPA believes if wastes contain cyanides in concentrations above the treatment standard, the generators would at least know and report that cyanides were present.)

Although EPA has only evaluated data from a subset of F006 generators, it believes this pattern to be representative of the total census of F006 wastes. In addition, the data on total cyanide submitted to EPA in the public comments to the rulemaking also showed greater than 90 percent compliance with the final treatment standard. Therefore, EPA believes that, as a worst case, 10 percent of F006 waste may need alternative commercial treatment capacity. EPA therefore assumes for this rule that 10 percent of the 129 million gallons of land disposed F006 (or about 13 million gallons) may require alternative commercial treatment. Sufficient commercial alkaline chlorination capacity exists to treat this volume of waste. Appendix A contains the detailed results of these analyses.

1.3.3 Major Revisions to the Second Third Final Rule

Since proposal of the Second Third rule, EPA has revised the capacity analysis. This section discusses the results of these revisions and their cause.

One such revision involves multisource leachate wastes. On February 27, 1989 (54 FR 8264), EPA amended the schedule for prohibiting hazardous waste from land disposal to include multisource leachates under the same schedule as Third Third wastes. EPA defined multisource leachate as "leachate that is derived from disposal of more than one listed hazardous waste." This rulemaking also included residuals from the treatment of multisource leachates, as well as soil and ground water contaminated only with multisource leachates. This action, taken to allow EPA more time to fully evaluate the treatability and capacity issues involved with these wastes, means that multisource leachate will not be subject to the land disposal restrictions until May 1990.

For the proposed rule, EPA included incineration and reuse as fuel capacity that was planned to be operational prior to the Second Third final rule. Since the publication of the Second Third proposed rule, EPA determined that this capacity is not yet operational and consequently has not included it as available for the final rule. However, one facility reported land disposing about 16 million gallons of F001-F005 biological treatment sludge in 1986. This waste stream was determined to require sludge/solid incineration. The waste stream is only hazardous, however, because it treats multisource leachates bearing the F001-F005 waste codes. As a result of EPA's recent rulemaking on multisource leachates (described above), this waste stream is no longer subject to the solvent land disposal restriction rule (refer to Appendix B for further detail). Consequently, the 16 million gallons of sludge/solid incineration capacity assigned to this waste stream during the capacity analysis for the solvents rule would now be available for Second Third wastes and has been included in this capacity analysis.

Since the Second Third proposed rule, information has been received indicating an increase in the amount of stabilization capacity available for Second Third wastes. This increase in capacity is the result of additional data from late-reporting facilities that have been included in the TSDR Survey data base and updated capacity information received from stabilization facilities since the Second Third proposed rule. Table 1-2 shows the late-reporting facilities that were added to the TSDR Survey since the proposed rule and the stabilization capacity considered to be available at each facility for the final rule. A total stabilization capacity increase of 240 million gallons per year is available at these facilities.

Table 1-2 Commercial Stabilization Facilities Added
to the TSDR Survey Capacity Data Base
Since the Second Third Proposed Rule

Facility name	Location	EPA ID No.	Available capacity for Second Third final rule (million gallons per year)
IT, Imperial Valley	Martinez, CA	CAD000633164	81
Enrx Inc.	Buffalo, NY	NYD991291782	1
Malone Services	Texas City, TX	TXD027147115	16
East Coast Environmental	New Haven, CT	CTD089631956	0.08
Solidtek Inc.	Morrow, GA	GAD096629282	10
Frontier Chemical Waste Process Inc.	Devon, NY	NYD057770109	120
ThermalKem Inc.	Rock Hill, SC	SCD044442333	5
CyanoKem Inc.	Detroit, MI	MID098011992	2
Stablex of Canada	Quebec, Canada	NYD980756415	5
	TOTAL		240

The facilities listed in Table 1-3 are all the other commercial facilities that were contacted to confirm or update the stabilization capacity information that was originally reported in their TSDR Surveys. Nine facilities confirmed the information they had originally reported and four reported changes.

The resulting net change in available stabilization capacity based on facility contacts was an increase of 11 million gallons per year. Overall, the information received indicates that approximately 252 million gallons per year of additional commercial capacity is available. This increases the available stabilization capacity for Second Third wastes from 264 million gallons to 516 million gallons. The increase in stabilization capacity did not affect any of the variance determinations made for this rule. It has been included in the capacity analysis performed for this rule for the sake of completeness.

This rule also reflects an increase in the amount of available liquid combustion capacity from that estimated for the Second Third proposed rule. This increase is the result of the inclusion of commercial industrial boilers and furnaces as available capacity. The available capacity of these units has been included with the available capacity of commercial incinerators and industrial kilns for the combustion of liquids (Ref. 6). The Agency has included these types of units because it believes they will be capable of meeting the treatment standards for waste for which the BDAT technology is incineration or reuse as fuel, as long as they are well designed and well operated. The inclusion of these technologies increases the available liquids combustion capacity for

Table 1-3 List of Commercial Stabilization Facilities Contacted to Verify/Update Capacity Information Reported in the TSDR Survey

Facility name	Location	EPA ID No.
Chemical Waste Management	Emelle, AL	ALD000622464
Petroleum Waste Inc.	Bakersfield, CA	CAD980675276
Chemical Waste Management	Kettleman City, CA	CAT000646117
Cecos International	Commerce City, CO	COD991300484
Environmental Waste Resources	Waterbury, CT	CTD072138969
Peoria Disposal	Peoria, IL	ILD000805912
CID Landfill	Calumet City, IL	ILD010284248
Cecos International	Sulphur, LA	LAD000618298
Rollins Environmental Services	Baton Rouge, LA	LAD010395127
Erieway Pollution Control	Independence, OH	OHD055522429
USPCI	Waynoka, OK	OKD065438376
GSX Services	Pinewood, SC	SCD070375985
Rollins Environmental Services	Deer Park, TX	TXD055141378
Envirosafe Services	Devers, TX	TXD980748107
Cecos International (Gulfwest)	Houston, TX	TXD980864078
USPCI, Grassy Mountain	Stansbury Park, UT	UTD991301749
Crosby and Overton	Kent, WA	WAD991281767

Second Third wastes by 28 million gallons per year. This increase in capacity did not affect any of the variance determinations made for this rule. It has been included in the capacity analysis performed for this rule for the sake of completeness.

Since publication of the Second Third proposed rule, EPA has decided to delay the effective date for F006 nonwastewaters and for F007, F008, F009, F011, and F012 wastes (both wastewaters and nonwastewaters). The Agency's capacity analysis conducted for these wastes shows that sufficient commercial capacity does exist for these wastes; therefore, no long-term national capacity variance is warranted. However, in order to allow time (if any is truly needed) for facilities to adjust existing cyanide treatment processes to operate more efficiently, EPA has decided to grant a 30-day extension for these wastes.

In addition, because F011 and F012 heat treating wastes are often commingled with F006, F007, F008, and F009 electroplating wastes, EPA expects that they will have to be segregated and treated separately. To allow some time to adjust processes to segregate these heat treating (F011, F012) and electroplating wastes (F006, F007, F008, F009), EPA is deferring the total and amenable cyanide standards for F011 and F012 heat treating wastes until December 8, 1989. However, between July 8, 1989, and December 8, 1989, these wastes will be subject to the same cyanide standards as the electroplating wastes (F006, F007, F008, F009).

2. CAPACITY ANALYSES RESULTS

This section presents general discussions of the source(s) of data and the methodology used for the capacity analyses in support of the Second Third final rule. Also presented are the results of the analyses of required and available capacity conducted for the Second Third promulgated wastes, as well as for previous rulemakings.

2.1 General Methodology

2.1.1 Data Set Development

(1) National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities

(a) Background. To improve the quality of data used for capacity analyses of hazardous waste volumes and management practices in support of the land disposal restrictions, EPA conducted the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (the TSDR Survey). The TSDR Survey was designed as a census of RCRA-permitted or interim status treatment, disposal, and recycling facilities, with no weighting factors for statistical extrapolations to project national estimates. The survey also included a sample of storage-only facilities. The survey results thus provide a comprehensive source of data on waste volumes land disposed and treatment, recovery, and disposal capacity.

Receipt of the completed surveys was followed by extensive technical review and detailed analysis of the facility responses, including facility contact when necessary. Certain facility responses and data elements derived from the facility-level analysis were then incorporated into a specialized capacity data base (a series of data sets) developed on land disposal facilities and commercial treatment and recovery facilities. (See Section 3 for a detailed discussion of the capacity data base.)

(b) Schedule and status. The TSDR Survey was originally mailed to over 2,400 facilities in August 1987. Facilities were allowed 60 days to complete and return the surveys. Many facilities requested and were granted extensions of 30 days. Since August 1987, an additional 225 facilities that either were initially overlooked or are new have been identified and sent the TSDR Survey. Over 2,500 facilities had returned their surveys as of April 1989, the deadline for review and analysis of data for support of this final rule.

A total of 475 facilities reported onsite land disposal/land placement (surface disposal and underground injection) of 63 billion gallons of RCRA hazardous wastes during 1986, the baseline year for the survey. All data were reviewed and have been included in the data set used to support this final rule.

Five facilities with surface land disposal have not returned their surveys to date or did not provide sufficient land disposal data for inclusion in the data set. Some did provide limited information, however. These facilities represent about 150 million gallons of land disposed waste, accounting for about 6 percent of the adjusted 1988 total volume of surface disposed wastes. The Agency is assuming that the wastes at these late responding facilities will reflect patterns similar to those of the wastes reported, and therefore does not believe that inclusion of these facilities would have affected variance decisions for this final rule.

A total of 236 facilities with commercial treatment/recovery technologies in 1988 have completed and returned surveys, accounting for a maximum of 11.4 billion gallons per year of commercial hazardous waste alternative capacity in 1988. Some of these facilities also reported land disposal onsite and are included among the 475 facilities noted above.

One hundred and ninety-five facilities reported having commercial processes in 1988 other than combustion, mostly wastewater treatment capacity, that may be applicable as alternative treatment/recovery of Second Third promulgated wastes, accounting for a maximum capacity of 8.7 billion gallons of commercial noncombustion treatment/recovery capacity in 1988.

Sixty facilities reported commercial combustion processes (incineration or reuse as fuel) that may be applicable for burning hazardous waste currently being land disposed, accounting for a maximum capacity of 499 million gallons of commercial liquid combustion capacity and 68 million gallons of commercial sludge and solid combustion capacity in 1988.

A total of 15 commercial treatment/recovery facilities have not returned their surveys to date. To fill known data gaps, these late facilities were contacted to gather critical capacity information; where available, other data sources were also used.

(c) Technology capacity information. The TSDR Survey was designed to provide comprehensive information on all current and planned hazardous waste treatment, disposal, and recycling processes at all RCRA-permitted and interim status facilities, including information on exempt processes at these facilities (e.g., recycling, wastewater treatment).* The baseline year for the survey was 1986. Information was requested on any planned changes to existing processes, including closures, and any new processes planned prior to 1992.

The survey included the following information on treatment and recycling processes, including those taking place in land placement units:

- General categories (including new or planned processes)
  - Type of process
  - Operating status
  - Commercial status
  - RCRA permit status (exempt, interim status, final)
- Key parameters
  - Feed rates (by physical form)
  - Operating hours
  - Pollution controls
- Waste types
  - Waste codes managed in 1986
  - Restrictions or specifications for waste managed (for commercial facilities only)
- Capacity
  - Maximum capacity (by physical form)
  - Utilization rate for 1986
  - Planned changes through 1992
- Residuals
  - Quantities generated (by physical form, percent hazardous)
  - Further management

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* Exceptions include totally enclosed treatment facilities (TETFs) and closed loop recycling (CLR), which were not required to be reported. Also, the TSDR Survey did not gather information on facilities having exempt processes only.

• Equipment (type of unit)	- Tanks - Containers - Thermal treatment units - Land placement units (i.e., surface impoundments, waste piles)

For more details, refer to the complete set of questionnaires and instructions in the RCRA docket (Ref. 7).

(d) Waste volumes land disposed. The TSDR Survey was also designed to provide information on the types and quantities of all RCRA hazardous waste managed, by specific land disposal/placement practices, at all RCRA-permitted and interim status facilities. The survey provides limited but adequate characterization data (refer to Subsection 3.1.2) to assess the treatability potential of the wastes and to identify applicable alternative treatment/recovery technologies, including:

- RCRA waste code (or codes, if more than one is applicable);
- Waste description (physical/chemical form and qualitative information on hazardous characteristics and constituents);
- Industry description (general description of the industries that generated each type of waste at a facility);
- Quantity that entered land disposal/placement in 1986; and
- Residual information (whether this waste was actually a residual from onsite hazardous waste management operations).

The TSDR Survey also provides valuable detailed information on the individual units in which land disposal/placement is occurring, including plans for closures and upgrading/retrofitting to meet the minimum technology requirements. Through review of the questionnaire responses and the facility schematics, it is possible to track individual waste streams managed in more than one type of land disposal unit or managed by more than one process (treatment, storage, or disposal) in surface impoundments and waste piles, to avoid double-counting of waste volumes. The information gathered included:

• General categories	- Type of process - Permit status (interim status, final) - Commercial status - Operating status - Closure plans
• Key parameters	- Liner type (plans for upgrading) - Pollution controls
• Waste types	- Waste types and quantities managed in 1986 - Restrictions or specifications for waste managed (for commercial facilities only)
• Capacity	- Design capacity - Utilization rate for 1986 - Remaining capacity - Planned changes through 1992
• Residuals	- Quantities of effluents and dredged solids - Further management

For more details, refer to the complete set of questionnaires contained in the RCRA docket (Ref. 7).

(e) Overview of data handling, technical review, and quality assurance. Extensive technical review of TSDR Survey data was required to ensure completeness, consistency, and accuracy on a per-facility basis. To achieve this goal, the review process was designed to promote the consistent and efficient identification and resolution of any errors, inconsistencies, and omissions, including any required facility follow-up. The review procedures were comprehensive and required the consideration and analysis of the facility responses to essentially every question in the survey (if applicable to that facility), as well as the review of general and detailed schematics of all onsite hazardous waste management operations. The detailed review procedures are presented in the report Technical Review Procedures for the TSDR Survey (Ref. 8).

All surveys from TSDR facilities with onsite land disposal/placement (whether private or commercial) or commercial treatment/recovery operations were considered critical for support of the land disposal restrictions. Therefore, they were categorized as "priority" surveys and were given immediate technical review and analysis, including facility contact to resolve any major technical problems discovered in their responses. The required data entry forms were completed for either land disposal/placement and/or commercial treatment/recovery, and the survey package underwent a preliminary quality control (QC) review by the technical supervisors. As part of this preliminary QC, the supervisor then worked with the reviewer to correct or resolve any problems identified during the survey review. Every survey underwent preliminary QC review. (See Ref. 8 for details on the survey screening, distribution, and review procedures.)

Treatability assessments of each land disposed waste stream were then conducted, as described in Subsection 3.1.2, to identify potentially applicable alternative technologies.

The last step in the review process involved a detailed, or final, QC on approximately 25 percent of the surveys. (See Ref. 9 for detailed information on QC procedures.) After QC, the technical review/analysis was considered to be complete.

(2) National Survey of Hazardous Waste Generators

(a) Background. The primary purposes of the Generator Survey were (1) to gather waste characterization data on hazardous waste streams generated in the United States and (2) to gather information about exempt treatment and recovery processes at generation facilities used to manage these wastes. Late in 1987, Generator Surveys were sent to approximately 10,000 hazardous waste generator facilities. Over 300 additional facilities were sent Generator Surveys in a second mailing of surveys in early 1988. These facilities were considered representative of the hazardous waste generators in their States (based on the 1985 Biennial Report data). They included all facilities that were sent a TSDR Survey as well as the largest (non-TSDR) hazardous waste generators in each State, including the 1,000 largest generators in the U.S.

The Generator Survey consisted of nine questionnaires (Questionnaires GA through GI). Questionnaire GA requested general facility information and information about waste minimization practices, hydrogeology, and solid waste management units (SWMUs). Questionnaire GB requested waste characterization and minimization data for each hazardous waste stream generated at a facility, and Questionnaire GI requested information on tanks used to manage hazardous waste. The remaining questionnaires asked for information about specific exempt treatment and recovery operations. As with the TSDR Survey, historical data for calendar year 1986 activities and estimated data for planned (treatment and recovery) activities through 1992 were requested.

(b) Schedule and status. Between November 1987 and March 1988, Generator Surveys were sent to 10,424 facilities throughout the United States. As of March 31, 1989, 6,255 facilities had returned their surveys. Of the facilities that did not return surveys, 2,865 are Small Quantity Generators, undeliverable or duplicate mailings to facilities, non-generator facilities, or facilities that are no longer in business. The remaining 1,304 facilities had not responded as of March 31, 1989.

Selected Generator Surveys (those that report exempt treatment or recovery operations) are currently undergoing technical review of their waste characterization and exempt treatment and recovery data. The reviewed treatment and recovery data will be used to establish a Generator Survey data base similar to the capacity data base for the TSDR Survey, while the reviewed waste characterization data are scheduled to be entered into a Generator Survey mainframe computer data base. Both data bases are to be used in any remaining regulatory support activities for the Land Disposal Restrictions Program. Currently, about 1,500 generator facilities with exempt treatment and recovery have returned their Generator Surveys. Over 400 of these surveys have undergone or are currently undergoing technical review as of May 30; about an additional 125 surveys are scheduled for review by June 30, 1989.

(c) F006 subset. EPA evaluated a subset of Generator Survey data currently available. This subset consisted primarily of large facilities. The analysis involved evaluating data from almost 1,500 facilities. The analysis identified 322 facilities generating F006 waste. Since the Generator Survey contains waste concentration data, EPA was able to identify the volume of wastes with the following: cyanide concentrations above and below the treatment standards; with unknown cyanide concentration; and where the presence of cyanide is unknown. This analysis was performed to estimate the volume of F006 waste that had a cyanide concentration above the treatment standard.

(3) Other data sources. The TSDR Survey was used as the primary source of data on the volumes and characteristics of wastes land disposed, and on treatment/recovery capacity to support the land disposal restrictions under this final rule. Additional data sources were used only when necessary to fill obvious data gaps in the TSDR Survey. These sources were used to provide supplemental data for facilities that were late in responding to the survey or for facilities that had provided incomplete responses and either would not or could not assist in completing the responses. One such data source was the EPA Office of Drinking Water's (ODW's) Hazardous Waste Injection Well Data Base (HWIWDB). The HWIWDB was used to estimate the volume of some underground injected wastes for which the TSDR Survey did not have data (Ref. 10). Other data were obtained from published literature (as described in Subsection 3.1.2).

2.1.2 Capacity Analysis Methodology

This section presents a brief description of the Agency's capacity analysis methodology, as well as any modifications required for the analysis of the Second Third promulgated wastes. A detailed explanation of the methodology is contained in Section 3.

EPA assesses capacity requirements by comparing "required" capacity with "available" capacity. The following sections briefly describe how required and available capacities were determined.

(1) Required capacity. Required capacity, or capacity demand, consists of those volumes of wastes currently land disposed that will require alternative treatment or recovery when they are restricted from land disposal, and also includes the residuals generated by treatment of these wastes. The waste streams potentially affected by the land disposal restrictions were identified by type of land disposal, including treatment, storage, or disposal in a surface impoundment; treatment or storage in a waste pile; disposal by land treatment; and disposal in a landfill or an underground injection well. Unlike the previous land disposal restrictions in which underground injected wastes were considered under a separate rulemaking, both surface disposed and underground injected wastes are included in the Second Third final rule.

Salt dome formations, salt bed formations, and underground mines and caves are additional methods of land disposal that are affected by this rulemaking. Since insufficient information is available to document the volume of wastes disposed of by these three methods, they are not addressed in the analysis of volumes and required alternative capacity.

The volumes of waste reported in the TSDR Survey as land disposed in 1986 that require alternative treatment/recovery capacity were adjusted to reflect the fact that treatment in surface impoundments after November 1988 may be conducted only in impoundments meeting minimum technological requirements. Volumes of waste that were reported as undergoing treatment in impoundments meeting these requirements in 1988, or in impoundments being replaced by tank systems by 1988, were dropped from further analysis. Residuals from the treatment of these wastes in minimum technology impoundments or tanks were assumed to require further treatment prior to land disposal and therefore are included in the capacity analysis for this rulemaking. The waste volumes requiring alternative capacity were identified by RCRA waste code(s) and by their land disposal ban regulatory status (i.e., solvents and dioxins, First Thirds, Second Thirds, Third Thirds, and California List). A detailed discussion of this methodology is presented in Subsection 3.1.1.

To determine the type of alternative capacity required by the affected wastes, a "treatability analysis" was performed on each waste stream. Wastes were placed into "treatability groups" using the waste code, the physical/chemical form data, and information on prior management and the type of land disposal, and then considering the identified BDAT technologies. For example, all wastes requiring liquid incineration would be placed in the same treatability group. The physical/chemical form data were provided by the facility using qualitative technical criteria, not regulatory definitions. For example, liquid wastes were identified as "highly fluid" rather than as "wastes failing the Paint Filter Liquids Test."

Waste groups (i.e., waste streams described by more than one waste code) present special treatability concerns because they often contain constituents requiring different types of treatment (e.g., organics and metals). To treat these wastes, a treatment train must be developed that can treat all waste types in the group. A more detailed description of the treatability analysis methodology, including treatment train development, is presented in Subsection 3.1.2.

A number of the treatment technologies to which wastes have been assigned create treatment residuals that will require further treatment prior to land disposal (e.g., stabilization of incinerator ash). In these cases, the Agency has estimated the amount of residuals that would be generated by treatment of the original volume of waste and has included these residuals in the volumes requiring treatment capacity. A more detailed description of the determination of residual volumes is presented in Subsection 3.1.2(4).

For a number of wastes, BDAT includes treatment of incinerator scrubber water. Based on TSDR Survey responses, the RCRA-permitted incinerators have adequate air pollution control devices (APCDs) (including scrubber water treatment at those facilities with wet scrubbers), and therefore no additional analysis of the volume of scrubber water was made. However, if the resultant scrubber water treatment sludge would likely require further treatment (e.g., stabilization), these residuals were included in the volumes requiring treatment capacity.

(2) Available capacity. To obtain estimates of available capacity that could be compared with the capacity requirements of affected wastes, a "systems" approach was taken. A system is defined as one or more different processes used together in one or more different units to treat or recover hazardous waste. The capacity of the treatment/recovery system

may be limited by the capacity of one or more of the unit processes within the system. The available capacity of the system is determined by subtracting the utilized capacity of the system from the maximum capacity of the system. A detailed discussion of system capacity determination can be found in Subsection 3.2.2.

Comparing required capacity with available capacity begins at the facility level and moves to the national level, as dictated by the available capacity and commercial status of applicable treatment/recovery systems. The available capacity of systems identified as private is considered only when it is BDAT, and only for the wastes reported as being land disposed at that facility. Waste volumes assigned to onsite BDAT technologies are not considered in the national totals of required commercial capacity.

