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Agency

Office of
Solid Waste
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Background Document for Capacity Analysis for Land Disposal Restrictions—Phase IV (Second Supplement): Toxicity Characteristic Metal Wastes and Newly Identified Mineral Processing Wastes (Proposed Rule)

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CHAPTER 1
INTRODUCTION

This document presents the capacity analysis that EPA conducted to support the proposed Land Disposal Restrictions (LDRs) - Phase IV: Issues Associated with Treatment Standards for Newly Identified Mineral Processing Wastes and Toxicity Characteristic Metal Wastes. EPA conducts capacity analyses to evaluate the need for national capacity variances from the land disposal prohibitions.[1] The capacity analysis provides estimates of the quantities of wastes that will require alternative commercial treatment prior to land disposal as a result of the LDRs and estimates alternative commercial treatment capacity available to manage wastes restricted from land disposal. In this rule, EPA is proposing LDRs for the newly identified mineral processing wastes and toxicity characteristic metal wastes listed and identified since November 1984 that have not been covered in previous LDR rulemakings.

1.1 LEGAL BACKGROUND

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

Under the LDR Program, EPA must identify levels or methods of treatment that substantially reduce the toxicity of a waste or the likelihood of migration of hazardous constituents from the waste. Whenever possible, the Agency prefers to define treatment in terms of performance (i.e., maximum acceptable concentrations of hazardous constituents in the treated waste or residuals), rather than in terms of specific treatment methods, and thus provide the regulated community with flexibility in complying with the LDRs. EPA's standards are generally based on the performance of the best demonstrated available technology (BDAT) for that waste, as documented by treatment data collected at well-designed and well-operated systems using that technology, or are based on data derived from the treatment of similar wastes that are as difficult or more difficult to treat.

The LDRs are effective immediately upon promulgation unless the Agency grants a national capacity variance from the statutory date because of a lack of available treatment capacity (see RCRA section 3004(h)(2)). For every waste, EPA considers - on a national basis - both the capacity of commercially available treatment technologies and the quantity of restricted wastes currently sent to land disposal for which on-site treatment capacity is not available. If EPA determines that adequate alternative commercial treatment capacity is available for a particular waste, the land disposal restriction

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

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

is effective immediately. If not, the Agency establishes an alternative effective date based on the earliest date on which adequate treatment capacity will be available or two years, whichever is less. During the variance period, management of the wastes is still subject to 40 CFR 268.5 (h). Once the variance expires, the wastes must meet the LDR treatment standards prior to being land disposed.

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

HSWA's schedule divided hazardous wastes into three broad categories: solvent and dioxin wastes; California list wastes;[4] and "scheduled" wastes. EPA restricted surface disposed solvents and dioxins from land disposal on November 7, 1986 and deep well injected solvents and dioxins from land disposal on July 26, 1998. The final rule for California list wastes, which was issued on July 8, 1987, covers wastes originally listed by