The remaining volumes of waste still requiring treatment capacity are added to determine the national demand for commercial capacity of each alternative technology. Consequently, all estimates of capacity presented in this document represent commercially available (not private) capacity.

By comparing the required capacity with the available commercial capacity, the Agency can identify capacity shortfalls and make determinations concerning variances. The comparative capacity analysis accounts for the sequential and cumulative effects of previous land disposal restrictions, capacity variances, and projected capacity changes after 1986 (the baseline year). Solvents and dioxin wastes were assigned to available capacity first, followed by First Third promulgated wastes, California List HOCs (other than those that are also First Third promulgated wastes), underground injected wastes, and finally Second Third promulgated wastes. In addition, available capacity was first assigned to all affected wastes land disposed in "surface" units (i.e., waste piles, surface impoundments, landfills, and land treatment, but not underground injection wells), and then to underground injected wastes. The Agency believes that land disposal in surface units may represent a greater threat to human health and the environment than does the underground injection of wastes.

2.2 Results

The following subsections present the results of the capacity analyses conducted for this and previous rulemakings. All land disposed hazardous wastes, including those capable of being treated onsite in BDAT systems and wastes stored only in land disposal units, are included in the overview tables. As mentioned earlier, land disposed wastes capable of being treated onsite in a BDAT system have not been included in the national estimates of required capacity; therefore, only commercially available capacity is presented in this document. In addition, the amount of commercial capacity available for each rulemaking always considers the amount used by previous rulemakings.

2.2.1 All RCRA Wastes

Table 2-1 presents estimates of the volumes of RCRA wastes that are surface land disposed annually. These volumes were compiled by adding all waste stream volumes managed by treatment, storage, or disposal in surface land disposal units. Separate waste volumes are shown for

Table 2-1 Overview of All Surface Land Disposed RCRA Hazardous Waste

	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	92
- Surface impoundments	126
Treatment	
- Waste piles	63
- Surface impoundments	1,521
Disposal	
- Landfills	600
- Land treatment	83
- Surface impoundments	218
Total	2,703

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

storage and treatment in waste piles; treatment, storage, and disposal in surface impoundments; and disposal in landfills and land treatment units. The baseline data for determining the volumes in Table 2-1 were the 1986 data from responses to the TSDR Survey. Data reported in tons were converted to gallons (using the conversion factor of 240 gallons/ton, based on the density of water), to allow comparisons to available capacity in a standard unit. These reported 1986 volumes were adjusted by subtracting the volumes of waste managed in treatment surface impoundments that have undergone closure and have been replaced by tanks or that have been retrofitted to meet minimum technology requirements.

To avoid double-counting of wastes that underwent more than one management operation in the same type of unit (e.g., storage and treatment in a waste pile), the following procedures were used:

- In tabulating volumes of waste managed in surface impoundments and waste piles, any wastes that underwent treatment in an impoundment or waste pile were reported in the "treatment" volume.
- Wastes stored in a surface impoundment or waste pile that never underwent treatment in the impoundment or waste pile were reported in the "storage only" volumes.
- In tabulating surface impoundment volumes, wastes that were disposed of in surface impoundments but not also treated in the impoundment were included among "disposal" surface impoundment volumes.

Not represented in the estimates presented in Table 2-1 are volumes of surface land disposed waste from facilities that did not return their TSDR Surveys before April 1989 or did not provide sufficient data on land disposal. Based on the limited information provided by these facilities, EPA estimates that these facilities accounted for approximately 150 million gallons of land disposed waste in 1986. This represents less than 6 percent of the reported 1988 adjusted volume of surface land disposed hazardous waste. Sufficient data were not available to determine specific management practices and RCRA waste codes associated with these volumes.

2.2.2 Solvents

For the First Third final rule, EPA performed a reanalysis of required and available treatment capacity for surface land disposed solvent wastes (Ref. 4). This subsection summarizes the results of that analysis. The First Third final rule did not include a capacity analysis for underground injected wastes. A capacity analysis for underground injected wastes was performed for a separate rulemaking.

Table 2-2 presents estimates of the volume of solvents that are surface land disposed annually, by management practice and by type of land disposal unit. The same procedures described for the analysis of all RCRA wastes were used for estimating solvent volumes. The entire volume of any waste stream, for both single waste streams and waste groups (waste described by more than one waste code), was considered if the waste stream contained any solvent wastes.

The volume of surface land disposed solvent wastes requiring alternative commercial treatment capacity is less than the volume of solvents land disposed. This is because the Agency has assumed that the 13 million gallons of solvent wastes that were only stored in impoundments or waste piles do not require alternative treatment capacity (although

Table 2-2 Overview of Surface Land Disposed Solvent Wastes

Management practice	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	2
- Surface impoundments	11
Treatment	
- Waste piles	3
- Surface impoundments	<1
Disposal	
- Landfills	71
- Land treatment	<1
- Surface impoundments	26
Total	113

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

they may require alternative storage capacity) because they are treated or disposed of elsewhere. Furthermore, the facility-level waste treatability and technology capacity analyses conducted on solvent wastes being land disposed determined that 34 million gallons of these wastes either had already been treated using the BDAT technology or could be treated onsite, and therefore were not included in the volumes requiring alternative commercial treatment/recovery capacity. Based on this, the Agency estimates that 66 million gallons of solvent wastes will require alternative treatment/recovery capacity on a commercial basis. This volume includes 25 million gallons of soil; therefore, it is estimated that only 41 million gallons of nonsoil solvent wastes will require alternative commercial treatment capacity.* Finally, the Agency estimates that treatment of this 41 million gallons will generate 4 million gallons of waste residuals that will also require additional alternative treatment capacity.

Table 2-3 presents the estimates of available commercial capacity for the alternative technologies that are applicable to solvent wastes. Also presented are the estimates of annual surface land disposed waste volumes that require alternative commercial capacity based on the facility-level treatability and capacity analyses (not including contaminated soils or

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* This includes 16 million gallons of solvent-contaminated wastewater treatment sludge that was deemed to require incineration. The sludge, however, results from the treatment of multisource leachate and consequently is to be evaluated under the same schedule as Third Third wastes and is not now subject to the solvents rule (see Subsection 1.3.3).

Table 2-3 Solvent Capacity Analysis

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- Liquids	275	1
- Sludges/solids	47	38[a]
Stabilization of incinerator ash	499	4
Wastewater treatment		
- Cyanide oxidation, chemical precipitation, and settling/filtration	159	<1
- Steam stripping, carbon adsorption, biological treatment, or wet air oxidation	66	2

[a] This includes 16 million gallons of solvent-contaminated wastewater treatment sludge that was deemed to require incineration. The sludge, however, results from the treatment of multisource leachate and consequently is to be evaluated under the same schedule as Third Third wastes and is not subject to the solvents rule.

underground injected wastes). As evident from the table, the Agency determined that, based on the new data available from results of the TSDR Survey, there was adequate capacity for all of the solvent wastes that will require alternative capacity (Ref. 4).

2.2.3 Nonsolvent RCRA Wastes Containing Halogenated Organic Compounds (HOCs)

For the First Third final rule, EPA performed a reanalysis of required and available treatment capacity for California List HOCs (Ref. 4). This subsection summarizes the results of that analysis. The First Third final rule did not include a capacity analysis for underground injected wastes. A capacity analysis for underground injected wastes was performed for a separate rulemaking.

Tables 2-4 through 2-6 present estimates of annual surface land disposed volumes for nonsolvent RCRA wastes that are potential California List wastes containing HOCs at concentrations of 1,000 mg/kg or greater. Separate tables are presented for total HOC wastes, HOC wastes that are also First Third promulgated wastes, and all other HOC wastes. The same procedures used for tabulating all RCRA wastes apply to HOC volumes. However, the total volume for each management practice in Tables 2-4 through 2-6 represents the sum of all single HOC waste streams (in that table's regulatory group) and all waste groups containing at least one potential HOC waste (in that table's regulatory group) but containing no solvents.

The volume of land disposed HOC wastes requiring alternative commercial treatment capacity is less than the volume of HOC wastes land disposed. This is because the facility-level treatability and capacity

Table 2-4 Overview of Surface Land Disposed Potential California List Wastes Containing Halogenated Organic Compounds

Management practice	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	1
- Surface impoundments	<1
Treatment	
- Waste piles	7
- Surface impoundments	6
Disposal	
- Landfills	20
- Land treatment	<1
- Surface impoundments	<1
Total	34

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

Table 2-5 Overview of Surface Land Disposed
First Third Promulgated Wastes Containing
Halogenated Organic Compounds

Management practice	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	1
- Surface impoundments	<1
Treatment	
- Waste piles	7
- Surface impoundments	<1
Disposal	
- Landfills	8
- Land treatment	<1
- Surface impoundments	<1
Total	16

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

Table 2-6 Overview of All Other Surface Land Disposed Wastes Containing Halogenated Organic Compounds

Management practice	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	<1
- Surface impoundments	<1
Treatment	
- Waste piles	<1
- Surface impoundments	6
Disposal	
- Landfills	12
- Land treatment	<1
- Surface impoundments	<1
Total	18

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment standards retrofitted to meet minimum technology requirements.

analyses conducted on the HOC wastes being land disposed determined that 3 million gallons of these wastes could be treated onsite and therefore were not included in the volume requiring alternative commercial treatment capacity. Based on this, the Agency estimates that 15 million gallons of HOC wastes will require alternative treatment capacity on a commercial basis. This volume includes 6 million gallons of soils, which are discussed in a separate section of the document (2 million gallons of HOC soils were assigned to onsite treatment); therefore, it is estimated that only 9 million gallons of nonsoil HOC wastes will require alternative commercial treatment capacity.

Table 2-7 presents the results of the facility-level treatability and capacity analyses for HOC-containing wastes (not including underground injected waste volumes). To eliminate double-counting, this table does not include wastes that contain First Third promulgated wastes or solvents.

Based on the data from the TSDR Survey, the Agency determined that adequate capacity exists for the volume of HOC wastes requiring combustion. Consequently, the Agency rescinded the national capacity variance previously granted to these wastes (Ref. 4).

2.2.4 First Third Wastes

In support of the First Third final rule, EPA performed facility-level treatability and capacity analyses on First Third waste streams (Ref. 4). This subsection documents the results of the capacity analysis for the First Third wastes. As previously mentioned, the First Third final rule did not include underground injected wastes.

Table 2-7 Capacity Analysis for HOC Wastes
(Excluding First Third Proposed HOCs)

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- Liquids	274	<1
- Sludges/solids	9	2
Wastewater treatment (for organics)	64	7
Stabilization of incinerator ash	495	<1

(1) <u>All First Third wastes</u>. Table 2-8 presents the estimates of all First Third wastes (as listed in 40 CFR 268.10) that are surface land disposed annually, by management practice and by type of disposal unit. The total volume for each category in Table 2-8 represents the sum of all single First Third waste streams and all waste groups containing at least one First Third waste but no solvents. This prevents double-counting of multiple waste streams that contain both First Third wastes and solvents.

(2) <u>First Third wastes for which formal treatment standards have been promulgated</u>. Table 2-9 presents estimates of the annual volume of First Third wastes surface land disposed for which treatment standards were promulgated, by management practice and by type of disposal unit. These wastes are referred to hereafter as First Third promulgated wastes. The same procedures described for the analysis of all RCRA wastes were used for estimating First Third promulgated waste volumes. The total volume for each category in Table 2-9 represents the sum of all single First Third promulgated waste streams and all waste groups containing at least one First Third promulgated waste but no solvents. This prevents double-counting of multiple waste streams that contain First Third promulgated wastes and solvents.

The volume of land disposed First Third promulgated wastes requiring alternative commercial treatment capacity is less than the volume of First Third promulgated wastes land disposed. This is because the Agency has assumed that 35 million gallons of the 45 million gallons that were only stored in impoundments or waste piles do not require alternative treatment capacity because they are treated or disposed of elsewhere

Table 2-8 Overview of All Surface Land Disposed First Third Wastes

Management practice	Land disposed volume[a] (million gal/yr)
Storage only	
- Waste piles	49
- Surface impoundments	6
Treatment	
- Waste piles	29
- Surface impoundments	328
Disposal	
- Landfills	302
- Land treatment	76
- Surface impoundments	71
Total	861

[a] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

Table 2-9 Overview of Surface Land Disposed First Third Promulgated Wastes[a]

Management practice	Land disposed volume[b] (million gal/yr)
Storage only	
- Waste piles	41
- Surface impoundments	4
Treatment	
- Waste piles	27
- Surface impoundments	320
Disposal	
- Landfills	274
- Land treatment	76
- Surface impoundments	70
Total	812

[a] First Third promulgated wastes are those wastes for which treatment standards were finalized on August 8, 1988.

[b] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

(although they may require alternative storage capacity). The 10 million gallons of "stored only" wastes that do require alternative capacity were determined to have undergone "long-term storage" and therefore would not have been reported elsewhere as treated or disposed of. Furthermore, the facility-level waste treatability and technology capacity analyses conducted on First Third wastes being land disposed determined that 341 million gallons of these wastes either had already been treated or could be treated onsite using the BDAT technology and therefore do not require alternative commercial treatment capacity. This volume includes 290 million gallons of wastewater from one facility assigned to onsite dewatering in tanks.

Table 2-10 presents estimates of available commercial capacity for the alternative technologies applicable to the First Third promulgated wastes. Also presented are the estimates of annual land disposed waste volumes requiring alternative commercial capacity, excluding First Third promulgated wastes that are underground injected or soils contaminated with First Third promulgated wastes. In most cases, adequate capacity was available to treat all of the First Third promulgated wastes and mixed waste groups containing a First Third promulgated waste.

As Table 2-10 shows, four technologies had required capacity exceeding the available capacity: acid leaching of sludges, high temperature metals recovery, solvent extraction, and combustion of sludges/solids.

BDAT for K071 was identified as acid leaching of the sludge. Because of the shortfall of acid leaching capacity, the Agency granted a 2-year national capacity variance for K071 wastes.

Table 2-10 1988 Capacity Analysis for First Third Promulgated Wastes

Technology	Available capacity (million gal/yr)	Required commercial capacity (million gal/yr)
Combustion		
- Liquids	274	<1
- Sludges/solids	7	6 - 160[a]
Stabilization	495	231 [b]
Solvent extraction	1	0 - 154
Metals recovery		
- High temperature metals recovery (not secondary smelting)	34	62
Wastewater treatment		
- Chromium reduction, chemical precipitation, and settling/filtration	260	40
- Carbon adsorption and chromium reduction, chemical precipitation, and settling/filtration	12	1
Sludge Treatment		
- Acid leaching, chemical oxidation, and dewatering of sludge and sulfide precipitation of effluent	0	4

[a] Six million gallons of non-K048-K052 wastes require sludge/solids combustion. Amount of K048-K052 sludge/solids requiring combustion may be as much as 154 million gallons. The alternative BDAT technology for these wastes is solvent extraction.

[b] This volume includes 62 million gallons of "high zinc" K061 also assigned to high temperature metals recovery.

High temperature metals recovery (HTMR) was identified as the BDAT for "high zinc" K061 (i.e., K061 containing ≥15 percent zinc). Because of the shortfall of HTMR capacity, the Agency granted a 2-year capacity variance to the HTMR standard for high zinc K061. However, during this 2-year variance period, the Agency is requiring that high zinc K061 meet the standard for low zinc K061, which is based on stabilization. Therefore, 62 million gallons of K061 waste have been "double-counted" on Table 2-10 under both stabilization and HTMR.

The required capacity for the combustion of sludges/solids was divided into two numbers: the total amount of waste that requires sludge/solid combustion, 160 million gallons, and the amount of First Third promulgated waste other than K048-K052 waste that requires sludge/solid combustion, 6 million gallons. The BDAT standard for K048-K052 was also based on solvent extraction, however, and thus the required capacities for these technologies are presented as ranges on Table 2-10. The total volume of K048-K052 wastes requiring capacity has been determined to be 154 million gallons. Consequently, because of a shortfall of sludge/solid incineration and solvent extraction capacity, the Agency granted a 2-year national capacity variance for K048-K052 wastes.

(3) <u>Soft hammer wastes from the First Third final rule</u>. Table 2-11 presents estimates of annual surface land disposed volumes for "soft hammer" First Third wastes from the First Third final rule, by management practice and by type of disposal unit. These are the First Third wastes for which treatment standards were not promulgated in the First Third

Table 2-11 Overview of Surface Land Disposed Soft Hammer First Third Wastes[a]

Management practice	Land disposed volume[b] (million gal/yr)
Storage only	
- Waste piles	8
- Surface impoundments	2
Treatment	
- Waste piles	2
- Surface impoundments	7
Disposal	
- Landfills	28
- Land treatment	<1
- Surface impoundments	1
Total	48

[a] The First Third wastes for which treatment standards were not finalized in the First Third final rule.

[b] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

final rule. Treatment standards for some of the soft hammer wastes from the First Third final rule are being promulgated in the Second Third final rule. Volume estimates for the First Third soft hammer wastes remaining after the Second Third final rule (First Third wastes for which treatment standards were not promulgated in the First Third or Second Third final rules), as well as volume estimates for Second Third soft hammer wastes (Second Third wastes for which treatment standards were not promulgated in the Second Third final rule), are presented in the next subsection. The same procedures described for the analyses of all RCRA wastes were used for estimating soft hammer waste volumes. The total volume for each category in Table 2-11 represents the sum of all single, First Third soft hammer waste streams and all waste groups containing at least one First Third soft hammer waste, but no First Third promulgated wastes or solvents. This prevents double-counting of multiple waste streams that contain First Third soft hammer wastes, First Third promulgated wastes, and solvents.

2.2.5 Underground Injected Solvent Wastes

On July 26, 1988 (53 FR 28118), EPA published the final rule regulating underground injection of F001-F005 solvents and of F020-F023 and F026-F028 dioxin wastes. The results of the capacity analysis for these wastes are presented in Table 2-12.

EPA used the data resulting from the TSDR Survey to estimate the amount of required alternative commercial treatment capacity. For this rule, the Agency estimated that 317 gallons of solvent wastes are underground injected annually. The TSDR Survey does not contain detailed

Table 2-12 Capacity Analysis for Underground Injected Solvent Wastes[a]

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- liquids	339	57
Wastewater treatment		
- stream stripping, carbon adsorption, biological treatment, or wet air oxidation	75	260

[a] Based on 53 FR 28118-28155.

data on the concentration of contaminants in wastes; however, based on waste descriptions, EPA estimated that at least 260 million gallons were solvent-water mixtures containing less than 1 percent total F001-F005 solvent constituents at the point of generation. The appropriate treatment for these wastes was identified as wastewater treatment for organics (steam stripping, carbon adsorption, biological treatment, or wet air oxidation). Using the TSDR Survey, the Agency identified only 75 million gallons of available commercial wastewater treatment for organics. Consequently, EPA granted a national capacity variance for solvent-water mixtures with less than 1 percent total F001-F005 solvent constituents until August 8, 1990.

EPA estimated that the remaining 57 million gallons of underground injected solvent wastes contained F001-F005 constituents in concentrations greater than or equal to 1 percent at the point of generation. The BDAT standard for these wastes is based on the performance of liquid combustion. Using the TSDR Survey, the Agency identified 339 million gallons of available liquid combustion capacity. EPA, therefore, did not grant a national capacity variance to those wastes.

EPA determined that F020-F023 and F026-F028 dioxin wastes were not being underground injected and that restricting them would have a negligible effect on available treatment capacity; EPA, therefore, did not grant a 2-year capacity variance to these wastes.

2.2.6 Underground Injected California List Wastes

On August 16, 1988, EPA published its regulatory approach for underground injected California List wastes. The results of the capacity analysis for these wastes are shown on Table 2-13. This subsection summarizes the capacity determinations for each California List waste type.

(1) Free cyanides. For this rule, EPA determined that 1.36 billion gallons of cyanide wastes are underground injected annually. The Agency estimated that at least 170 million gallons of this waste exceeded the statutory prohibition level of 1,000 mg/l. Using the TSDR Survey, EPA identified only 162 million gallons of available cyanide oxidation capacity. Consequently, EPA granted a national capacity variance to underground injected California List cyanide wastes until August 8, 1990.

(2) Metals. EPA estimated that 234 million gallons of waste exceeding the California List standards for metals (other than chromium) are underground injected annually. Using the TSDR Survey, the Agency identified 128 million gallons of available commercial chemical precipitation capacity. Consequently, EPA granted a national capacity variance to underground injected California List metal-bearing wastes until August 8, 1990.

(3) Chromium wastes. EPA identified 105 million gallons of wastes with chromium levels exceeding the California List limits. EPA also identified an additional 237 million gallons of wastes that could potentially exceed the chromium levels. Using the TSDR Survey, the Agency determined that 109 million gallons of chromium reduction,

Table 2-13 Capacity Analysis for Underground Injected California List Wastes[a]

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- liquids	246	b
Cyanide oxidation	162	>170
Chemical precipitation	128	234
Neutralization	30	>1,000
Wastewater treatment for organics	50	245
- steam stripping, carbon adsorption, biological treatment, or wet air oxidation		
Chromium reduction, chemical precipitation, and settling or filtration	109	105-342

[a] Based on 53 FR 30908-30918.

[b] Exact volume is not known; determined to be "substantially less" than available capacity.

chemical precipitation, and settling or filtration capacity was available to treat these wastes. Thus, EPA decided to grant a national capacity variance to underground injected California List chromium wastes until August 8, 1990.

(4) Corrosives. EPA identified over 1 billion gallons of underground injected acidic corrosive (pH $\leq$2) wastes subject to the California List prohibitions. Using the TSDR Survey, the Agency identified only about 30 million gallons of available commercial neutralization capacity. Consequently, EPA granted a national capacity variance to underground injected California List corrosive wastes until August 8, 1990.

(5) Halogenated organic compounds (HOCs). EPA divided California List HOC wastes into two subgroups: concentrated HOC wastes containing greater than or equal to 10,000 mg/l (1 percent) HOC constituents, and dilute wastewaters with HOC concentrations between 1,000 and 10,000 mg/l. The Agency determined that the volume of concentrated HOC wastes being underground injected was substantially less than the amount of available liquid combustion capacity (the specified BDAT for these wastes). EPA, therefore, did not grant a national capacity variance to underground injected California List wastes with HOC concentrations greater than or equal to 10,000 mg/l.

Using the TSDR Survey, EPA identified 245 million gallons of underground injected dilute HOC wastewaters (HOCs between 1,000 and 10,000 mg/l). EPA identified only 50 million gallons of available wastewater treatment capacity applicable to these wastes (steam stripping, carbon adsorption, biological treatment, or wet air oxidation). Consequently, EPA granted a national capacity variance to underground injected dilute California List HOC wastewaters until August 8, 1990.

(6) Polychlorinated biphenyls (PCBs). EPA identified 25,000 gallons of underground injected PCBs; however, EPA does not believe that these wastes exceed the statutory prohibition level of 50 ppm. Furthermore, data from both the TSDR Survey and the RIA Mail Survey indicate that treatment capacity for these wastes (liquid combustion) substantially exceeds the volume injected. EPA, therefore, did not grant a national capacity variance to underground injected California List PCB wastes.

2.2.7 Underground Injected First Third Wastes

EPA's regulatory approach for underground injected First Third wastes was outlined in two parts. The first part, published on August 16, 1988 (53 FR 30908), covered underground injected K049-K052, K062, K071, and K104 wastes. EPA's proposed regulations on the remaining underground injected First Third wastes were published on October 26, 1988 (53 FR 43400). EPA plans to finalize this rule in June of 1989. Table 2-14 summarizes the capacity analyses for First Third wastes.

(1) K062 wastes. EPA determined that between 128 and 148 million gallons of K062 wastes, spent pickle liquor, are underground injected each year. The BDAT standard for K062 wastes is based on chromium reduction, chemical precipitation, and sludge dewatering. Using the TSDR Survey, the Agency identified only 109 million gallons of available chromium reduction capacity. Consequently, EPA granted a national capacity variance to K062 wastes until August 8, 1990.

Table 2-14 Capacity Analysis for Underground Injected First Third Wastes[a]

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- liquids	246	<1
Chromium reduction, chemical precipitation, and settling or filtration	109	128-148
Solvent extraction followed by steam stripping and carbon adsorption	1	57
Acid leaching followed by chemical oxidation, dewatering of sludges, and sulfide precipitation	0	<1
Biological treatment followed by wet air oxidation	72	118

[a] Based on 53 FR 30908-30918 and 53 FR 40400-40408.

(2) K049, K050, K051, and K052 wastes. K049-K052 are petroleum refining wastes. The BDAT standard for these wastes is based on sludge incineration or solvent extraction followed by stabilization. EPA determined that about 656,000 gallons of these wastes are underground injected annually. Based on the limited treatment capacity available, and the decision to allocate available treatment first to surface disposed wastes, the Agency granted a national capacity variance to underground injected K049-K052 wastes until August 8, 1990.

(3) K104 wastes. K104 wastes are wastewaters generated from production of nitrobenzene and aniline. The BDAT standard for K104 wastes was based on solvent extraction followed by steam stripping and carbon adsorption. The TSDR Survey indicates that nearly 57 million gallons of K104 are being underground injected each year. EPA, however, identified only 1 million gallons of available solvent extraction capacity. Consequently, EPA granted a national capacity variance to underground injected K104 wastes until August 8, 1990.

(4) K071 wastes. K071 waste is brine purification muds from mercury cell production of chlorine. The BDAT standard for K071 is based on acid leaching followed by chemical oxidation, dewatering of sludges, and sulfide precipitation of metals in the effluent. Although EPA determined that only about 45,000 gallons of K071 waste is underground injected each year, the Agency believes that there is inadequate capacity to treat these wastes. Consequently, EPA granted a national capacity variance to underground injected K071 wastes until August 8, 1990.

(5) <u>K016 wastes</u>. K016 waste is heavy ends or distillation residues from the production of certain halogenated hydrocarbons. The BDAT standard for dilute (less than 1 percent) K016 wastes is based on biological treatment followed by wet air oxidation; for K016 wastes in concentrations equal to or greater than 1 percent, the BDAT standard is based on liquid combustion. Using the TSDR Survey, EPA identified 118 million gallons of underground injected dilute (less than 1 percent) K016 wastes. EPA identified only 72 million gallons of available capacity for dilute K016 wastes, however. Consequently, EPA proposed to grant a national capacity variance to underground injected dilute (less than 1 percent) K016 wastes until August 8, 1990.

Using the TSDR Survey, EPA identified only 170,000 gallons of underground injected concentrated K016 wastes (greater than 1 percent) and 246 million gallons of available liquid combustion capacity. EPA, therefore, did not propose to grant a national capacity variance to underground injected concentrated (greater than 1 percent) K016 wastes.

(6) <u>K019 wastes</u>. K019 is heavy ends or distillation residues from the production of ethylene dichloride. EPA determined that only 65,000 gallons of relatively dilute K019 wastes are being underground injected and that the most appropriate treatment would be biological degradation. Using the TSDR Survey, the Agency identified 72 million gallons of available biological treatment capacity. EPA, therefore, did not propose to grant a national capacity variance to underground injected K019 wastes.

(7) K030 wastes. K030 is column bottoms and heavy ends from production of trichloroethylene and perchloroethylene. Using the TSDR Survey, EPA identified 30,000 gallons of underground injected K030. As with K019, EPA determined that the underground injected K030 waste is relatively dilute and is best treated by biological treatment. EPA, therefore, did not propose to grant a national capacity variance for underground injected K030 wastes.

(8) K103 wastes. K103 wastes are residues from the production of analine. The Agency determined that 31,560 gallons of K103 waste was being underground injected annually. The Agency believes that these wastes are relatively concentrated and would therefore require liquid combustion. EPA identified 246 million gallons of available liquid combustion capacity. EPA, therefore, did not propose to grant a national capacity variance to underground injected K103 wastes.

(9) First Third promulgated wastes with established BDAT that are not being underground injected. EPA determined that a number of First Third promulgated wastes for which BDAT standards have been established are not being underground injected. The Agency believes that restricting these wastes from underground injection would have a negligible effect on available treatment capacity. EPA, therefore, did not propose to grant a national capacity variance to the following underground injected First Third promulgated wastes:

- Wastewater and nonwastewater forms of K001, K015, K018, K020, K024, K037, K044, K045, K047, K048, K087, K099, K101, and K102;
- Nonwastewater forms only of F006, K004, K008, K021, K022, K025, K036, K060, K061, and K100;

- K046 nonexplosive nonwastewaters, K069 noncalcium sulfate nonwastewaters, K083 no-ash nonwastewaters, and K086 solvent wastes.

2.2.8 Determination of Available Capacity for the Second Third Final Rule

This section presents the Agency's determination of the amount of commercial treatment capacity available for Second Third promulgated wastes.

(1) Revisions to available capacity. Since publication of the Second Third proposed rule, EPA has made a number of revisions to its determination of available commercial treatment capacity. This subsection discusses the reasons behind these revisions and their effects.

After publication of the Second Third proposed rule, EPA amended the schedule for prohibiting hazardous wastes from land disposal to include multisource leachates under the same schedule as Third Third wastes (54 FR 8264). As a result of this rule, one solvent waste stream of 16 million gallons, which was assigned to sludge incineration, is no longer subject to the solvent land disposal restriction rule (see Appendix B). Consequently, the 16 million gallons of sludge/solid incineration capacity that had been assigned to this waste stream during the capacity analysis for the solvents rule is now available for Second Third wastes and has been included in the capacity analysis for Second Third promulgated wastes.

In the proposed rule, EPA included incineration and reuse as fuel capacity that was planned to be operational prior to promulgation of the Second Third final rule. However, EPA was unable to confirm that this capacity is indeed operational and therefore did not include it as available for the final rule.

This final rule also reflects an increase in the amount of available liquid combustion capacity. In the Second Third proposed rule, EPA included only available capacity from commercial incinerators and industrial kilns. For today's rule, however, EPA has included commercial industrial boilers and furnaces in its determination of available capacity. The Agency has included these types of units because it believes that they will be capable of meeting the treatment standards for waste for which the BDAT technology is incineration or reuse as fuel, as long as they are well designed and well operated. The inclusion of these technologies increases the amount of available liquid combustion capacity for Second Third wastes by 28 million gallons per year. This increase did not affect any of the variance determinations made for this rule; it has been included for the sake of completeness.

Since the Second Third proposed rule, EPA has received information indicating an increase in the amount of stabilization capacity available for Second Third wastes. This increase in capacity is due to additional data from facilities late in reporting and updated capacity information received from stabilization facilities after publication of the Second Third proposed rule. The information received indicates that approximately 252 million gallons per year of additional commercial capacity is available (refer to Subsection 1.3.3 for more detail). This increases the available stabilization capacity for Second Third wastes from 264 million gallons to 516 million gallons. Although this increase did not affect any capacity variance determinations, it has been included for the sake of completeness.

Finally, EPA is continuously revising and adding to the TSDR Survey capacity data base to reflect the addition of new data from late-reporting facilities and corrections made during QC of the data. Although none of these revisions have affected any capacity determinations, they have been included for the sake of completeness. The data contained in this document, therefore, represent the most complete data currently available to EPA.

(2) Effects of previous land disposal restrictions. Table 2-15 shows the effects of previous land disposal restrictions on available capacity for Second Third promulgated wastes. The table shows the Agency's latest estimate of 1988 available capacity for each technology (i.e., these estimates include all the revisions discussed in the previous subsection). The table also presents the amount of capacity required by each of the previous land disposal restrictions in order of promulgation. The amount required by previous rules is subtracted from the 1988 available capacity for each technology to determine the amount remaining, and therefore available, for the Second Third promulgated wastes. Table 2-15 also accounts for the 13 million gallons of alkaline chlorination capacity that may be required as a result of the Second Third final rule. EPA developed this estimate based on an analysis of data from the TSDR Survey, the Generator Survey, and from public comments. A detailed discussion of the findings of these analyses is contained in Appendix A.

Table 2-15 Determination of Available Capacity for Second Third Wastes[a]
(million gal/yr)

Technology	1988 Available capacity	Required capacity by: Solvents rule	CA List HOCs	Solvents[a] UIW	First Thirds	First Third and CA List UIW[b]	Remaining capacity for Second Thirds
Combustion:							
- liquids	340	1	<1	57	<1	<1	282
- sludge/solids	47	22	2	0	6	0	17
Stabilization	751	4	<1	<1	231	<1	516
Wastewater treatment for organics							
- steam stripping	2	0	0	0	0	0	2
- carbon adsorption	2	0	0	0	0	0	2
- wet air oxidation	2	0	0	0	0	0	2
- biological treatment	53	2	7	0	0	<1	44
Alkaline chlorination and chemical precipitation	46	<1	0	0	13[c]	0	33
Chromium reduction and chemical precipitation	149	0	0	0	40	0	109
Carbon adsorption, chromium reduction, and chemical precipitation	31	0	0	0	1	0	30

Source: TSDR Survey unless otherwise noted.

[a] Extracted from 53 FR 28118-28155.
[b] Extracted from 53 FR 30908-30918 and 53 FR 43400-43408.
[c] Required capacity for F006 wastes based on the need for capacity resulting from the promulgation of the cyanide standard on June 8, 1989.

UIW = Underground Injected Wastes

2.2.9 Second Third Promulgated Wastes

(1) Overview. The Agency is today finalizing its regulatory approach for Second Third wastes. As previously mentioned, however, the Agency is not setting standards for all Second Third wastes at this time, but instead is allowing the soft hammer requirements to take effect for those Second Third wastes for which standards are not now being promulgated. In addition, the Agency is today establishing treatment standards for some "soft hammer" First Third wastes as well as some wastes that were originally Third Third wastes. Those wastes for which the Agency is today setting treatment standards are listed in Table 1-1. These wastes will hereafter be referred to as Second Third promulgated wastes. Waste code-specific capacity analyses for the Second Third promulgated wastes are presented in the next subsection. Today's rule also includes capacity analyses for underground injected Second Third promulgated wastes.

Table 2-16 presents estimates of the volume of Second Third promulgated wastes land disposed annually, by management practice and by type of land disposal unit. These estimates include the entire volume of any waste stream, for both single waste streams and waste groups, if the waste stream contained any Second Third promulgated waste but no solvent, First Third waste for which a standard has been finalized, or California List HOC wastes. The estimates also include volumes for waste streams containing soft hammer First Third wastes and Third Thirds wastes for which treatment standards are being promulgated today. The volumes for these wastes have thus been counted in Table 2-16 as well as in Table 2-11.

Table 2-16 Overview of Second Third Promulgated Wastes[a]

Management practice	Land disposed volume[b] (million gal/yr)
Storage only	
- Waste piles	1
- Surface impoundments	3
Treatment	
- Waste piles	5
- Surface impoundments	<1
Disposal	
- Landfills	10
- Land treatment	<1
- Surface impoundments	<1
- Underground injection	604
Total	623

[a] Second Third promulgated wastes are those wastes for which standards are being finalized today and include some soft hammer First Third and Third Third wastes.

[b] Baseline was TSDR Survey data for 1986 (facility responses as of April 1989), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

The volume of land disposed Second Third promulgated wastes requiring alternative commercial treatment capacity is less than the volume of Second Third promulgated wastes land disposed. This is because the Agency has assumed that the 4 million gallons that were only stored in impoundments or waste piles do not require alternative treatment capacity because they are treated or disposed of elsewhere (although they may require alternative storage capacity; for more detail on "stored only" waste volumes see Subsection 3.1.1). Furthermore, the facility-level waste treatability and technology capacity analyses conducted on Second Third promulgated wastes being land disposed determined that 22 million gallons of these wastes either had already been treated or could be treated onsite using the BDAT technology and therefore do not require alternative commercial treatment capacity.

Based on this analysis, the Agency estimates that 597 million gallons of Second Third promulgated wastes will require alternative commercial treatment capacity. This volume includes 2 million gallons of soils, which are discussed in a separate section of this document; therefore, it is estimated that 595 million gallons of nonsoil Second Third promulgated wastes will require alternative commercial treatment capacity. Finally, the Agency estimates that treatment of the 595 million gallons will generate 3 million gallons of waste residuals that will require additional alternative treatment capacity.

(2) Surface disposed Second Third wastes. Table 2-17 presents the estimates of available commercial capacity applicable to surface disposed Second Third promulgated wastes. The amount of available commercial

Table 2-17 1988 Capacity Analysis for Surface Disposed Second Third Promulgated Wastes[a]

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- Liquids	282	<1
- Sludges/solids	17	9
Wastewater treatment		
- Alkaline chlorination	33 [b]	2
- Eletrolytic oxidation followed by alkaline chlorination	0	0 [c]
- Carbon adsorption	2	0
- Biological treatment	44	<1
- Steam stripping followed by biological treatment	0	0
Stabilization	516	2

[a] Volumes do not include underground injected waste and soils/debris.

[b] Alkaline chlorination capacity has been adjusted to account for 13 million gallons of capacity that may be needed for F006 wastes.

[c] These wastes have been included with the wastes requiring alkaline chlorination.

capacity presented is that amount remaining after accounting for surface land disposed spent solvent, California List HOC, and First Third wastes previously restricted (see Tables 2-3, 2-7, and 2-9, respectively). The table also accounts for 57 million gallons of underground injected spent solvent waste previously restricted (see 53 FR 28124). No other underground injected wastes previously restricted affect the amount of available capacity for Second Third promulgated wastes. In addition, the available commercial capacity data presented in this table have been updated to reflect new data received since publication of the proposed rule. These updates do not affect any variance determinations and have been included only for completeness (see Subsection 1.3.3 for additional description of these updates).

Table 2-17 also shows the estimates of the volume of surface land disposed Second Third promulgated wastes that will require alternative commercial treatment recovery capacity as a result of today's rule (i.e., required capacity excluding soil and debris). These estimates are based on the results of the TSDR Survey.

A comparison of required and available treatment/recovery capacity shows adequate capacity for all surface disposed Second Third promulgated wastes affected by today's rulemaking. However, in order to allow time (if any is needed) for facilities to adjust existing cyanide treatment processes to operate more efficiently, EPA has determined to grant a 30-day variance from the cyanide standards for F006 nonwastewaters and F007, F008, and F009 wastewaters and nonwastewaters.

In addition, because F011 and F012 heat treating wastes are often commingled with F006, F007, F008, and F009 electroplating wastes, EPA expects that they will have to be segregated and treated separately. In order to allow some time to adjust processes to segregate these heat treating (F011, F012) and electroplating wastes (F006, F007, F008, F009), EPA is deferring the total and amenable cyanide standards for F011 and F012 heat treating wastes until December 8, 1989. However, between July 8, 1989, and December 8, 1989, these wastes will be subject to the same cyanide standards as the electroplating wastes (F006, F007, F008, F009).

The Agency is not granting a national capacity variance to any other surface disposed Second Third promulgated wastes. Subsection 2.2.6 contains a detailed capacity analysis for each Second Third promulgated waste code.

(3) Underground injected Second Third wastes. Table 2-18 presents the amount of required and available commercial treatment recovery capacity for underground injected wastes affected by today's rule. The amount of available commercial capacity presented is that amount remaining after accounting for surface disposed Second Third wastes. The amount of available commercial capacity and most of the required capacity were estimated using the TSDR Survey. For some waste codes for which the TSDR Survey did not contain data on the volume being underground injected, the Agency used the Office of Drinking Water's (ODW's) Hazardous Waste Injection Well Data Base (HWIWDB) to estimate the volume of these wastes underground injected (Ref. 10). Wastes for which this data base was used are identified in Subsection 2.2.10.

Table 2-18 1988 Capacity Analysis for Underground Injected Second Third Promulgated Wastes

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion		
- Liquids	282	379
Wastewater treatment		
- Alkaline chlorination	31	126
- Electrolytic oxidation followed by alkaline chlorination	0	<1
- Carbon adsorption	2	<1
- Biological treatment	44	<1
- Steam stripping followed by biological treatment	0	79
Stabilization	514	1

The table shows shortfalls in available capacity for cyanide destruction, incineration, and wastewater treatment of organics. Treatment standards based on alkaline chlorination are today being promulgated for F007, F008, F009, F011, F012, F019, P013, P021, P029, P030, P063, P074, P098, P099, P104, P106, and P121 wastes. EPA estimates that about 126 million gallons per year of underground injected Second Third promulgated wastes will require alkaline chlorination. However, one F007 waste stream accounts for 126 million gallons per year of the required capacity. Excluding this stream, adequate capacity exists to treat the small volumes required for the remainder of these wastes. Consequently, of the waste requiring alkaline chlorination, the Agency is today granting a 2-year national capacity variance only for F007 wastes, which are underground injected. However, because F007 waste was originally scheduled as a First Third waste, the maximum extension available is until August 8, 1990.

In addition, as previously mentioned, EPA is granting a 30-day variance from the cyanide standards to F006 nonwastewaters and F007, F008, and F009 wastewaters and nonwastewaters. EPA is also deferring the cyanide standards for F011 and F012 until December 8, 1989. However, between July 8, 1989, and December 8, 1989, F011 and F012 wastes will be subject to the same cyanide standards as the electroplating wastes (F006, F007, F008, and F009).

The treatment standard for K009 nonwastewaters is based on incineration; for wastewaters it is based on steam stripping followed by biological treatment. In the capacity analysis for K009 wastes, only wastewaters were identified as requiring alternative treatment. Table 2-18 shows that insufficient wastewater treatment capacity exists for the volume of K009 waste that is underground injected. The Agency is therefore granting a 2-year national capacity variance to underground injected K009 wastes.

The treatment standard for K011 and K013 nonwastewaters is based on incineration; for wastewaters, EPA is not finalizing the proposed treatment standards. K011 and K013 wastewaters will therefore be subject to the soft hammer requirements. Table 2-18 shows that insufficient capacity exists for the volume of underground injected K011 and K013 nonwastewaters requiring incineration. The Agency is therefore granting a national capacity variance to underground injected K011 and K013 wastes.

The Agency has determined that sufficient capacity does exist for the remainder of the underground injected Second Third promulgated wastes. However, as previously mentioned, to allow time (if any is needed) for facilities to adjust existing cyanide treatment processes to operate more efficiently, EPA has determined to grant a 30-day variance from the cyanide standards for F006 nonwastewaters and F007, F008, and F009 wastewaters and nonwastewaters.

In addition, because F011 and F012 heat treating wastes are often commingled with F006, F007, F008, and F009 electroplating wastes, EPA expects that they will have to be segregated and treated separately. To allow some time to adjust processes to segregate these heat treating (F011, F012) and electroplating wastes (F006, F007, F008, F009), EPA is deferring the total and amenable cyanide standards for F011 and F012 heat treating wastes until December 8, 1989. However, between July 8, 1989, and December 8, 1989, these wastes will be subject to the same cyanide standards as the electroplating wastes (F006, F007, F008, F009).

(4) Soft hammer First Third and Second Third wastes from the Second Third final rule. Table 2-19 presents estimates of annual land disposed volumes for "soft hammer" First Third and Second Third wastes from the Second Third final rule. These are the First Third and Second Third wastes for which treatment standards were not promulgated in the First Third or Second Third final rules. The same procedures described for the analyses of all RCRA wastes were used for estimating these soft hammer waste volumes. The total volume for each category in Table 2-19 represents the sum of all single waste streams and all waste groups containing at least one First Third or Second Third soft hammer waste, but no First Third or Second Third promulgated wastes, California List HOCs, or solvents. This prevents double-counting of multiple waste streams that contain First Third and Second Third soft hammer wastes, First Third and Second Third promulgated wastes, California List HOCs, and solvents.

The results of the TSDR Survey were used to perform a capacity analysis for the First Third and Second Third soft hammer wastes. As previously indicated, these are wastes for which treatment standards were not promulgated in the First Third or Second Third final rules; therefore, they are subject to the soft hammer provisions. The soft hammer provisions require that wastes be treated where treatment is practically

Table 2-19 Overview of Land Disposed Soft Hammer First Third and Second Third Wastes[a]

	Land disposed volume for First Third soft hammer wastes (million gal/yr)	Land disposed volume for Second Third soft hammer wastes (million gal/yr)
Storage only		
- Waste piles	0	0
- Surface impoundments	2	<1
Treatment		
- Waste piles	1	<1
- Surface impoundments	0	0
Disposal		
- Landfills	17	2
- Land treatment	0	0
- Surface impoundments	1	<1
- Underground injection	1,334	134
Total	1,355	136

[a] The First Third and Second Third wastes for which treatment standards were not finalized in the First Third or Second Third final rules.

[b] Baseline was TSDR Survey data for 1986 (facility responses as of August 1988), adjusted for volumes of waste managed in surface impoundments that will be replaced by tanks or treatment impoundments retrofitted to meet minimum technology requirements.

available. If generators can certify the lack of practically available treatment capacity, they can land dispose the waste in minimum technology units with limited or no treatment. Tables 2-20 and 2-21 present the results of the capacity analysis conducted for First Third and Second Third nonsoil soft hammer wastes. Tables 2-22 and 2-23 present the results of the capacity analysis conducted for soils contaminated with First Third and Second Third soft hammer wastes. These tables list the types of treatment technologies believed to be applicable to these wastes as well as the available and required capacities. The available capacity listed for each technology is the treatment capacity available after treatment of restricted wastes (i.e., spent solvents, California List HOCs, First Third promulgated wastes, and Second Third promulgated wastes).

As indicated in the tables, adequate available treatment exists for treatment of these soft hammer wastes except for those requiring wastewater treatment for organics, mercury retorting, and vitrification. The TSDR Survey indicates that no commercial mercury retorting or vitrification capacity exists. Therefore, certification as to the lack of practically available mercury retorting and vitrification capacity would not be difficult. The waste streams assigned to wastewater treatment for organics are predominantly large-volume underground injected waste streams. Of the total volume of First Third and Second Third soft hammer wastes assigned to wastewater treatment for organics

Table 2-20 Capacity Analysis for First Third Nonsoil Soft Hammer Wastes

Technology	Current available capacity[a] (million gal/yr)	Required capacity (million gal/yr): Volume surface land disposed	Required capacity (million gal/yr): Volume underground injected
Combustion of liquids	250	<1	30
Combustion of sludges/solids	8	1	<1
Wastewater treatment			
- Wastewater treatment for organics	50	<1	1,304
- Alkaline chlorination	29 [b]	6	0
- Chromium reduction	109	1	<1
- Neutralization	36	<1	<1
- Chemical precipitation	3,010	<1	<1
- Sulfide precipitation	252	<1	0
Stabilization	511	13	<1
Mercury retorting	0	<1	0
Vitrification	0	<1	0
Management of lab pack wastes	[c]	<1	<1
Totals		21	1,334

[a] Capacity given is the current available capacity after treatment of the estimated volumes of restricted wastes requiring alternative treatment (i.e., spent solvents, California List HOCs, First Third promulgated wastes, and Second Third promulgated wastes).

[b] Available capacity has also been adjusted for 13 million gallons per year of capacity that may be needed for F006 wastes.

[c] Lab pack wastes will require several different treatment technologies including incineration and wastewater treatment. Because of the small volume (5,840 gallons), adequate treatment capacity is considered to be available.

Table 2-21 Capacity Analysis for Second Third Nonsoil Soft Hammer Wastes

Technology	Current available capacity[a] (million gal/yr)	Required capacity (million gal/yr) Volume surface land disposed	Volume underground injected
Combustion of liquids	250	<1	28
Combustion of sludges/solids	8	2	0
Wastewater treatment			
- Wastewater treatment for organics (wet air oxidation, carbon adsorption, steam stripping, or biological treatment	50	0	106
- Chromium reduction	109	0	<1
Stabilization	511	<1	0
Management of lab pack wastes	b	<1	<1
Totals		2	134

[a] Capacity given is the current available capacity after treatment of the estimated volumes of restricted wastes requiring alternative treatment (i.e., spent solvents, California List HOCs, First Third promulgated wastes, and Second Third promulgated wastes).

[b] Lab pack wastes will require several different treatment technologies including incineration and wastewater treatment. Because of the small volume (10,320 gallons), adequate treatment capacity is considered to be available.

Table 2-22 Capacity Analysis for Soils Contaminated with First Third Soft Hammer Wastes

Technology	Current available capacity[a] (million gal/yr)	Required capacity (million gal/yr)	
		Volume surface land disposed	Volume underground injected
Combustion of sludges/solids	8	3	<1
Stabilization	512	1	0
Vitrification	0	<1	0
Mercury retorting	0	<1	0
Totals		4	<1

[a] Capacity given is the current available capacity after treatment of the estimated volumes of restricted wastes requiring alternative treatment (i.e., spent solvents, California List HOCs, First Third promulgated wastes, and Second Third promulgated wastes).

Table 2-23 Capacity Analysis for Soils Contaminated with Second Third Soft Hammer Wastes

Technology	Current available capacity[a] (million gal/yr)	Required capacity (million gal/yr) Volume surface land disposed	Volume underground injected
Combustion of sludges/solids	8	1	0
Stabilization	495	<1	0
Vitrification	0	<1	0
Totals		1	0

[a] Capacity given is the current available capacity after treatment of the estimated volumes of restricted wastes requiring alternative treatment (i.e., spent solvents, California List HOCs, First Third promulgated wastes, and Second Third promulgated wastes).

(1,410 million gallons per year), approximately 1,396 million gallons per year, or 99 percent, are from large-volume underground injected waste streams. The volume of each of these waste streams is over 27 million gallons per year. Because the total volume of these waste streams significantly exceeds the amount of available capacity, and because each of these waste streams would require over one-half of the available treatment capacity (50 million gallons per year), it is believed that certifying a lack of practically available treatment capacity for these waste streams, if necessary, would not be difficult. Therefore, the generators of these waste streams will not be forced to compete for alternative treatment capacity. Additionally, the estimated volume of Second Third promulgated wastes requiring wastewater treatment for organics is very small (less than 1 million gallons per year). Based on this capacity analysis, it is believed that the only soft hammer waste streams that may exceed available alternative treatment capacity are the large-volume underground injected waste streams that would require wastewater treatment for organics. However, as previously described, there is a severe capacity shortfall for these waste streams. The generators of these waste streams should have no problem certifying a lack of practically available capacity. Therefore, it is believed that the potential utilization of available treatment capacity for First Third and Second Third soft hammer wastes would not deplete available capacity to the point where sufficient capacity is not available for Second Third promulgated wastes.

Soft hammer wastes that are sent to sludge/solid incineration will reduce the amount of capacity available for other restricted wastes. However, analysis indicates that although the available capacity is limited, there is currently adequate sludge/solid incineration capacity for both restricted wastes and soft hammer wastes. For future rules, EPA will continue to evaluate the impact of soft hammer wastes.

2.2.10 Waste Code-Specific Capacity Analyses for Second Third Promulgated Wastes (Nonsoils)

This subsection presents the results of the analyses of required capacity for each alternative technology on a waste code-specific basis for the Second Third promulgated wastes. Tables 2-24 through 2-54, located later in this subsection, present waste code-specific analyses of the alternative capacity required by the Second Third promulgated wastes. The capacity analysis for soils contaminated with Second Third promulgated wastes is presented in Subsection 2.2.11.

The land disposed waste volume data from the TSDR Survey were sorted by waste code and type of alternative treatment/recovery required. This information was then combined and summarized to create technology-specific and waste code-specific capacity analysis tables for the Second Third promulgated wastes. The raw data used to develop the capacity analysis tables are included in Appendix C. Appendix D contains, for each technology, the amount of required capacity for Second Third promulgated wastes.

In a limited number of instances, it was not feasible to assign waste streams directly to the BDAT technology; however, these wastes were assigned to alternative technologies. In these cases, the waste code discussions explain why the waste stream could not be assigned directly to BDAT and how the stream was handled. (Subsection 3.1.2 explains the methodology used to assign alternative technologies.)

Some Second Third promulgated wastes were reported in the TSDR Survey as mixed waste streams containing wastes that were included in previous land disposal restriction rulemakings (i.e., solvents, California List HOCs, and/or First Third promulgated wastes). The entire volume of these waste streams was included in the capacity analyses made for the previous rulemakings. To avoid double-counting, these waste streams are not included in the capacity analysis made for this rule. See Section 3 for a more detailed description of the capacity analysis methodology.

This subsection also presents discussions for each Second Third promulgated waste code requiring alternative treatment. Each discussion contains a description of the waste, identifies the hazardous constituents for which it is listed, and identifies the BDAT technology used to set the treatment standard.

In today's rule, treatment standards are being promulgated for K029 nonwastewaters; K023, K028, and K036 wastewaters; and K038, K039, K040, K043, K095, K096, K113, K114, K116, P013, P021, P040, P041, P043, P044, P062, P074, P085, P097, P099, P104, P109, P111, P121, U058, U088, U102, U107, and U235. However, these wastes are not included in this section because no nonsoil wastes with these codes were reported in the TSDR Survey as being land disposed and therefore will not require alternative treatment. Consequently, the Agency is not granting capacity variances for these wastes.

In the Second Third proposed rule, the Agency proposed treatment standards for F019 wastes based on cyanide treatment. However, the Agency has decided not to finalize the proposed treatment standards for F019. Since F019 is a First Third waste, its land disposal will continue to be restricted by the soft hammer provisions.

The Agency has also decided not to finalize the treatment standard of "no land disposal based on total recycling" proposed for K002, K003, K004, K006, and K008 nonwastewaters in the Second Third proposed rule. K002, K003, and K006 are Third Third wastes; therefore, they are not subject to the soft hammer provisions. The Agency will develop treatment standards for the wastewater and nonwastewater forms of these wastes prior to May 8, 1990, if there is an identified need for such standards.

In the Second Third proposed rule, the Agency proposed a treatment standard of "no land disposal based on no generation" for K005 and K007 nonwastewaters. Although several K005 and K007 waste streams were reported in the TSDR Survey as being land disposed in 1986, recent information from industry indicates that alternative treatment will not be required for K005 or K007 nonwastewaters because the waste is no longer being generated. Therefore, in today's rule, the Agency is promulgating a treatment standard of "no land disposal based on no generation" for K005 and K007 nonwastewaters. Treatment standards for K005 and K007 wastewaters will be promulgated with the Third Third wastes prior to May 8, 1990.

The Second Third proposed rule also included proposed treatment standards for K011, K013, and K014 wastewaters and nonwastewaters. However, while finalizing the treatment standards for the K011, K013, and

K014 nonwastewaters, the Agency has decided not to finalize the treatment standards for the wastewaters. Because these are First Third wastes, the K011, K013, and K014 wastewaters will continue to be restricted from land disposal by the soft hammer provisions.

F006

RCRA hazardous waste F006 is wastewater treatment sludges from certain electroplating operations. F006 is listed as hazardous because of the presence of cadmium, hexavalent chromium, nickel, and cyanides (complexed). In the land disposal restrictions for the First Third final rule (53 FR 31138), the Agency set treatment standards for the metals in F006 nonwastewaters based on stabilization. In today's rule, the Agency has established treatment standards for cyanides in F006 nonwastewaters based on pretreatment using alkaline chlorination followed by chemical precipitation, settling, and filtration. Treatment standards are being promulgated for cyanides in F006 nonwastewaters because the Agency believes that a pretreatment step to destroy the cyanides should be performed prior to stabilization. In today's rule, the Agency is not promulgating treatment standards for F006 wastewaters; these wastes will be regulated by the soft hammer provisions.

In the First Third final rule, the Agency estimated that 129 million gallons of surface land disposed F006 wastes would require stabilization as a result of the metals treatment standards. Adequate stabilization capacity was determined to be available for this volume of waste. Today, the Agency is promulgating cyanide treatment standards for F006 nonwastewaters. In response to public comments received on the cyanide treatment standards, the Agency has significantly raised the treatment standards for cyanides in F006 (from 110 mg/kg total cyanides and 0.064 mg/kg amenable cyanides to 590 mg/kg total cyanides and 30 mg/kg amenable cyanides).

In response to comments on the capacity needed to meet the cyanide treatment standards for the Second Third final rule, EPA performed an analysis to estimate the volume of generated F006 wastes that may exceed the promulgated cyanide standards and therefore require treatment for cyanides. The information sources EPA relied upon for this analysis were: (1) the TSDR Survey capacity data base, (2) Generator Surveys from non-TSDR facilities with exempt hazardous waste treatment capacity, (3) Generator Surveys from TSDR facilities, and (4) F006 data submitted by several commenters.

EPA screened the TSDR Survey capacity data base to identify the facilities that generated F006 and those that also had alkaline chlorination or another type of cyanide treatment onsite. It was assumed that these facilities were treating or were able to treat their F006 waste onsite to meet the cyanide standards and would not need commercial cyanide treatment capacity. The TSDR Surveys for the remaining TSDR facilities identified as generating F006 were evaluated to determine which ones generate noncyanide F006 wastes (e.g., facilities that perform chrome electroplating and therefore do not use cyanides in their process).

As a worst-case scenario, EPA assumed the remaining F006 waste streams (cyanide-bearing F006 wastes generated at facilities that did not have onsite cyanide treatment) have cyanide concentrations above the revised cyanide treatment standards.

The analysis of the TSDR Survey data showed that 104 million gallons of F006 were generated in 1986 at TSDR facilities. (This volume does not include F006 wastes generated at facilities without a RCRA permit or interim status, i.e., non-TSDR facilities.) Of this 104 million gallons, 72 million gallons (69 percent) are generated at facilities that have onsite cyanide treatment, and 28 million gallons (27 percent) do not contain cyanides. Only 4 million gallons (4 percent) of F006 wastes were generated at these facilities that may, as a worst-case scenario, contain cyanide concentrations above the revised treatment standards. A summary of the F006 analysis conducted from the TSDR Survey capacity data base is presented in Table 2-24.

Generator Survey data available for the F006 analysis included about 550 Generator Surveys from facilities not having a RCRA permit or interim status but with exempt hazardous waste treatment capacity onsite (non-TSDRs) and data from about 950 Generator Surveys from TSDR facilities. This limited subset of Generator Surveys was screened to identify facilities that reported generating F006 waste streams. Data were then gathered on the volumes and characteristics of each F006 waste stream, including the reported cyanide concentrations. The reported cyanide concentrations were assumed to be total cyanides.

Review of these Generator Surveys resulted in the identification of 322 facilities generating F006 waste streams. The total volume of F006 waste streams generated at the facilities in 1986 was 96 million gallons. Of this 96 million gallons, 89 million gallons (93 percent) were reported as not containing cyanides or as having cyanide concentrations below the revised total cyanide treatment standard; 7 million gallons (7 percent) were reported either as being of unknown cyanide content, to contain cyanide at unknown concentrations, or to have cyanide concentrations above the revised total cyanide treatment

Table 2-24 Analysis of F006 Generation at RCRA-Permitted and Interim Status Facilities

Category	Number of facilities	Percent of total no. of facilities	Generated volume (million gallons)	Percent of total generated
Facilities with onsite cyanide treatment	142	40	72	69
Facilities generating noncyanide F006	114	32	28	27
Facilities generating F006 with cyanide concentrations that may be above the revised treatment standards	102	28	4	4
TOTAL	358	100	104	100

Source: TSDR Survey.

standard. However, generators reported that less than 1.6 percent of the volume of the F006 waste at these facilities have a cyanide concentration above the treatment standard or had cyanides with unknown concentration levels. In addition, several of the facilities with unknown cyanide concentrations have onsite cyanide treatment. If it is assumed that these waste streams would meet the BDAT standard, then less than 0.7 percent of the F006 wastes from Generator Survey facilities would require cyanide treatment capacity.

In the public comments for the Second Third proposed rule, the Agency received data from two commenters on cyanide concentrations in F006 waste streams. The data supplied by one commenter included data on the total cyanide concentrations in 88 F006 waste stream samples from a variety of generators. Of the reported 88 waste streams, only 8 waste streams (9 percent) had total cyanide concentrations above the revised treatment standard. The commenter did not supply waste stream volumes or conditions of treatment.

The other commenter supplied total and amenable cyanide concentration data on samples from F006 wastes generated at two of its facilities. Upon review of the data, the Agency found that none of the 47 samples for which data were supplied had total cyanide concentrations above the revised treatment standard, and only 2 out of the 47 samples (4 percent) had amenable cyanide concentrations above the revised treatment standard. One sample reported by the commenter was not considered by the Agency. This sample was assumed to have been erroneously reported because the amenable cyanide concentration was greater than the total cyanide concentration. Waste stream volume information was not supplied by the commenter.

A summary of the cyanide concentration data from the Generator Survey and commenter information used to support the F006 analysis is presented in Table 2-25. Although only data from a subset of F006 generators have been evaluated, it is believed that these data establish that only a small percentage of F006 wastes will have cyanide concentrations above the revised treatment standards. As a worst-case scenario, the Agency estimates that 10 percent of the F006 wastes generated may have cyanide concentrations above the revised treatment standards.

Estimates of required capacity for the land disposal restrictions are based on the volume of waste land disposed, not the volume generated. For the First Third final rule, EPA estimated that 129 million gallons per year of land disposed F006 wastes require alternative treatment. Using the assumption that the percentage of F006 generated that contains cyanide concentrations above the revised treatment standards is representative of the percentage of land disposed F006 waste that contains cyanide concentrations above these standards, the Agency estimates, as a worst-case scenario, that 10 percent of the 129 million gallons of F006 waste land disposed, or about 13 million gallons per year, will require alternative commercial capacity for cyanides. Sufficient alkaline chlorination capacity (46 million gallons per year) exists to treat this volume of waste. (Refer to Appendix A for a more detailed discussion of the analysis of F006 wastes to estimate the volumes that may exceed the revised treatment standards.)

Table 2-25 Summary of Cyanide Concentration Data Supporting the F006 Analysis

Data source	Number of F006 generating facilities	Total volume of F006 waste streams	Volume of F006 waste streams failing final treatment standards (percent of total volume)	Volume of F006 waste streams with cyanides, but at an unknown concentration (percent of total volume)	Comments
Generator Surveys	322	96 Mgal	0.4 Mgal (<1%)	1.1 Mgal (<1%)	The actual volume of waste streams either failing final treatment standards or containing cyanides, but at an unknown concentration is 1,475,520 gallons of F006
National Association of Metal Finishers data	*	Unknown	a	NA	F006 waste stream volume information was not provided
United Technologies (Pratt & Whitney)	*	Unknown	b	NA	F006 waste stream volume information was not provided

* The number given is the number of F006 waste samples analyzed.

[a] Eight F006 waste samples (9 percent) had concentrations above the revised total cyanide standard.

[b] None of the F006 waste samples had concentrations above the revised total cyanide standard; 2 of the 47 (4 percent) had amenable cyanide concentrations above the revised standard.

Mgal = million gallons.

NA = Not applicable.

Based on the analysis of the TSDR Survey and Generator Survey information and the new BDAT levels, the Agency believes that adequate treatment capacity exists for the volume of F006 wastes requiring cyanide treatment. Therefore, the Agency is not granting a capacity variance for this waste.

Complete Agency responses to public comments regarding capacity-related issues are included in the "Response to Capacity-Related Comments Submitted on the Second Third Proposed Land Disposal Restrictions Rule," which is included in the RCRA public docket for this final rule (Ref. 11).

F007, F008, and F009

RCRA hazardous wastes F007, F008, and F009 are generated from electroplating operations. They are listed as hazardous wastes because of the presence of cyanides. In the Second Third proposed rule, the Agency established BDAT treatment standards for F007, F008, and F009 based on the performance of wet air oxidation or alkaline chlorination followed by chemical precipitation, settling, and filtration for wastewaters and alkaline chlorination followed by chemical precipitation, settling, and filtration for nonwastewaters. For the Second Third final rule, the Agency is promulgating revised BDAT treatment standards for F007, F008, and F009 wastewaters and nonwastewaters based on the performance of alkaline chlorination followed by chemical precipitation, settling, and filtration. The BDAT treatment of these wastes also includes the stabilization of treatment residuals.

Tables 2-26 through 2-28 show the non-deepwell injected and deepwell injected volumes requiring treatment and the alternative treatment technologies determined to be necessary for these wastes. As shown in the tables, most of the wastes requiring alternative treatment were assigned to alkaline chlorination. One waste stream reported in the TSDR Survey was a mixed waste of F007, F009, chromium-bearing waste, and cadmium-bearing waste. Because the waste stream was described as an acidic aqueous waste, the Agency assumed that cyanides were not present and assigned the waste stream to chromium reduction followed by chemical precipitation, sludge dewatering, and stabilization of the wastewater treatment sludge.

Several waste streams reported in the TSDR Survey were described as sludge or solid treatment residues. Some of these waste streams were reported by facilities that perform cyanide treatment. Other treatment residues were reported by commercial landfills that have restrictions on accepting wastes with levels of cyanides exceeding the treatment standards. Based on this information, the Agency assumed that these wastes had already been treated for cyanides. Therefore, the Agency believes that these waste streams would require only stabilization.

Several F008 waste streams were reported in the TSDR Survey as F008 mixed with metal-bearing organic solids. These waste streams were assigned to solids incineration followed by treatment of the scrubber water and stabilization of the scrubber water treatment sludge and incinerator ash.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for non-deepwell injected F007, F008, and F009 wastes requiring alternative treatment. The Agency has therefore determined that no long-term national capacity variance for these wastes is warranted. However, in order to be cautious and allow time (if any is needed) for facilities to adjust existing cyanide treatment processes to operate more efficiently, EPA has determined to grant a 30-day extension for surface land disposed F007, F008, and F009. TSDR Survey data indicate that adequate treatment capacity exists for the relatively small volume of deepwell injected F008 and F009 wastes. However, for the reasons previously described, the Agency is granting a 30-day extension for deepwell injected F008 and F009 wastes. The Agency believes that there will be ample treatment capacity at the end of 30 days (if not sooner) to accommodate demand for treatment of non-deepwell injected F007, F008, and F009 wastes as well as deepwell injected F008 and F009 wastes.

Conversely, the Agency believes that adequate treatment capacity does not exist for the large volume of deepwell injected F007 wastes. Therefore, the Agency is granting a 2-year national capacity variance for the effective date of this rule for F007 wastes that are deepwell injected.

Table 2-26 Capacity Analysis for F007

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	543,769	126,183,360
Chromium reduction and chemical precipitation	0	113,040
Stabilization of wastewater treatment sludge	446,338	1,263,905
Stabilization	242,018	0

Table 2-27 Capacity Analysis for F008

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	1,022,571	15,840
Stabilization of wastewater treatment sludge	999,070	3,922
Stabilization	242,018	0
Combustion of sludges	2,640	0
Combustion of solids	14,760	0
Stabilization of incinerator ash	3,216	0
Stabilization of scrubber water treatment sludge	174	0

Table 2-28 Capacity Analysis for F009

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	45,251	42,480
Chromium reduction and chemical precipitation	0	6,480
Stabilization of wastewater treatment sludge	5,147	489
Stabilization	266,978	0

F010

RCRA hazardous waste F010 is generated from heat treating operations. F010 is listed as a hazardous waste because of the presence of cyanides. The Agency is promulgating the proposed BDAT treatment standards for F010 based on the performance of incineration followed by stabilization of the incinerator ash and scrubber water treatment sludge for nonwastewaters and alkaline chlorination followed by chemical precipitation, settling, and filtration for wastewaters.

As shown in Table 2-29, all of the F010 wastes requiring alternative treatment were assigned to one of the BDAT technologies based on whether the waste stream was described as a wastewater or nonwastewater.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected F010 wastes requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for the F010 wastes that are not deepwell injected. Deepwell injected F010 wastes were not identified from the TSDR Survey as requiring alternative treatment. Therefore, the Agency is also not granting a national capacity variance for deepwell injected F010 wastes.

Table 2-29 Capacity Analysis for F010

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	32,400	0
Stabilization of incinerator ash	9,444	0
Stabilization of scrubber water treatment sludge	780	0
Alkaline chlorination	45,600	0
Stabilization of wastewater treatment sludge	45,144	0

F011 and F012

RCRA hazardous wastes F011 and F012 are generated from heat treating operations. They are listed as hazardous wastes because of the presence of cyanides. The Agency is promulgating BDAT treatment standards for F011 and F012 based on the performance of alkaline chlorination followed by chemical precipitation, settling, and filtration for wastewaters and electrolytic oxidation followed by alkaline chlorination, chemical precipitation, settling, and filtration for nonwastewaters. The BDAT treatment of these wastes also includes the stabilization of treatment residuals.

One commenter on the Second Third proposed rule pointed out that no commercial facilities offer the specific treatment train identified as BDAT for nonwastewaters (i.e., electrolytic oxidation followed by alkaline chlorination). The Agency agrees that no commercial facilities with a treatment train consisting of electrolytic oxidation followed by alkaline chlorination were identified in the TSDR Survey. However, EPA believes that alkaline chlorination, as a single process, will be able to meet the treatment standards. The Agency received numerous public comments supporting this position. Consequently, EPA included commercial alkaline chlorination capacity in its estimates of available capacity for F011 and F012 nonwastewaters.

Tables 2-30 and 2-31 show the non-deepwell injected and deepwell injected volumes requiring treatment and the alternative treatment technologies determined to be necessary for F011 and F012 wastes. As shown in the tables, most of the wastes requiring alternative treatment were assigned to alkaline chlorination. One F011 waste stream was described as a treatment residue. This waste stream was reported by a commercial landfill that has restrictions on accepting wastes with cyanide concentrations above the BDAT treatment standards. Therefore, the Agency believes that this waste stream would only require stabilization.

Based on TSDR Survey data, the Agency believes that adequate treatment capacity exists for non-deepwell injected F011 and F012 wastes requiring alternative treatment. However, if F011 and F012 wastes are commingled with electroplating wastes (F007, F008, and F009), the entire mixture will become subject to the lowest treatment standard for common constituents, in this case 110 mg/kg total cyanide. This limit is not uniformly attainable for the electroplating wastes because of significant concentrations (in some streams, at least) of complexed cyanides. Thus, EPA expects that F011 and F012 wastes will be segregated and treated separately, an appropriate result since otherwise the electroplating wastes would interfere with the treatment of the free (i.e., noncomplexed) cyanides in the heat treating operation wastes. However, it will take some time to adjust processes to segregate these heat treating and electroplating wastes. Accordingly, the Agency is deferring the effective date of the 110 mg/kg total cyanide standard and the 9.1 mg/kg amenable cyanide standard for the F011 and F012 heat treating wastes until December 8, 1989. Between July 8, 1989, and December 8, 1989, these wastes will be subject to the same cyanide standards as the electroplating wastes

(590 mg/kg total cyanide standard and 30 mg/kg amenable cyanide standard). The alternative is to leave these heat treating wastes subject to no cyanide standard at all, even though some treatment is available and achievable.

Although deepwell injected F011 and F012 wastes were not identified from the TSDR Survey as requiring alternative treatment, the Agency is also deferring the effective date of the cyanide treatment standard for deepwell injected F011 and F012 wastes. Therefore, these wastes will be subject to the same schedule as the non-deepwell injected F011 and F012 wastes.

Table 2-30 Capacity Analysis for F011

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	82,868	0
Stabilization of wastewater treatment sludge	45,517	0
Stabilization	3,788	0

Table 2-31 Capacity Analysis for F012

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	63,620	0
Stabilization of wastewater treatment sludge	61,338	0

F024

RCRA hazardous waste F024 is generated from the production of aliphatic hydrocarbons. F024 is listed as a hazardous waste because of the presence of toxic organics. The Agency is promulgating BDAT treatment standards for F024 wastewaters and nonwastewaters based on the performance of incineration followed by stabilization of the incinerator ash and scrubber water treatment sludge.

As shown in Table 2-32, all of the F024 wastes requiring alternative treatment were assigned to the BDAT technology. Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected F024 wastes requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for the F024 wastes that are not deepwell injected. Deepwell injected F024 wastes were not identified from the TSDR Survey as requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for deepwell injected F024 wastes.

Table 2-32 Capacity Analysis for F024

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	9,360	0
Combustion of sludges	46,080	0
Combustion of solids	16,800	0
Stabilization of incinerator ash	8,062	0
Stabilization of scrubber water treatment sludge	723	0

K009 and K010

RCRA hazardous wastes K009 and K010 are generated in the production of acetaldehyde. These wastes are listed as hazardous because of the presence of toxic organics. The Agency is promulgating BDAT treatment standards for K009 and K010 based on the performance of incineration for nonwastewaters and steam stripping followed by biological treatment for wastewaters. The BDAT technology identified for K009 and K010 nonwastewaters is based on a transfer of the incineration standards for K019 wastes promulgated with the First Third wastes on August 8, 1988.

As shown in Tables 2-33 and 2-34, all of the K009 and K010 wastes requiring alternative treatment were assigned to one of the BDAT technologies based on whether the waste stream was described as a wastewater or nonwastewater. The BDAT treatment of these wastes does not normally require stabilization of the treatment residuals, and no waste streams identified from the TSDR Survey were believed to require this additional treatment.

Information for the K009 and K010 waste streams generated at one facility was not taken from the TSDR Survey data base. Public comments and additional data received from the facility after the Second Third proposed rule indicated that because of changes in the facility's production process, the TSDR Survey information originally submitted for these deepwell injected waste streams is now incorrect. Therefore, the Agency used the new information supplied by the facility to ascertain the volumes and analyze characteristics of these waste streams. The information was used to determine whether the waste streams were to be considered wastewaters or nonwastewaters. Based on the information supplied, a K009 waste stream (79 million gallons per year) was determined to be a wastewater and a K010 waste stream (5 million gallons per year) to be a nonwastewater. These were the only waste streams reported as being deepwell injected. The data supplied by the facility and a letter from the Agency to the facility indicating the results of the evaluation of the waste streams are found in Appendix E.

Based on TSDR Survey data and data supplied by a facility generating K009 and K010 wastes, the Agency believes that adequate treatment capacity does not exist for the volume of deepwell injected K009 wastewaters requiring alternative treatment. Therefore, the Agency is granting a 2-year national capacity variance from the effective date of this rule for K009 wastewaters that are deepwell injected. However, the Agency believes that adequate treatment capacity does exist for all K010 wastes as well as all K009 nonwastewaters. Therefore, the Agency is not granting a national capacity variance for these wastes.

Table 2-33 Capacity Analysis for K009

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	1,440	0
Steam stripping and/or biological treatment	0	79,000,000

Table 2-34 Capacity Analysis for K010

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	0	5,000,000
Combustion of sludges	1,440	0

K011, K013, and K014

RCRA hazardous wastes K011, K013, and K014 are wastes generated in the production of acrylonitrile. These wastes are listed as hazardous because of the presence of toxic organics. K011 and K013 are also listed as hazardous because they are reactive. The Agency is promulgating BDAT treatment standards for the nonwastewater forms of K011, K013, and K014 based on the performance of incineration. However, the Agency is not promulgating BDAT treatment standards for K011, K013, and K014 wastewaters. Because these are First Third wastes, the wastewater forms will continue to be restricted from land disposal by the soft hammer provisions.

As shown in Tables 2-35, 2-36, and 2-37, all of the K011, K013, and K014 nonwastewaters requiring alternative treatment were assigned to the BDAT technology. The BDAT treatment of these wastes does not normally require stabilization of treatment residuals. However, several K011 waste streams reported in the TSDR Survey were mixed waste streams containing metal-bearing wastes. The Agency believes that these waste streams would require stabilization of the residuals.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected K011, K013, and K014 nonwastewaters requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for these wastes that are not deepwell injected. No deepwell injected K014 wastes were identified from the TSDR Survey as requiring alternative treatment.

Therefore, the Agency is not granting a national capacity variance for deepwell injected K014 nonwastewaters. However, the Agency believes that adequate treatment capacity does not exist for the volume of K011 and K013 nonwastewaters that are deepwell injected. Therefore, the Agency is granting a 2-year national capacity variance from the effective date of this rule for K011 and K013 nonwastewaters that are deepwell injected.

Table 2-35 Capacity Analysis for K011

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	49,920	173,379,980
Combustion of sludges	16,000	0
Combustion of solids	128,359	0
Stabilization of incinerator ash	120	0
Stabilization of scrubber water treatment sludge	6	0

Table 2-36 Capacity Analysis for K013

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	1,920	173,379,980
Combustion of sludges	16,000	0
Combustion of solids	128,359	0

Table 2-37 Capacity Analysis for K014 Nonwastewater

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	16,000	0

K027, K115, U221, and U223

RCRA hazardous wastes K027, K115, U221, and U223 are generated in the production of toluene diisocyanate and toluenediamine. These wastes are listed as hazardous because of reactivity and the presence of toxic organics. The Agency has identified the BDAT technology for these wastes to be incineration for nonwastewaters and carbon adsorption or direct incineration for wastewaters. The Agency is requiring these technologies as a method of treatment rather than developing numerical standards.

As shown in Tables 2-38 through 2-41, all of the K027, K115, U221, and U223 wastes requiring alternative treatment were assigned to one of the BDAT technologies based on whether the waste stream was described as a wastewater or nonwastewater. The only wastewater identified as requiring alternative treatment was a small volume of deepwell injected U223 wastes. Deepwell injected U223 wastes requiring alternative treatment were not identified from the TSDR Survey; however, information obtained from the EPA Office of Drinking Water's Hazardous Waste Injection Well Data Base indicated that a small volume of U223 wastes may require alternative treatment (Ref. 10). This volume is included in Table 2-41. The BDAT treatment of these wastes does not normally require treatment of scrubber water, incinerator ash, or wastewater treatment sludge, and no waste streams reported in the TSDR Survey were believed to require this additional treatment.

Based on the TSDR Survey and the EPA Office of Drinking Water data, the Agency believes that adequate treatment capacity exists for non-deepwell injected and deepwell injected K027, K115, U221, and U223 wastes requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for these wastes.

Table 2-38 Capacity Analysis for K027

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	7,465,464	0
Combustion of solids	21,360	0

Table 2-39 Capacity Analysis for K115

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	161,760	0

Table 2-40 Capacity Analysis for U221

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	0	26,824,080
Combustion of solids	305,784	0

Table 2-41 Capacity Analysis for U223

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	59,041	0
Carbon adsorption or direct combustion of wastewaters	0	9,853 [a]

[a]Based on the EPA Office of Drinking Water's Hazardous Waste Injection Well Data Base.

K093 and K094

RCRA hazardous wastes K093 and K094 are generated in the production of phthalic anhydride from ortho-xylene. These wastes are listed as hazardous because of the presence of toxic organics. The Agency is promulgating BDAT treatment standards for K093 and K094 based on the performance of incineration. This is based on a transfer of the incineration standards for K024 wastes promulgated with the First Third wastes on August 8, 1988.

As shown in Tables 2-42 and 2-43, all of the K093 and K094 wastes requiring alternative treatment were assigned to the BDAT technology. The BDAT treatment of these wastes does not normally require the treatment of scrubber water and incinerator ash, and no waste streams reported in the TSDR Survey were believed to require this additional treatment.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected K093 and K094 wastes requiring alternative treatment. Therefore, the Agency is not granting a capacity variance for these wastes that are not deepwell injected. Deepwell injected K093 and K094 wastes were not identified from the TSDR Survey as requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for these wastes that are deepwell injected.

Table 2-42 Capacity Analysis for K093

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	36,480	0

Table 2-43 Capacity Analysis for K094

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of sludges	36,480	0

P029, P030, P063, P098, and P106

RCRA hazardous wastes P029, P030, P063, P098, and P106 are discarded commercial chemical product wastes listed as hazardous because of the presence of cyanides. The Agency is promulgating BDAT treatment standards for these wastes based on the performance of alkaline chlorination followed by chemical precipitation, settling, and filtration for wastewaters and electrolytic oxidation followed by alkaline chlorination, chemical precipitation, settling, and filtration for nonwastewaters. This is based on a transfer of the treatment standards being promulgated in the Second Third final rule for F011 and F012.

One commenter on the Second Third proposed rule pointed out that no commercial facilities offer the specific treatment train identified as BDAT for nonwastewaters (i.e., electrolytic oxidation followed by alkaline chlorination). The Agency agrees that no commercial facilities with a treatment train consisting of electrolytic oxidation followed by alkaline chlorination were identified in the TSDR Survey. However, EPA believes that alkaline chlorination alone will be able to meet the treatment standards. The Agency received numerous public comments supporting this position. Consequently, EPA included commercially available alkaline chlorination capacity in its capacity determinations for these wastes.

As shown in Tables 2-44 through 2-48, all of the P029, P030, P063, P098, and P106 wastes requiring alternative treatment have been assigned to alkaline chlorination. The BDAT treatment of these wastes does not normally require stabilization of the wastewater treatment sludge, and no waste streams reported in the TSDR Survey were believed to require this additional treatment.

When mixed waste streams are reported in the TSDR Survey and no breakdown of the volumes of the component wastes is given, the total volume is assumed to be divided equally among the components. This assumption resulted in over 184 million gallons of required alternative capacity originally being attributed to P063 (hydrogen cyanide). The Agency questioned whether such a large volume of P063 waste would actually be generated.

40 CFR Section 261.33 includes a list of commercial chemical products that have been assigned "P" and "U" codes. These commercial chemical products are considered a hazardous waste when they meet one of the following descriptions: (1) discarded product, (2) off-specification product, (3) container residue, or (4) spill residue.

The Agency solicited public comments on the volume and characteristics of P063 wastes. No public comments were received concerning P063 wastes. Therefore, in order to determine whether these wastes truly meet the definition of P063 under 40 CFR Section 261.33, TSDR Survey data, and Generator Survey data, where available, were used to reevaluate waste generation, characterization, and capacity requirements for P063 wastes. Using these data sources, large-volume mixed waste streams containing P063 were identified at two facilities: (1) Monsanto Co. (EPA ID No. TXD001700806) and (2) Standard Oil Chemical Co. (EPA ID No. TXD000751172). A detailed analysis, including facility contact, was conducted on the TSDR and Generator Survey data from these facilities. The results of this analysis are detailed below:

- Monsanto Co. (EPA ID No. TXD001700806): In the TSDR Survey originally submitted for this Monsanto facility, two high-volume underground injected waste streams containing P063 were reported. One waste stream (330 million gallons per year) was described as a wastewater mixture of K011, K013, D002, D007, P003, and P063. The second waste stream (54 million gallons per year) was described as a wastewater mixture of K011, K013, P003, P063, and U002. The Generator Survey completed for this facility indicated that these waste streams were generated from the production of acrylonitrile at the facility.

  On May 5, 1989, the facility was contacted to confirm the applicability of waste code P063 to these waste streams. The facility contact indicated that the Texas Water Commission requires that a list of constituents be developed for each waste stream generated onsite. According to the contact, if any of the constituents in the waste stream had a "P" or "U" code designation in 40 CFR Section 261.33, then that code was assigned to the waste stream when the facility responded to the TSDR and Generator Surveys. For example, P063 was assigned to both waste streams because hydrogen cyanide is a constituent in the wastes. However, this is not a proper reason to assign a waste code to a waste stream under RCRA. As previously described, for a waste stream to be assigned a "P" or "U" code, the waste must be a discarded product, off-specification product, container residue, or spill residue. The "P" or "U" codes assigned to the two underground injected waste streams at this facility do not meet any of these descriptions; therefore, it was determined that the "P" and "U" codes were erroneously assigned and should be deleted from the surveys. After review of the relevant information, the facility contact agreed with this determination. Consequently, the "P" and "U" codes were deleted from these waste streams. For capacity determinations in the Second Third final rule, these waste streams were reevaluated as mixed K011 and K013 wastewaters.

- Standard Oil Chemical Co. (EPA ID No. TXD000751172): In the TSDR Survey originally submitted for this Standard Oil facility, one high-volume underground injected waste stream (169 million gallons per year) containing P063 was reported. The waste stream was described as a nonwastewater mixture of K011, K013, P063, and U009. A sludge from the filtration of this waste stream (255,600 gallons per year) was also reported as being landfilled onsite. The Generator Survey for this facility indicated that these waste streams are generated from the production of acrylonitrile at the facility.

On May 8, 1989, the facility was contacted to confirm the applicability of waste code P063 to these waste streams. The facility contact indicated that the underground injected waste stream is predominantly a K011/K013 waste stream routinely generated as part of the production process onsite. The 169 million gallons per year reported by the facility is the total volume of waste that was underground injected in 1986, which included the routinely generated K011/K013 waste stream and a small volume of P063 and U009 spill residues. When completing the TSDR Survey, the facility was unable to differentiate the volumes of the two waste streams; therefore, the facility reported them as a single waste stream.

The facility contact was able to estimate that 99.99 percent of the volume of waste underground injected in 1986 was the routinely generated K011/K013 waste stream. Based on this estimate, it is believed that only 16,900 gallons of P063 and U009 spill residues were underground injected in 1986. Consequently, the TSDR and Generator Surveys for this facility were revised to include a separate waste stream of 16,900 gallons per year of P063/U009 spill residue. Because the sludge reported as being landfilled onsite is from the filtration of the routinely generated K011/K013 waste stream, it is assumed that the sludge should also only be identified by the waste codes K011 and K013. The facility contact agreed with these revisions. The change in the waste streams reported for this facility will be incorporated in the capacity determinations for the Second Third final rule.

The revisions made to the TSDR Surveys of the facilities mentioned above result in changes in the estimates of required capacity for certain Second Third waste codes, namely K011, K013, and P063. For the Second Third final rule, the total volume of P063 wastes estimated to require alternative treatment has been reduced from over 184 million gallons per year to approximately 21,700 gallons per year. Overall, the total volume of K011 and K013 wastes estimated to require alternative treatment has been reduced from over 999 million gallons per year to approximately 347 million gallons per year. This is because treatment standards for K011 and K013 wastewaters are not being promulgated in the Second Third final rule. These wastewaters will therefore be covered by the soft hammer provisions, and have been deleted from the estimates of K011 and K013 wastes requiring alternative treatment. When the wastewater volumes that have been shifted from P063 to K011 and K013, based on the revisions reported above, are included, a total of 831 million gallons per year of K011 and K013 wastewaters will be covered by the soft hammer provisions as a result of the Second Third final rule.

The total amount of combustion capacity required for Second Third promulgated wastes has not changed because of these revisions. However, over 56 million gallons per year of liquids combustion capacity and 85,262 gallons per year of solids combustion capacity have been shifted from P063 to K011 and K013.

Based on the TSDR Survey data, Generator Survey data, and other available information, the Agency believes that adequate treatment capacity exists for the non-deepwell injected and deepwell injected P029, P030, P063, P098, and P106 wastes requiring alternative treatment. The Agency does not believe that any extension is warranted for these discarded commercial chemical product wastes because they are generated in small volumes at sporadic intervals and do not have to be treated in existing treatment systems that conceivably require minor adjustments. Therefore, the Agency is not granting a national capacity variance for these wastes.

Table 2-44 Capacity Analysis for P029

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	0	1,512

Table 2-45 Capacity Analysis for P030

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	21,382	22,552

Table 2-46 Capacity Analysis for P063

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	4,800	16,900

Table 2-47 Capacity Analysis for P098

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	308	2,952

Table 2-48 Capacity Analysis for P106

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	3,782	0

P039, P071, P089, and P094

RCRA hazardous wastes P039, P071, P089, and P094 are organophosphorous wastes. These hazardous wastes are listed for toxicity. The Agency is promulgating BDAT treatment standards for these wastes based on the performance of incineration for nonwastewaters and biological treatment for wastewaters.

As shown in Tables 2-49 through 2-52, all of the wastes requiring alternative treatment were assigned to one of the BDAT technologies based on whether the waste was described as a wastewater or nonwastewater. The BDAT treatment of these wastes does not normally require treatment of scrubber water, incinerator ash, or wastewater treatment sludge, and no waste streams reported in the TSDR Survey were believed to require this additional treatment.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected and deepwell injected P039, P071, P089, and P094 wastes requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for these wastes.

Table 2-49 Capacity Analysis for P039

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	295	0

Table 2-50 Capacity Analysis for P071

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Biological treatment	0	1,920
Combustion of solids	25,896	0

Table 2-51 Capacity Analysis for P089

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	26,880	0
Combustion of solids	480	0
Biological treatment	0	1,200

Table 2-52 Capacity Analysis for P094

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	1,200	0

U087

RCRA hazardous waste U087 is an organophosphorous waste listed for toxicity. The Agency has identified the BDAT technology for this waste to be incineration for nonwastewaters and carbon adsorption or incineration for wastewaters. The Agency is promulgating these technologies as a method of treatment rather than developing numerical standards.

As shown in Table 2-53, the U087 wastes requiring alternative treatment were deepwell injected and have been assigned to the BDAT technology for nonwastewaters. The BDAT treatment of these wastes does not normally require treatment of scrubber water and incinerator ash, and no waste streams reported in the TSDR Survey were believed to require this additional treatment. U087 waste streams described as wastewaters were not identified from the TSDR Survey as requiring alternative treatment.

Based on the TSDR Survey data, the Agency believes that adequate treatment capacity exists for the deepwell injected U087 wastes requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for U087 wastes that are deepwell-injected. Non-deepwell injected U087 wastes were not identified from the TSDR Survey as requiring alternative treatment. Therefore, the Agency is not granting a national capacity variance for non-deepwell injected U087 wastes.

Table 2-53 Capacity Analysis for U087

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	0	960

U028, U069, and U190

RCRA hazardous wastes U028, U069, and U190 are phthalate wastes listed for toxicity. The Agency is promulgating BDAT treatment standards for these wastes based on the performance of incineration. This is based on a transfer of the incineration standards for K024 promulgated with the First Third wastes on August 8, 1988.

As shown in Tables 2-54 through 2-56, all of the U028, U069, and U190 wastes requiring alternative treatment were assigned to the BDAT technology. Deepwell injected U028, U069, or U190 wastes were not identified from the TSDR Survey as requiring alternative treatment. However, information obtained from the EPA Office of Drinking Water's Hazardous Waste Injection Well Data Base indicates that a small volume of deepwell injected U190 wastes may require alternative treatment (Ref. 10). This volume is included in Table 2-54. The BDAT treatment of these wastes does not normally require the treatment of scrubber water and incinerator ash, and no waste streams reported in the TSDR Survey were believed to require this additional treatment.

Based on the TSDR Survey and the EPA Office of Drinking Water data, the Agency believes that adequate treatment capacity exists for the non-deepwell injected and deepwell injected U028, U069, and U190 wastes requiring alternative treatment. Therefore, the Agency is not granting a capacity variance for these wastes.

Table 2-54 Capacity Analysis for U028

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of solids	480	0

Table 2-55 Capacity Analysis for U069

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	29	0

Table 2-56 Capacity Analysis for U190

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of liquids	0	9,853 [a]
Combustion of solids	75,120	0

[a]Based on the EPA Office of Drinking Water's Hazardous Waste Injection Well Data Base.

2.2.11 Contaminated Soils

Because of the unique treatability and regulatory issues associated with contaminated soils, such soils have been handled separately in this document. Table 2-57 presents estimates based on TSDR Survey data of the total volume of contaminated soils land disposed at Subtitle C facilities, as well as a breakdown of the total volume land disposed per regulatory group, including the waste affected by today's rule. Contaminated soils were identified by the waste description code associated with each waste stream and do not include contaminated debris unless specifically indicated by the facility. The TSDR Survey contains data only on the volume of contaminated soils land disposed, not on the volume generated. Furthermore, no data are available on the source generating the waste volume being land disposed (e.g., corrective actions, spill cleanups, etc.). Appendix F presents the results of the analysis of required capacity for each alternative technology for contaminated soils.

Available capacity was first assigned to the nonsoil land disposed wastes analyzed in this document (i.e., solvent, HOCs, First Third promulgated wastes, and Second Third promulgated wastes). The remaining capacity was then used as available capacity for contaminated soils. Table 2-58 presents the results of the capacity analyses conducted for soils contaminated with solvents, HOC wastes (excluding First Third promulgated wastes containing HOCs), First Third promulgated wastes, and Second Third promulgated wastes. Tables 2-59 through 2-79 present waste code-by-waste code analysis of the treatment capacity required by soils contaminated with Second Third promulgated wastes.

Analysis of the TSDR Survey data indicated that relatively small volumes of soil contaminated with Second Third promulgated wastes were land disposed in 1986. However, the Superfund remediation program has expanded significantly since that time.

An incineration capacity analysis conducted by the Agency (Ref. 12) indicates that the amount of contaminated soils being sent to offsite incineration will probably be significantly higher in 1989 and 1990 than in 1986. This capacity analysis was based on information from the EPA Hazardous Site Control Division (Ref. 13). The Agency believes that capacity is still inadequate for incineration of soils contaminated with Second Third promulgated wastes because of the major increase in the Superfund remediation program. Therefore, the Agency is granting a 2-year national capacity variance from the effective date of this rule for soils contaminated with Second Third promulgated wastes that require incineration.

The Agency is not promulgating a national capacity variance for soils contaminated with any of the Second Third promulgated cyanide wastes. The treatment technology on which the Agency based treatment standards is alkaline chlorination. TSDR Survey data indicate that there is ample commercial cyanide treatment capacity providing alkaline chlorination. It is true that this is a wastewater treatment technology, and that contaminated soils are not liquids. However, contaminated soils could be slurried into liquid form and so be treatable by this technology. Therefore, the Agency is not granting a national capacity variance for these wastes.

Table 2-57 Volume of Contaminated Soils Land Disposed

Regulatory group	Land disposed volume (million gal/yr)
Solvents	26
First Third promulgated wastes	18
HOCs containing soft hammer First Third wastes	2
All other HOC wastes	4
Second Third promulgated wastes	2
Other RCRA wastes	12
All RCRA wastes	64

Table 2-58 Contaminated Soils
Capacity Analysis

Technology	Available capacity (million gal/yr)	Required capacity (million gal/yr)
Combustion of soils (sludges/solids)	8	
- Solvents		26
- First Third promulgated wastes		12
- HOCs (excluding above)		4
- Second Third promulgated wastes		1
Alkaline chlorination	31	
- Second Third promulgated wastes		2
Stabilization of soils contaminated with	512	
- Solvents (combustion residues)		10
- Solvents (other)		<1
- First Third promulgated wastes (combustion residues)		6
- First Third promulgated wastes (other)		11
- Second Third promulgated wastes (treatment residues)		2

Table 2-59 Capacity Analysis for
F007 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	764,769	0
Stabilization of wastewater treatment sludge	757,121	0

Table 2-60 Capacity Analysis for
F008 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	596,635	0
Stabilization of wastewater treatment sludge	590,669	0

Table 2-61 Capacity Analysis for
F009 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	242,018	0
Stabilization of wastewater treatment sludge	239,598	0

Table 2-62 Capacity Analysis for
F010 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	480	0
Stabilization of incinerator ash	475	0
Stabilization of scrubber water treatment sludge	5	0

Table 2-63 Capacity Analysis for
F011 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	3,788	0
Stabilization of wastewater treatment sludge	3,750	0

Table 2-64 Capacity Analysis for
K011 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	120	0

Table 2-65 Capacity Analysis for
K013 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	120	0

Table 2-66 Capacity Analysis for
K113 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	240	0

Table 2-67 Capacity Analysis for
P029 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	240	0

Table 2-68 Capacity Analysis for
P030 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	7,350	0

Table 2-69 Capacity Analysis for
P044 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	1,680	0

Table 2-70 Capacity Analysis for P063 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	15,360	0

Table 2-71 Capacity Analysis for
P071 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	46,980	0

Table 2-72 Capacity Analysis for
P089 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	720	0

Table 2-73 Capacity Analysis for
P094 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	43,800	0

Table 2-74 Capacity Analysis for
P106 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Alkaline chlorination	480	0

Table 2-75 Capacity Analysis for
U028 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	386,160	0

Table 2-76 Capacity Analysis for
U069 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	1,440	0

Table 2-77 Capacity Analysis for
U190 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	11,550	0

Table 2-78 Capacity Analysis for
U221 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	97,200	0

Table 2-79 Capacity Analysis for
U223 (Soil and Debris)

Type of alternative treatment/recovery	1988 non-deepwell volume requiring alternative capacity (gallons/year)	1988 deepwell volume requiring alternative capacity (gallons/year)
Combustion of soils	6,000	0

3. CAPACITY ANALYSIS METHODOLOGY

This section of the background document presents a detailed discussion of the methodology (approach) and rationale for the capacity analyses to support this final rule.

Section 3.1 includes a brief discussion of the data sources and the technical review and quality control procedures associated with the creation of the waste volume data set used for capacity analysis. Section 3.1 also presents a detailed discussion of the methodology used for determination of required alternative capacity for land disposed wastes (capacity demand). Section 3.2 provides a detailed discussion of the determination of available alternative capacity (supply) and the creation of the alternative capacity data sets used for the analysis. Finally, Section 3.3 describes the methodology used to compare the waste volumes and the associated required alternative capacity (demand) with the supply of available capacity to determine whether adequate capacity exists to support the land disposal restrictions.

3.1 Determination of Required Treatment Capacity

This section presents a detailed discussion of the analytical methodology used to determine the demand for alternative treatment capacity required by wastes affected by the Second Third final rule.

3.1.1 Waste Volumes Affected

As mentioned previously, this document presents an analysis of required and available treatment capacity for Second Third promulgated wastes, including contaminated soils. To assess the requirements for alternative treatment capacity that will result from the Second Third final restrictions, it was necessary to identify waste volumes by land disposal method, waste code, and physical/chemical form. With this information, it is possible to identify which treatment technologies are applicable to the waste volumes and to determine required alternative treatment capacity.

(1) Data sources. The TSDR Survey data base described earlier was the only source used to estimate surface disposed waste volumes and the primary source used to estimate underground injected waste volumes. For some wastes (specifically U190 and U223), the TSDR Survey did not contain data on underground injected volumes. Consequently, the EPA Office of Drinking Water's Hazardous Waste Injection Well Data Base (HWIWDB) was used to determine the underground injected volume for these two wastes (Ref. 12).

(2) Identification of waste volumes. Second Third promulgated wastes were identified on a waste code basis. For Second Third promulgated wastes described by a single waste code, the volume was allocated to the appropriate waste code.

For waste groups (mixed wastes and/or wastes described by more than one RCRA waste code), the entire volume was included in the regulatory group of the highest priority code in the group. For example, if a waste group was described by both a solvent waste code (F001-F005) and a Second Third promulgated code, the entire waste volume was assigned to solvents because they were restricted prior to Second Third wastes.

Consequently, to avoid double-counting, only waste volumes for waste groups containing a Second Third promulgated code but no solvents, potential California List halogenated organic compounds (HOCs), or First Third wastes for which a treatment standard was promulgated on August 8, 1988 (i.e., non-soft hammer First Third wastes), have been included in today's estimates of required capacity. Furthermore, if a waste group contained more than one Second Third promulgated code but no previously restricted codes, the volume was divided equally among the Second Third promulgated codes.

(3) Determination of affected volumes. Land disposal is defined under RCRA as any placement of hazardous waste into or on the land. Therefore, storage and treatment of hazardous waste in or on the land is also considered land disposal. Land disposal methods can be divided into numerous categories. Five types of land disposal are addressed in detail in this document: disposal in landfills; treatment and storage in waste piles; disposal by land application; treatment, storage, and disposal in surface impoundments; and underground injection. Utilization of salt dome formations, salt bed formations, and underground mines and caves are additional methods of land disposal that are affected by this rulemaking. Currently, there is insufficient information to document the volumes of Second Third promulgated wastes disposed of by these last three methods; therefore, they are not addressed in the analysis of volumes and required alternative treatment capacity.

Estimates of the volumes of affected wastes that have been stored (but not treated or disposed of) in surface impoundments or waste piles are presented. Storage implies a temporary placement of wastes in the surface impoundment or waste pile. EPA has assumed that all of the affected wastes stored in surface impoundments are eventually treated or recycled or that they are routed to permanent disposal in other existing units. To avoid double-counting in this analysis (i.e., counting waste volumes once when they are stored and again when they are finally disposed of), the volumes of wastes reported as being stored in surface impoundments or waste piles were not included in the estimates of volumes requiring alternative treatment capacity. Nevertheless, these wastes will be affected by the restrictions and will require alternative storage capacity. However, if during the facility-level analysis of the responses to the TSDR Survey it was determined that wastes were being stored indefinitely in the impoundment or waste pile (i.e., long-term storage), these volumes were included as requiring alternative treatment capacity because they would not be counted elsewhere. If hazardous waste entered a waste pile or surface impoundment for storage in 1986 but was not reported as having been removed from the impoundment or waste pile for treatment or disposal prior to or during 1986, the waste was considered to have undergone long-term storage.

HSWA required that all surface impoundments be in compliance with certain minimum design and operating criteria (minimum technology requirements; see RCRA section 3005(j)) to continue receiving, treating, or storing hazardous waste beyond November 8, 1988. Furthermore, the land disposal restrictions, upon promulgation, forbid placement of restricted wastes in surface impoundments, except for treatment. Consequently, most surface impoundments were replaced by tanks, retrofitted to meet the minimum technical standards, or closed entirely by November 1988. Because the baseline year for the TSDR Survey is 1986, however, the 1986 land disposed volumes do not reflect these changes. Therefore, a special analysis of the management of wastes in surface impoundments was conducted. As described in Section 2.1.1, if it could be determined from the survey responses or through facility follow-up that a treatment surface impoundment was being closed without a replacement (i.e., the surface impoundment is to be bypassed because it is not crucial to effective operation of the treatment system), was being replaced by tanks, or was being retrofitted, then the volume was dropped from further analysis of waste requiring alternative treatment capacity.

For surface impoundments used for treatment and long-term storage or for treatment and disposal that were being replaced by tanks or retrofitted, it was sometimes necessary to include the volume of treatment residual generated in the impoundment in 1986 in the volume requiring alternative treatment capacity. Because the impoundment was used for long-term storage or disposal of the treatment residual, the volume was not counted elsewhere as land disposal. Where it could be assumed that the treatment residual would continue to be generated after retrofitting or replacement, the volume of treatment residual generated on an annual basis, not the entire volume entering the impoundment for treatment, was included as requiring alternative treatment capacity. For example, if a facility reported that in 1986 it used a surface impoundment for treatment (settling) and disposal of a Second Third promulgated hazardous waste but that in 1988 it was replacing the impoundment with a settling tank, the volume of waste entering the impoundment in 1986 would not require alternative treatment capacity because it would no longer be land disposed in 1988. However, the volume that was settling for disposal in 1986 would still be generated in the tank in 1988 and would require alternative treatment capacity prior to disposal. The treatment residual volume would therefore be included in the volume of wastes requiring alternative treatment capacity. If, however, it was determined that the impoundment was a flow-through impoundment and that only incidental settling occurred (i.e., less than 1 percent of the volume entering was settled), then it was assumed that there would be essentially no settling when the impoundment was replaced by a tank.

3.1.2 Treatability Analysis

Those wastes that require alternative treatment/recovery because of the land disposal restrictions, once identified, must be analyzed to determine the types of alternative treatment required. This process is referred to as treatability analysis. This section discusses the methodology used to perform treatability analyses on the wastes identified as requiring alternative treatment/recovery. The results of the treatability analysis conducted on the waste streams used for this rulemaking are contained in Appendix C.

(1) Waste characterization. Respondents to the TSDR Survey were asked to provide a limited waste characterization, including a waste code (or codes) and a waste description code (A/B codes), for each waste stream being land disposed. The A/B codes classify wastes, at a minimum, by the following general physical/chemical categories: inorganic liquids, sludges, solids, and gases and organic liquids, sludges, solids, and gases. The waste description codes, in some cases, also provide qualitative information on hazardous constituents or characteristics. The waste code and A/B code combinations were the primary source of characterization data used to assess treatability of the wastes.

A limited number of facilities, however, did not provide these codes. If during technical review of the survey or facility follow-up, the facility was either unwilling or unable to provide these codes, engineering judgment was used to assign a waste description code. All available information from the survey was used to assign the waste description codes, including the survey responses and the facility schematic. These sources could provide information on previous management (e.g., whether the waste was a treatment residual), the origin of the waste (e.g., mixture rule and derived from rule wastes), and how the waste was being land disposed (e.g., no liquids in landfills).

In addition, for F and K coded wastes for which the facility did not provide waste description codes, the waste description in 40 CFR Part 261, as well as information contained in a report characterizing RCRA waste streams (Ref. 17), was used to assign the waste to the most common physical/chemical form. Occasionally, it was not feasible to assign the waste to the most common form. For example, if the available information indicated that the waste was commonly a solid but the waste was being underground injected, it was assumed to be a liquid rather than a solid.

P and U coded wastes for which the facility did not provide waste description codes were generally assigned to either off-spec or discarded products, contaminated soils, or aqueous cleanup residue, depending on the volume, management, and assumed physical/chemical form of each waste. Again, any assumptions regarding the physical form were based on available information from the schematic or survey, including the methods of management. For example, landfilled wastes were assumed to be either sludges or solids, and underground injected wastes were assumed to be liquids. If the volume of undescribed waste being land disposed was large (i.e., greater than 50 tons for solids or 1,000 gallons for liquids), the waste was assumed to be contaminated soil or aqueous waste derived from a cleanup operation. This was based on the assumption that, for economic reasons, only small volumes of off-spec products are likely to be produced, and therefore only small volumes would be land disposed.

Characteristic hazardous wastes (i.e., D waste codes) for which the facility did not provide waste description codes were generally assigned a waste description based on the method of land disposal used, any information from the schematic or other survey responses, and the characteristic represented by the particular D code. For example, pesticide wastes characteristically hazardous for their toxicity were generally considered organic, while toxic metal wastes were considered inorganic.

For the purposes of the TSDR Survey, certain X-codes were created to describe hazardous waste residuals that result from the onsite management of many individual RCRA coded wastes that are no longer individually identifiable. One such X-code was XLEA, which was used to describe leachate from hazardous waste landfills. To ensure that the X-codes were not being misused by respondents and that RCRA codes were being used when it was reasonable to do so, an attempt was made to "un-X" X-coded wastes that were reported as land disposed. In the case of XLEA, information from the facility schematic and facility notes, as well as information on the types of wastes entering the landfill, was used to assign RCRA codes to these wastes. However, because by definition these wastes should no longer be individually identifiable, very few X-coded wastes were assigned RCRA codes.

(2) Treatability grouping/assigning alternative treatment. As previously mentioned, EPA is required to establish treatment standards for those wastes being restricted from land disposal. The Agency has the option of either specifying the use of a particular technology or setting a concentration standard based on the performance of the best demonstrated available technology (BDAT). For the Second Third promulgated wastes, the Agency is generally establishing concentration standards based on the performance of BDAT; however, for some Second Third promulgated wastes, EPA is requiring the use of the BDAT technology.

Through use of the characterization data provided by the survey, i.e., the waste code and A/B code combinations, and consideration of the BDAT technologies identified by EPA, wastes were assessed for treatability and assigned to treatability groups. These treatability groups were then assigned to BDAT treatment or, in some cases, to alternative treatment that the Agency believes is capable of meeting the BDAT treatment standard. For example, if the BDAT technology was identified as rotary kiln incineration, it was assumed that other types of incineration with the appropriate feed system would be able to achieve the BDAT standard. In addition, for this analysis, reuse as fuel was also assumed to be equivalent to incineration (incineration and reuse as fuel have been grouped under the general category of combustion).

Wastes with similar A/B codes that require the same BDAT were assigned to the same treatability groups. Appendix G presents the alternative treatment/recovery technologies associated with each treatability group, and Appendix H contains a description of each alternative treatment/recovery technology.

In limited cases, waste could not be assigned to the treatability group representing the BDAT treatment because the physical/chemical form of the waste was incompatible with the BDAT treatment. In these cases, an engineering analysis of the waste stream was conducted to assign the waste to an alternative technology believed capable of achieving the BDAT treatment standard. The results of these analyses for each waste stream are presented in the waste code-specific discussions in Subsection 2.2.6. The TSDR Survey does not contain data on the performance of treatment technologies; therefore, several alternative sources (Refs. 15, 16, 17, 18, and 19) and "best engineering judgment" were required to identify potential alternatives to BDAT.

A similar analysis was conducted for waste groups (i.e., mixed wastes). Waste groups are hazardous wastes that are described by more than one RCRA waste code, and they present special treatability problems in that they are often contaminated with hazardous constituents that may fall under more than one treatability group (e.g., organics and metals). Such waste groups usually cannot be assigned to only the BDAT technology for one specific waste type. Instead, a treatment train that is capable of treating each waste type in the group sequentially must be developed. Often these treatment trains can be developed by combining BDAT treatments in sequence, or by adding pre- or post-treatment steps to the BDAT technology. Treatment trains were developed using the references mentioned above and engineering judgment.

(3) Treatment residuals. Treatment technologies generate residuals that create capacity demand. For example, some wastes require incineration followed by stabilization of the incinerator ash and treatment of the scrubber water followed by stabilization of the resultant wastewater treatment sludge. Based on the TSDR Survey responses, it was determined that RCRA permitted incinerators have adequate air pollution control devices (APCD) (including scrubber water treatment at those facilities with wet scrubbers) and that the facilities considered the capacity of their APCDs and wastewater treatment systems when determining the capacity of their incinerators. Therefore, no attempt was made to evaluate capacity for treatment of scrubber waters. Wastewater treatment sludges and incinerator ash requiring stabilization, however, were included in the estimates of treatment residuals requiring capacity.

Although the entire waste volume would require incineration, only a portion of the original volume would require stabilization because the amount of ash and wastewater treatment sludge generated would be less than the original volume incinerated. To account for these changes in the volume within a treatment train, volume adjustment factors were developed. These factors were developed using engineering judgment and are dependent on the type of treatment and the physical/chemical form of the waste. The factors represent that percent of the original volume exiting the technology of concern as a residual. For example, the volume adjustment factor used to estimate the volume of ash generated from incineration of an organic sludge is 0.1, or 10 percent of the original volume, and the volume of scrubber water treatment sludge is estimated at 0.01 or 1 percent of the original volume. Therefore, if 100 gallons were incinerated, the volume adjustment factor would estimate that 10 gallons of ash and 1 gallon of wastewater (scrubber water) treatment sludge would be produced as residuals.

(4) Previous management. Another important factor considered during the treatability analysis of a waste was any previous management. Using information contained in the TSDR Survey and the facility schematics, it was possible to evaluate the previous management, if any, for wastes being land disposed. Whenever possible, the previous management of land disposed wastes was evaluated in an attempt to determine whether the waste had already been treated by the BDAT technology or by a technology believed capable of achieving the BDAT treatment standard. If it could be determined that the waste had been previously treated by such a

technology, the waste was assumed to meet the BDAT treatment standard. Such wastes would therefore not be prohibited from land disposal and were consequently not included in further analysis of the volume of wastes requiring alternative treatment/recovery capacity.

(5) Wastes excluded from further analysis. Because of the unique treatability issues associated with lab packs, these wastes were not included in the volume of wastes requiring alternative treatment/recovery capacity. Furthermore, these volumes represent less than 8,000 gallons, a small portion of the volume of wastes affected by the Second Third final rule.

3.2 Determination of Available Treatment Capacity

This section presents a detailed discussion of the analytical methodology used to determine the estimates of alternative treatment and recovery capacity available for wastes affected by the Second Third final rule. These processes include "combustion" in incinerators or industrial kilns, furnaces, and boilers, and "other treatment/recovery" processes including solidification/stabilization, solvent and liquid organic recovery for reuse, metals recovery, acid leaching of sludges, neutralization, and wastewater treatment for cyanides, metals, and organics. The discussion of combustion capacity is separate from the discussion of other treatment and recovery capacity. Combustion is predominantly a single unit process system; therefore, the combustion system analysis does not require locating and quantifying a limiting unit within a treatment train of unit processes as in the analysis of other treatment or recovery systems.

3.2.1 Determination of Combustion Capacity

(1) Introduction. The combustion data set was established to determine the following information for incineration and reuse as fuel: (1) the utilized capacity during the base or reference year of 1986; (2) the maximum capacity during 1986 and any planned changes through 1992; (3) the unused or available capacity during the periods 1986, 1987, 1988, 1989-1990, and 1991-1992; and (4) the possible interchange of capacity between the various hazardous waste forms (feed capabilities) for these time periods should excess capacity exist for certain forms and shortfalls exist for others. The data set was generated by technical review and engineering evaluation of TSDR Survey responses and facility schematics, followed by development of the data set and data consolidation and aggregation to arrive at national totals.

For this rule, capacity data from only fully commercial incinerators were used to determine available capacity. These data represent the most readily available capacity, on a national level, to treat the waste that is currently being considered under the land disposal restriction rules.

The incineration capacity compiled for this rule does not include information on two other potential categories of waste treatment capacity, limited commercial and captive facility capacity. "Limited commercial" facilities are those that accept wastes from only a limited number of facilities not under the same ownership--in many cases, only from their customers and/or clients. "Captive facilities" are those that manage wastes from other facilities under the same ownership. Although capacity from these types of facilities has not been included in this analysis, the Agency does not believe that available capacity from these sources would have affected any of the variance decisions for this rule.

To determine reuse as fuel capacity, data from facilities with fully and limited commercial industrial kilns, furnaces, or boilers were included. During review of the TSDR Survey, it was discovered that most facilities with reuse as fuel units described themselves as limited commercial because they accept waste only from a limited number of facilities not under the same ownership, primarily fuel blenders or waste brokers. Because fuel blenders and waste brokers are typically fully commercial, capacity at these limited commercial reuse-as-fuel units was also considered fully commercial.

The capacity data set was compared to estimates of waste volumes currently being land disposed that will require combustion capacity to determine whether there is adequate incineration and reuse-as-fuel capacity for all waste forms. Combustion technologies lend themselves well to wastes that are difficult to treat by conventional treatment technologies and are very versatile in that they can treat the various waste forms (liquids, sludges, solids, and gases) with some interchangeability.

(2) Approach and methodology. The data set was generated by review and engineering evaluation of TSDR Survey responses, transfer of data derived from the questionnaires to the computer data set, and final consolidation of all facility capacities to arrive at national totals.

The questionnaires pertaining to incineration and reuse as fuel in the TSDR Survey were Questionnaire B, "Incineration," and Questionnaire C, "Reuse as Fuel." A copy of the two questionnaires can be found in the RCRA docket for this proposed rule (Ref. 7). The questionnaires were designed not only to provide actual utilization and maximum capacity data for each unit at the facility, but also to provide other design and operational information to enable the reviewer to evaluate the accuracy of the facility responses. These other data elements were the following:

- Operating/downtime information;
- Percent utilization;
- Maximum practical thermal rating;
- Average heating value of the hazardous and nonhazardous waste being treated;
- Maximum practical feed rate for each waste form;
- Planned capacity increases/decreases by time period;
- Type of solids that can be fed to the unit; and
- Waste characteristics that exclude or limit acceptance for treatment.

The above information was used by the reviewer, using mass/heat balances and other methods, to evaluate the validity of the facility responses to utilized and maximum capacity questions. If discrepancies in responses were apparent, the reviewer would attempt to resolve the discrepancies, would contact the facility by telephone to verify such findings, and, if agreeable to the facility, would adjust the data.

In addition, technical review of reported capacity data included the evaluation of incinerator or reuse-as-fuel support systems such as waste feed handling systems, air pollution control devices, scrubber water treatment systems, and ash handling systems.

The types of incinerators considered in the TSDR Survey were as follows:

- Liquid injection
- Rotary (or rocking) kiln
- Rotary kiln with liquid injection
- Two-stage
- Fixed hearth
- Multiple hearth
- Fluidized bed
- Infrared
- Fume/vapor
- Pyrolytic destructor
- Other (specify).

The types of units that were considered in the Reuse as Fuel questionnaire were as follows:

- Cement kiln
- Aggregate kiln
- Asphalt kiln
- Other kiln (specify)
- Blast furnace
- Sulfur recovery furnace
- Smelting, melting, or refining furnace
- Coke oven
- Other furnace (specify)
- Industrial boiler
- Utility boiler
- Process heater
- Other reuse as fuel (specify).

The computer data set used to consolidate and analyze capacity data from Questionnaires B and C included the following information (brief explanation of each data element):

1. Facility ID - The USEPA identification number for the facility

2. Facility Name

3. Unit No. - data were gathered on a unit basis since some facilities have more than one incinerator or kiln

4. Commercial status - the two commercial categories are facilities that (1) accept waste from the general public (full commercial) and (2) accept waste from a limited number of facilities not under the same ownership (limited commercial); the two noncommercial categories are facilities that (3) accept waste from facilities under the same ownership (captive) and (4) manage wastes generated onsite (onsite)

5. Unit type - a code for the type of incinerator or reuse as fuel unit (as described earlier)

6. Fixed or Mobile unit (F/M)

7. Exempt (Y/N) - RCRA permit status

8. Thermal Rating, MBtu/hr

9. Waste Feed Mix (Y/N)

   A. liquids
   B. sludges
   C. solids
   D. gases

10. Unique (Y/N): If yes, explain.

11. Capacity 1986

    A. Hazardous Waste Quantity - this amount represents the quantity of RCRA hazardous waste treated in the subject unit during calendar year 1986. This quantity is also referred to as utilized capacity.

    B. Nonhazardous Waste Quantity - this is the quantity of nonhazardous waste that was treated in the same unit, either concurrently or separately, during 1986.

    C. Hazardous Waste Maximum Quantity (Capacity) - the maximum quantity of hazardous waste that the treatment unit could have treated during 1986.

    D. All Waste Maximum Quantity (Capacity) - the maximum quantity of both hazardous and nonhazardous waste that could have been treated in 1986.

12. Planned changes or new units, by time period, for 1987 through 1992.

The above data were used to tabulate and develop the combustion capacity data set, the results of which will be discussed in Section 3.2.3, Development of the Treatment Capacity Data Set and Results.

The data were compiled in a computer data base for more convenient data management. A copy of the data sheets, along with a description of their use, can be found in Ref. 20.

To make the necessary comparisons for this analysis, the original facility responses were converted to one standard unit, volume in gallons. Data reported in short tons (2,000 lb/ton) by facilities were consistently converted to gallons by using a conversion factor of 240 gal/ton (based on the density of water) for all waste forms other than gases. Gases are reported in standard cubic feet (SCF) in the initial data and were converted to tons by assuming an average molecular weight of 29. However, the analyses were done in the appropriate units (e.g., tons for solids) and simply converted to gallons for consistent presentation of units.

Data through 1992 are presented because the long-range plans of many facilities extend to these years, and projections of future capacity may be necessary for variance determinations. It is also assumed that the units reported as operational in 1986 with no closure dates reported will continue to operate through 1992.

3.2.2 Determination of Other Treatment System Capacities

The capacity data set also includes data on treatment systems other than combustion that may be able to treat Second Third promulgated wastes to their respective treatment standards. These technologies include solidification/stabilization and wastewater treatment processes. Because the TSDR Survey data for these treatment processes are reported on a unit process basis, a method was developed to derive a system capacity from the unit process data. The results of this analysis were aggregated into a hazardous waste treatment system capacity data set for comparison with required capacity.

For this rule, capacity data from only fully commercial treatment facilities were used to determine available capacity. These data represent the most readily available capacity, on a national level, to treat the waste that is currently being considered under the land disposal restrictions rule. The capacity indicated by the commercial data set does not include information on two other potential categories of waste treatment capacity, limited commercial and captive facility capacity. "Limited commercial" facilities are those that accept wastes from only a limited number of facilities not under the same ownership--in many cases, only from their customers and/or clients. "Captive facilities" are those that manage wastes from other facilities under the same ownership. Data are not yet available to include in this analysis. However, the Agency does not believe that available capacity from these sources would have affected any of the variance decisions for this rule.

(1) Unit process capacity. The TSDR Survey requested capacity data on a process-specific basis. A process is defined in the TSDR Survey as one or more units of equipment acting together to perform a single operation on a waste stream. A system is defined in the TSDR Survey as one or more processes that work together to treat a waste stream.

Figure 3-1 presents the process codes provided for the TSDR Survey respondent to report treatment process information.

During technical review, three different interpretations by respondents of the process capacity questions were identified, which determined the method of system capacity analysis to be used by the reviewer.

Case I: Each unit process was reported separately. In such a case, process units must be aggregated into treatment systems so that the capacity of the systems can be calculated from the reported maximum and utilized process capacities.

Case II: The capacity for each process type was combined and reported as one process by the facility, including when the same process was conducted in several different units (tanks or surface impoundments) found in different systems. Responses to the tank and/or surface impoundment questionnaires were used to obtain the utilized capacity of each tank and/or surface impoundment using the process of concern. The maximum capacity of these tanks and/or surface impoundments was obtained by facility contact. The unit process data were then aggregated into treatment systems as in Case I.

Case III: The survey respondent reported the entire treatment system as one process. The utilized and maximum capacities reported for the process were used to represent the entire system. If the individual unit processes that make up the treatment system could not be identified by examining the facility schematic and responses to other questions in the survey, the facility was contacted to obtain that information. The respondent's system data were then inputted into the capacity data set.

Upon completion of technical review, the following information was obtained and examined prior to use in the system capacity analysis:

- All processes that compose the system and the units in which they occur were identified, and a flow diagram was constructed.
- The amount of hazardous and nonhazardous waste that enters and leaves the system was quantified so that a mass balance around the system could be conducted.

Figure 3-1

PROCESS CODES

These process codes were developed specifically for this survey to describe the onsite hazardous waste management operations at a facility

TREATMENT AND RECYCLING

Incineration/thermal treatment

1I Liquid injection
2I Rotary (or rocking) kiln
3I Rotary kiln with a liquid injection unit
4I Two stage
5I Fixed hearth
6I Multiple hearth
7I Fluidized bed
8I Infra-red
9I Fume/vapor
10I Pyrolytic destructor
11I Other incineration/thermal treatment

Reuse as fuel

1RF Cement kiln
2RF Aggregate kiln
3RF Asphalt kiln
4RF Other kiln
5RF Blast furnace
6RF Sulfur recovery furnace
7RF Smelting, melting, or refining furnace
8RF Coke oven
9RF Other industrial furnace
10RF Industrial boiler
11RF Utility boiler
12RF Process heater
13RF Other reuse as fuel unit

Fuel blending

1FB Fuel blending

Solidification

1S Cement or cement/silicate processes
2S Pozzolanic processes
3S Asphaltic processes
4S Thermoplastic techniques
5S Organic polymer techniques
6S Jacketing (macro-encapsulation)
7S Other solidification

Recovery of solvents and liquid organics for reuse

1SR Fractionation
2SR Batch still distillation
3SR Solvent extraction
4SR Thin-film evaporation
5SR Filtration
6SR Phase separation
7SR Dessication
8SR Other solvent recovery (including pretreatment)

Recovery of metals for reuse

1MR Electrolytic
2MR Ion exchange
3MR Reverse osmosis
4MR Solvent extraction
5MR Secondary smelting
6MR Liming
7MR Evaporation
8MR Filtration
9MR Sodium borohydride
10MR Other metals recovery (including pretreatment)

Wastewater treatment

Equalization
1WT Equalization

Cyanide oxidation
2WT Alkaline chlorination
3WT Ozone
4WT Electrochemical
5WT Other cyanide oxidation

General oxidation (including disinfection)
6WT Chlorination
7WT Ozonation
8WT UV radiation
9WT Other general oxidation

Chemical precipitation
10WT Lime
11WT Sodium hydroxide
12WT Soda ash
13WT Sulfide
14WT Other chemical precipitation

Chromium reduction
15WT Sodium bisulfite
16WT Sulfur dioxide
17WT Ferrous sulfate
18WT Other chromium reduction

Complexed metals treatment (other than chemical precipitation by pH adjustment)
19WT Complexed metals treatment

Emulsion breaking
20WT Thermal
21WT Chemical
22WT Other emulsion breaking

Adsorption
23WT Carbon adsorption
24WT Ion exchange
25WT Resin adsorption
26WT Other adsorption

Stripping
27WT Air stripping
28WT Steam stripping
29WT Other stripping

Evaporation
30WT Thermal
31WT Solar
32WT Vapor recompression
33WT Other evaporation

Filtration
34WT Diatomaceous earth
35WT Sand
36WT Multimedia
37WT Other filtration

Sludge dewatering
38WT Gravity thickening
39WT Vacuum filtration
40WT Pressure filtration (belt, plate and frame, or leaf)
41WT Centrifuge
42WT Other sludge dewatering

Air flotation
43WT Dissolved air flotation
44WT Partial aeration
45WT Air dispersion
46WT Other air flotation

Oil skimming
47WT Gravity separation
48WT Coalescing plate separation
49WT Other oil skimming

Other liquid phase separation
50WT Decanting
51WT Other liquid phase separation

Biological treatment
52WT Activated sludge
53WT Fixed film—trickling filter
54WT Fixed film—rotating contactor
55WT Lagoon or basin, aerated
56WT Lagoon, facultative
57WT Anaerobic
58WT Other biological treatment

Other wastewater treatment
59WT Wet air oxidation
60WT Neutralization
61WT Nitrification
62WT Denitrification
63WT Flocculation and/or coagulation
64WT Settling (clarification)
65WT Reverse osmosis
66WT Other wastewater treatment

OTHER PROCESSES (TREATMENT OR RECOVERY)

1TR Other treatment
2TR Other recovery for reuse

ACCUMULATION

1A Containers
2A Tanks

STORAGE

1ST Container (i.e., barrel, drum)
2ST Tank
3ST Waste piles
4ST Surface impoundment
5ST Other storage

DISPOSAL

1D Landfill
2D Land treatment
3D Surface impoundment (to be closed as a landfill)
4D Underground injection well

- The utilized and maximum capacities of each unit were determined.
- If surface impoundments were used in the treatment system, it was determined whether they met minimum technological requirements. The effect of closing, retrofitting, or replacing the surface impoundment with a tank or new minimum technological surface impoundment on system capacity was determined.
- Also noted were any other planned changes to the system and how they might affect the maximum capacity of the unit and/or system.

(2) Hazardous waste treatment/recovery system identification. Using the facility schematics, with revisions made as a result of technical review, hazardous waste treatment/recovery systems and their respective unit processes were identified. For purposes of the capacity analysis, a hazardous waste treatment/recovery system was identified by each hazardous waste entry point into a unit process or sequence of unit processes. The system begins at the process unit where the hazardous waste stream(s) first enters and consists of all other treatment or recovery process units downstream from the point of entry.

The following examples demonstrate system identification. Figure 3-2 shows a simple hazardous wastewater treatment system. Hazardous waste can enter the three-unit processes for treatment at only one point, the chemical precipitation process. Therefore, there is only one hazardous waste treatment system. The system consists of chemical precipitation, clarification/settling, and sludge dewatering (filter press) processes. Note that by this method, recycle streams and nonhazardous waste streams do not affect system identification.

Figure 3-3 depicts three hazardous waste treatment systems. Three hazardous waste entry points exist at three different units, which perform three different processes. The chromium waste treatment system

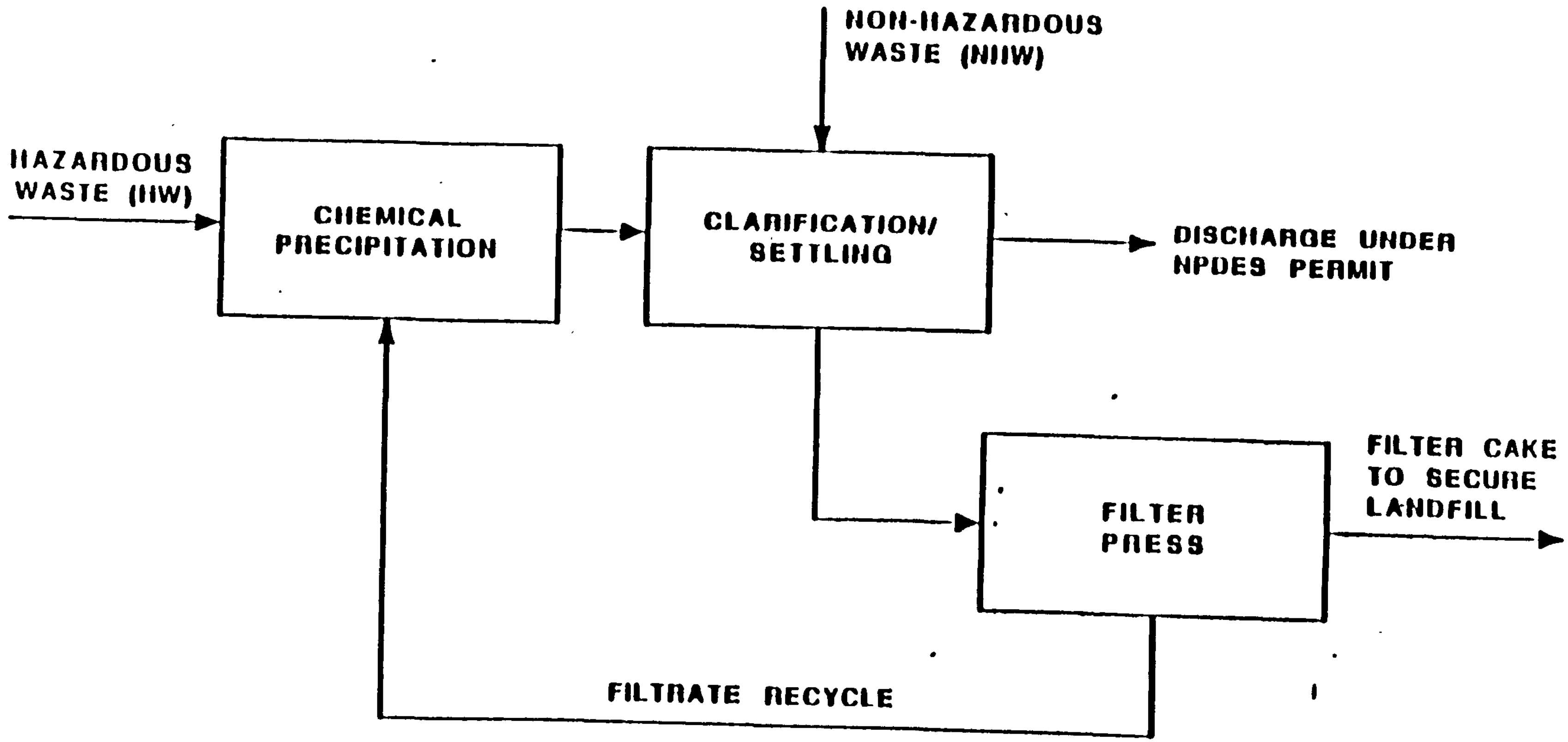

Figure 3-2 FLOW DIAGRAM OF A SIMPLE SYSTEM

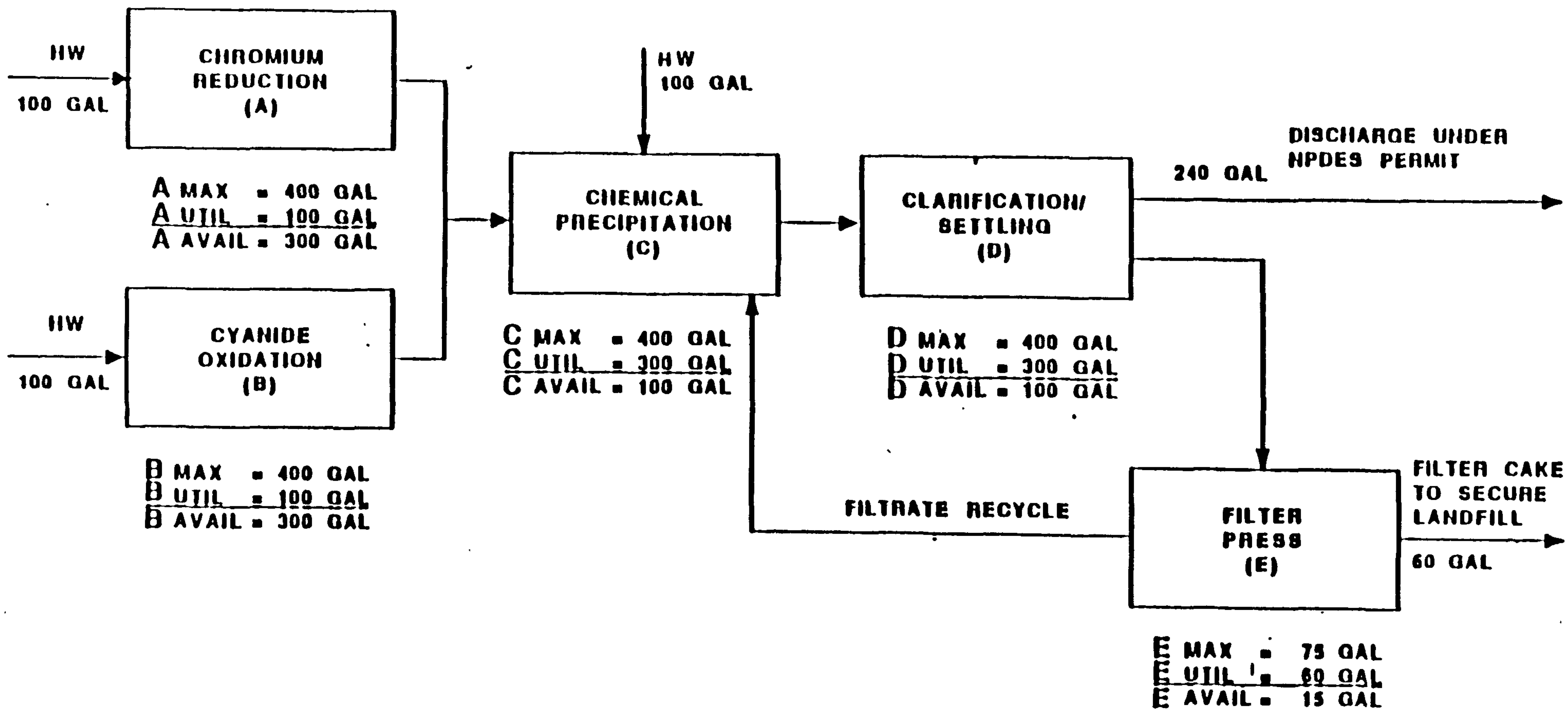

Figure 3-3 FLOW DIAGRAM OF THREE SYSTEMS WITH UNIT PROCESS CAPACITIES

consists of chromium reduction, chemical precipitation of chromium, settling, and sludge dewatering processes. The cyanide waste treatment system consists of a cyanide oxidation process followed by chemical precipitation of metals, and settling and dewatering of the resultant treatment sludge. The third is a treatment system for a general metal-containing waste consisting of chemical precipitation of metals, settling, and sludge dewatering. Note that the three systems share some of the same unit processes. These three systems may be linked together by competing for the capacity of the shared units. If the system capacity determination reveals that at least one of the shared units limits the capacity of at least one of the treatment systems, then the three systems are considered linked systems.

At first glance, Figure 3-4 appears to show two systems because there are two hazardous waste entry points. Upon closer examination, it can be seen that the two waste streams feed into two different tanks that conduct the same process in parallel. For purposes of capacity analysis, these two units are considered one process, with the utilized and maximum capacities of the "aggregated unit" equal to the sum of the utilized and maximum capacities of each of the individual units. Therefore, Figure 3-4 depicts only one hazardous waste treatment system.

(3) Determination of system capacity. To determine the capacity of a treatment system, the utilized and maximum capacity of each unit process must be examined. Where several systems share unit processes, such as in Figure 3-3, all the unit processes that make up each of the potentially linked systems must be considered together for this portion of the analysis.

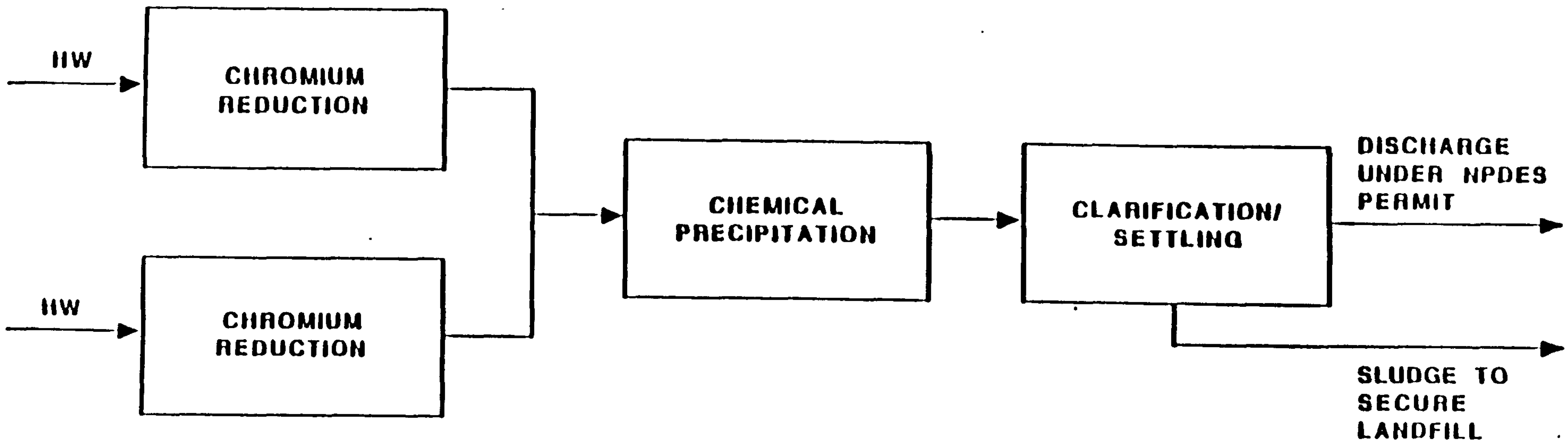

Figure 3-4 FLOW DIAGRAM OF ONE SYSTEM WITH TWO UNITS CONDUCTING THE SAME PROCESS

The capacity determination takes a "snapshot" approach, treating batch and continuous processes similarly by conducting a mass balance based on the amount of waste that was treated and could be treated during the entire year. Survey respondents reported unit capacities as the amount of hazardous waste entering the unit in 1986, the amount of nonhazardous waste entering the unit in 1986, the hazardous waste maximum capacity, and all waste maximum capacity. Volumes from internal recycle streams are considered in the volumes respondents reported for utilized and maximum unit capacities; therefore, recycle streams are not considered separately when conducting systems analysis.

The available capacity for each unit was calculated by subtracting the utilized capacity from the maximum capacity. The available capacities of upstream units were compared with each unit in the process string to locate the limiting unit(s) in the system(s). The overall system capacity was based on the restrictions imposed by the limiting unit.

The above methodology assumes a 1986 baseline for hazardous and nonhazardous wastes already being treated in the system and uses only that portion of the system's remaining capacity that the respondent claims may be used for hazardous waste treatment. It was assumed that when a survey respondent reported hazardous waste maximum capacity to be less than all waste maximum capacity, the respondent had already considered how much nonhazardous waste would be treated using the system when reporting the hazardous waste maximum capacity for the unit.

The available capacity of a simple system is the available capacity of the limiting unit. In Figure 3-5, B is the limiting unit because it has the smallest available capacity. If one were to try to treat 50 gallons of additional hazardous waste using this system, there would be a bottleneck at unit process B because it has room for only 25 additional gallons of waste. Therefore, the system has only 25 gallons of available hazardous waste treatment capacity. The maximum hazardous waste treatment system capacity would be 75 gallons--50 gallons of hazardous waste capacity already utilized plus the additional 25 gallons of available capacity based on limiting unit B.

When more complicated systems are analyzed, care must be taken that the total available capacities affecting a downstream unit are considered. Referring to the unit capacities provided in Figure 3-3, if the amount of waste being treated in units A and B were increased by 300 gallons in each unit (i.e., if they were run at their maximum capacities), unit C would become a bottleneck because it has only 100 gallons of available capacity. In other words, when units directly upstream of the unit of concern are in parallel, one must add the available capacities of the upstream units before comparing them with the available capacity of the unit of concern to determine whether that unit limits (imposes a restriction on) the maximum capacity of the upstream units (Example: $A_{Avail} + B_{Avail} = 600$ gal and 600 gal $> C_{Avail}$).

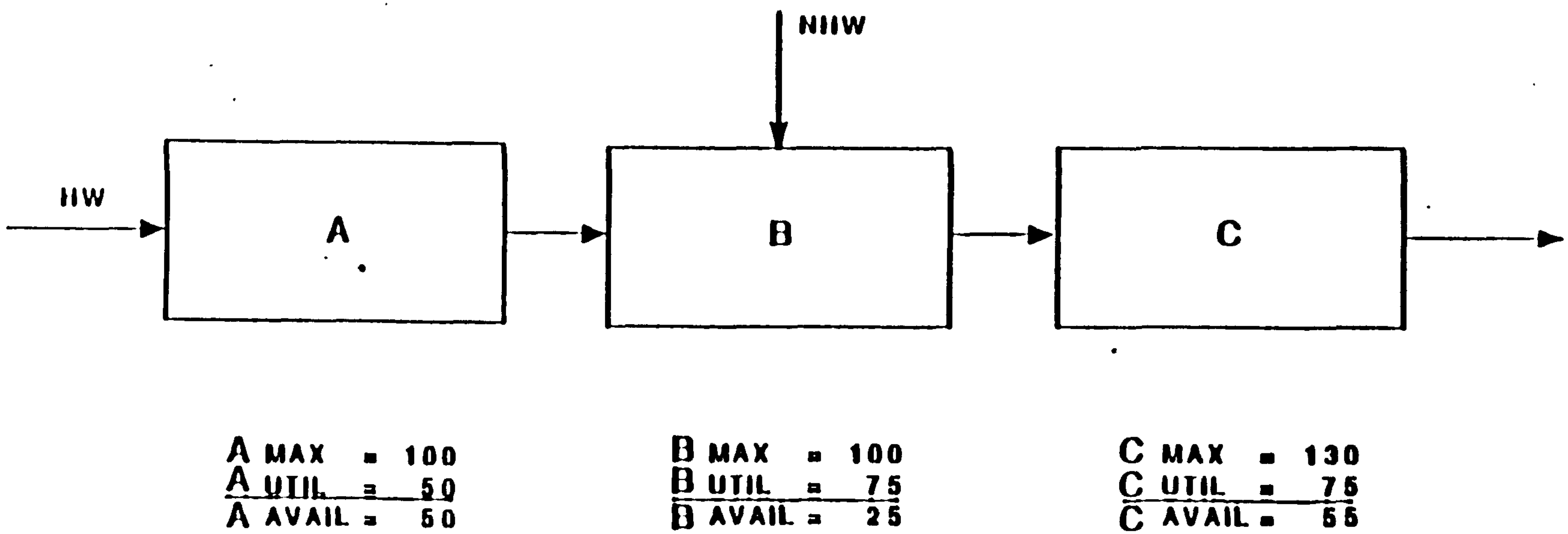

Figure 3-5 FLOW DIAGRAM WITH UNIT CAPACITIES

The effective available capacity of an upstream unit must be calculated for comparison with the downstream unit's available capacity in cases where only a portion of the waste treated in the upstream unit is treated in the downstream unit of concern. If one refers to Figure 3-3, one must consider the effluent stream from the clarifier being discharged under an NPDES permit when determining the effect of using the available capacity of the clarifier on the available capacity of the filter press. That fraction of waste being treated in the upstream unit that continues to the downstream unit is calculated. Under the assumption that as the utilized capacities of these units are increased, the percent of waste that is treated in both upstream and downstream units remains constant, the calculated percent is applied to the reported available capacity of the upstream unit before that capacity is compared with the available capacity of the downstream unit.

In Figure 3-3, the fraction of waste (D_p) going from the clarifier to the filter press (unit E) is calculated by:

$$D_p = \frac{E_{util}}{D_{util}} = \frac{60}{300} = 0.2.$$

Twenty percent of the waste treated by unit D is treated by unit E. Now the available capacity of the clarifier affecting the filter press (D_{eal}) is calculated:

$$D_{eal} = (D_p)\ (D_{avail}) = (0.2)\ (100) = 20 \text{ gallons.}$$

If the amount of waste being treated in the clarifier is increased to its maximum capacity, then 20 more gallons of waste will flow to the filter press. A comparison of the effective available capacities, however, indicates that the filter press limits the maximum capacity reported for the clarifier:

$$E_{avail} < D_{eal} \text{ or } 15 \text{ gallons} < 20 \text{ gallons.}$$

Considering the fact that the filter press limits the maximum capacity of the clarifier, the "new" available capacity of the clarifier must be compared to the capacity of the upstream unit, the chemical precipitation unit. The limiting effect of the filter press on the available capacity of the clarifier (D_{nac}) is quantified as follows:

$$D_{nac} = \frac{E_{avail}}{D_p} = \frac{15}{0.2} = 75 \text{ gallons.}$$

Based on the comparison of the "new" available capacity of the clarifier with the upstream chemical precipitation unit and the earlier comparison made between the chemical precipitation unit and the parallel upstream units, the filter press limits the capacities of all the other units in the process string.

At this point, the capacity analysis switches from a unit-by-unit analysis to a systems analysis. The effect of the limiting unit on the system's available and maximum capacity is determined. As previously discussed, Figure 3-3 shows three hazardous waste treatment systems. The utilized capacity of each of these systems is the amount of waste that enters each system for treatment. The utilized capacities for the chromium waste treatment, cyanide waste treatment, and metals waste treatment are 100 gallons each. The available capacity of each system, as determined by the effect of the limiting unit, is 75 gallons. This quantity, which was derived above, reflects the effluent stream that exits the systems upstream from the limiting filter press. The maximum capacity of each system equals the utilized capacity of the system plus the available capacity of the system. The maximum capacities of the chromium waste, cyanide waste, and metals waste treatment systems equal 175 gallons each.

When waste treatment systems share a limiting unit, as exemplified by the three systems shown in Figure 3-3, they compete for the available capacity of that limiting unit. Because of this competition for limited capacity, these linked systems cannot all operate at their maximum capacities as calculated above. A linked system can operate at its maximum capacity only if all the other systems to which it is linked continue to operate at the utilized capacities reported for 1986. The maximum capacities of each of the linked systems serve as end points when sufficient capacity for waste volumes requiring treatment is sought. Using the example shown in Figure 3-3 to illustrate, if additional chromium waste is sent to the chromium treatment system, then there is that much less additional capacity for cyanide waste and metals waste treatment. If the chromium waste treatment system operates at maximum capacity, then no additional waste may be sent to the cyanide waste treatment system or the metals waste treatment system.

To avoid overestimating available treatment capacity, a proportioned system capacity is calculated for linked systems. The proportioned system capacity is based on how much of the limiting unit's capacity was devoted to each linked system during the TSDR Survey base year of 1986.

First, the fractional flow of hazardous waste contributed by each linked system to the limiting process is determined. Using the systems shown in Figure 3-3:

Fractional flow of chrome treatment system = CR_p

Fractional flow of cyanide treatment system = CN_p

Fractional flow of metals treatment system = M_p

$$CR_p = \frac{CR_{util}}{CR_{util} + CN_{util} + M_{util}} = \frac{100}{100 + 100 + 100} = \frac{100}{300} = 0.333$$

$$CN_p = 0.333; \; M_p = 0.333.$$

Note that M_{util} is the utilized capacity of the metals treatment system, not the utilized capacity of the chemical precipitation unit. The utilized capacity of the chemical precipitation unit is the sum total of the utilized capacities of all three systems.

The effect of the limiting unit on each available system capacity is proportioned to each system based on the fractional flow determination. Continuing the calculation to determine the proportioned available capacity (CR_{pac}) using the above example:

$$CR_{pac} = (CR_p)\ (D_{nac}) = (.333)\ (75) = 25 \text{ gallons}$$

$$CN_{pac} = (CN_p)\ (D_{nac}) = 25 \text{ gallons}$$

$$M_{pac} = (M_p)\ (D_{nac}) = 25 \text{ gallons.}$$

Note that D_{nac}, the previously calculated "new" available capacity of unit D, reflects the effect of the limiting unit on all three systems and accounts for the effluent stream that exits the system before reaching the limiting unit.

When a linked system has an unshared limiting unit upstream from the mutually shared limiting unit of the other linked system(s), the system's calculated proportioned available system capacity must be compared with the available capacity of its limiting unit. If the limiting unit's available capacity is less than the calculated proportioned available system capacity, the final proportioned available system capacity equals the available capacity of the unshared limiting unit. The remainder of the calculated proportioned available system capacity is redistributed to the remaining linked systems based on how extensively the mutually shared limiting unit is devoted to the remaining linked systems. In the example shown in Figure 3-3, the limiting unit for all three systems is the shared filter press; therefore, no comparisons are necessary.

The proportioned maximum system capacity equals the utilized system capacity plus the proportioned available system capacity. The proportioned maximum system capacities (PMC) for the systems displayed in Figure 3-3 are:

$$CR_{PMC} = CR_{util} + CR_{pac} = 100 + 25 = 125 \text{ gallons}$$

$$CN_{PMC} = 125 \text{ gallons}$$

$$M_{PMC} = 125 \text{ gallons.}$$

(4) Projections of available capacity. The TSDR Survey requested capacity data for the baseline year 1986 and for changes or new operations planned through 1992. Projections of capacity beyond 1986 were obtained

from the TSDR Survey by engineering analysis of information regarding new treatment/recovery systems being installed and equipment changes being made to the systems operating in 1986 that result in changes in system capacity.

For new systems, capacity analysis was conducted as described above and the results were input into the treatment system data set for the appropriate years. Reported equipment changes to treatment systems operating in 1986 were examined to determine their effect on the system capacity. If the change involved the system's limiting unit or influenced the effect of a limiting unit on the system, then capacity analysis was performed again, incorporating the capacity changes for that year.

3.2.3 Development of the Treatment Capacity Data Set and Results

The treatment/recovery capacity data set consists of an incineration/ reuse as fuel data set and other treatment systems data set. System capacity data derived from data reported in the TSDR Survey, as described above, were entered onto data entry sheets. The purpose of these forms was to standardize information required for assessing available treatment capacity that was to be obtained from the TSDR Survey and entered into a computer data set. The data set is described in a report that can be found in the docket for this final rule (Ref. 6). A detailed discussion of the data entry sheets can also be found in the RCRA docket for this final rule (Ref. 20).

The following discussion presents the results of the incineration/ reuse-as-fuel data set.

(1) Incineration/reuse-as-fuel data set results. Table 3-1 summarizes the commercial capacity for hazardous waste incineration. This table presents the utilized, maximum, and available capacity for incineration of liquids, sludges, solids, and gases in 1986, and maximum and available capacity for 1987, 1988, 1989-1990, and 1990-1992. The analysis assumes that hazardous waste capacity not utilized in 1986, as well as all new hazardous waste capacity from 1987 and beyond, will be available for incineration of hazardous wastes, and does not consider the impact of previous land disposal restrictions on available capacity.

Table 3-2 summarizes the commercial capacity for reusing hazardous wastes as fuel. The table presents the utilized, maximum, and available capacity for combustion of liquids, sludges, and solids as fuel in 1986, and maximum and available capacity for 1987, 1988, 1989-1990, and 1991-1992. Again, the analysis assumes that hazardous waste capacity not utilized in 1986, and all new hazardous waste capacity from 1987 and beyond, will be available for combustion of hazardous wastes, and does not consider the impact of previous land disposal restrictions on available capacity.

(2) Development of the data set for other treatment systems. Data entry sheets were filled out for other treatment systems, and the data were entered into a computer data set. The data set contains data entry fields as well as calculated fields used to perform the capacity analysis. A more detailed explanation of the data fields contained in the data set can be found in a report in the RCRA docket for this rule (Ref. 20).

Table 3-1 Commercial Hazardous Waste Incineration Capacity (Million Gallons/Year)

Physical form of waste	1986 Utilized capacity	1986 Maximum capacity	1986 Available capacity	1987 Maximum capacity	1987 Available capacity[a]	1988 Maximum capacity	1988 Available capacity[a]	1989-1990 Maximum capacity	1989-1990 Available capacity[a]	1991-1992 Maximum capacity	1991-1992 Available capacity[a]
Liquids	63	81	18	101	38	132	69	325	262	325	262
Sludges	3	8	5	8	5	14	11	109	106	109	106
Solids	18	28	10	28	10	50	33	194	176	194	176
Gases	0	1	1	2	2	3	3	3	3	3	3
TOTAL	84	119	35	139	55	208	126	631	547	631	547

Source: TSDR Survey results as of April 1989.

[a] Projected based on maximum capacity for that year minus utilized capacity for 1986. This considers that capacity not utilized in 1986 and all new capacity (from 1987 and beyond) will be available for incineration of hazardous wastes being land disposed that may be affected by the land disposal restrictions; does not consider the impact of previous land disposal restrictions on available capacity.

Table 3-2 Commercial Capacity for Reuse as Fuel of Hazardous Waste (Million Gallons/Year)

Physical form of waste	1986			1987		1988		1989-1990		1991-1992	
	Utilized capacity	Maximum capacity	Available capacity	Maximum capacity	Available capacity[a]	Maximum capacity	Available capacity[a]	Maximum capacity	Available capacity[a]	Maximum capacity	Available capacity[a]
Liquids	97	361	264	388	291	367	271	606	509	606	509
Sludges	<1	<1	<1	1	1	2	2	38	38	38	38
Solids	<1	1	1	1	1	2	1	2	1	2	2
TOTAL	97	362	265	390	293	371	274	646	549	646	549

Source: TSDR Survey results as of April 1989.

NOTE: For cases where capacity was added to existing units or new units were added, all facilities indicated that new capacity would be available 100 percent for hazardous waste.

[a] Projected based on maximum capacity for that year minus utilized capacity for 1986. This considers that capacity not utilized in 1986 and all new capacity (from 1987 and beyond) will be available for burning (reuse as fuel) of hazardous wastes being land disposed that may be affected by the land disposal restrictions; does not consider the impact of previous land disposal restrictions on available capacity.

The data set has four major treatment system categories, each of which is divided into subcategories. A more detailed discussion of how and why the categories were developed is given below. The categories and subcategories, along with the codes used to represent them within the data set, are listed as follows:

I. Wastewater Treatment

Process	Code
- Cyanide Oxidation	WW, CO
- Chrome Reduction	WW, CR
- Organics/Metals Treatment	WW, OMT
- Organics/Metals Biological Treatment	WW, OMB
- Sulfide Precipitation	WW, SP
- General Chemical Precipitation	WW, GCP
- Steam Stripping	WW, SS
- Air Stripping	WW, AS
- Biological Treatment	WW, BT
- Carbon Adsorption	WW, CA
- General Oxidation	WW, GO
- Wet Air Oxidation	WW, WAO
- Neutralization	WW, N

II. Solvent Recovery

Process	Code
- Thin Film Evaporation	SR, TF
- Fractionation/Distillation	SR, FD
- Solvent Extraction	SR, SE
- Other Solvent Recovery	SR, O

III. Metals Recovery

Process	Code
- High Temperature Metals Recovery	MR, HT
- Retorting	MR, R
- Secondary Smelting	MR, SS
- Other Metals Recovery	MR, OMR

IV. Solidification

Process	Code
- Solidification	SL, S

The maximum, utilized, and available capacities were totaled for all systems in the data base that fell under each category. Each category is mutually exclusive so that the capacity of a treatment system is not double-counted. The treatment systems were categorized by using the computer to search each record for key unit types (process codes) that would identify the appropriate category under which the system should be placed. For example, records indicating systems with unit types identified by process codes 2WT, 3WT, 4WT, or 5WT, and 10WT through 15WT were categorized under cyanide oxidation. These categories are used because the BDAT program has identified them as treatment methods that may be effective in attaining the treatment standards established under the solvents and dioxins, California List, and First Third final rulemakings, and the Second Third proposed rule.

(3) Treatment capacity data set results. Only a subset of the treatment systems that compose the treatment capacity data set was required by the Second Third promulgated wastes. These treatment categories have been identified under the BDAT program as being effective in attaining the applicable treatment standards. Under each category, only commercial treatment systems were aggregated to establish a national supply of available treatment capacity that can be used to meet the demand created by the Land Disposal Restriction Rules.

Table 3-3 presents the maximum, utilized, and available capacities of commercial treatment systems (other than combustion) of concern for the baseline year 1986 and capacity projections through 1992. When making these projections, the 1986 utilized capacities of these treatment systems were assumed to remain constant for the subsequent years. Where a linked system exists, the proportioned system capacity for the linked system is used to avoid overestimating available capacity. For commercial treatment systems that closed between 1986 and 1988 or will close in 1989 or 1990, the utilized capacity of that system remained in the analysis under the assumption that the waste volumes the system was treating will require commercial capacity elsewhere. Keeping the utilized capacity of the closed system in the analysis results in reducing the available commercial capacity for that category. The data in this table were summarized from a report on commercial treatment capacity (Ref. 6).

3.3 Capacity Analysis (Comparison of Required and Available Treatment Capacity)

As previously described, the Agency is responsible for determining whether sufficient capacity exists to meet the requirements of the land disposal restrictions. This involves the comparison of required and available capacity. Available treatment capacity can be categorized by facility status as follows:

Table 3-3 Commercial Treatment System Capacities (Million Gallons/Year)[a]

Technology description	Utilized	1986		1987		1988		1989-1990		1991-1992	
		Maximum capacity	Available capacity[b]	Maximum capacity	Available capacity[b]	Maximum capacity	Available capacity[b]	Maximum capacity	Available capacity[b]	Maximum capacity	Available capacity[b]
Stabilization (cement and pozzolonic)	141	615	474	623	482	892	751	1,939	1,798	2,192	2,051
High temperature metals recovery	34	67	34	67	34	67	34	67	34	67	34
Cyanide oxidation and chemical precipitation	30	60	31	60	31	144	115	156	126	155	125
Chromium reduction and chemical precipitation	179	330	152	330	152	328	149	377	197	380	201
Carbon adsorption and chromium reduction/chemical precipitation	20	51	31	51	31	51	31	52	32	52	32
Carbon adsorption and chemical precipitation	9	41	32	41	32	51	41	115	105	82	73
Chemical precipitation	3,016	6,026	3,010	6,026	3,010	6,026	3,010	6,046	3,030	6,046	3,030
Sulfide precipitation	70	314	244	322	252	322	252	299	228	295	225
Neutralization	25	143	117	143	117	61	36	182	157	182	157
Steam stripping	1	2	2	2	2	2	2	2	2	2	2
Carbon adsorption	5	7	2	7	2	7	2	19	14	19	14
Biological treatment	106	125	19	125	19	158	53	175	69	175	69
Wet air oxidation	3	3	<1	<1	<1	5	2	18	15	18	15
Secondary smelting	49	52	3	71	22	86	37	98	49	98	49
Fractionation/distillation	85	370	286	366	281	369	284	376	291	375	290
Solvent extraction	<1	10	9	10	9	10	9	10	9	10	9
Thin film evaporation	43	92	50	102	59	108	65	149	106	131	89

[a] Numbers may not add exactly because of rounding.

[b] Projected based on maximum capacity for that year minus utilized capacity for 1986. This considers that capacity not utilized in 1986 and all new capacity (from 1987 and beyond) will be available for treatment of hazardous wastes being land disposed that may be affected by the land disposal restrictions; does not consider the impact of previous land disposal restrictions on available capacity.

- Onsite (private capacity) - facilities that manage only waste generated onsite.

- Captive capacity - facilities that manage only waste from other facilities under the same ownership.

- Limited commercial capacity - facilities that manage waste from a limited number of facilities not under the same ownership.

- Commercial capacity - facilities that manage waste from any facility.

Information on captive capacity was not available in time to be incorporated into the analysis for this final rule. The Agency does not believe, however, that this capacity would have affected the variance decisions. The data set does contain information on commercial capacity from baseline year 1986 and information on planned changes to 1986 management methods and new processes to be installed from 1987 through 1992. The methodology for determining the amount of available treatment capacity was described in Section 3.2.

Required capacity consists of wastes previously land disposed that will require treatment to meet a treatment standard prior to being land disposed. These volumes of waste were identified and underwent treatability analysis as was described in Section 3.1. The result of the treatability analysis was the assignment of waste volumes to treatability subgroups.

The comparison of required and available capacity was performed on a facility-by-facility basis. This was done to match treatability subgroups with available capacity of applicable treatment/recovery systems. Available onsite treatment capacity was matched only to volumes that were previously land disposed onsite and were determined to require alternative treatment. If the appropriate treatment/recovery technology was not available onsite, or if adequate available capacity was not present to manage the waste, then the remaining volume of waste requiring alternative treatment was aggregated into a national demand for commercial capacity. The final aggregate of national demand was then compared with the final estimates of national commercial capacity to match treatability subgroups with appropriate treatment technologies. This methodology was used by the Agency to make final determinations concerning variances.

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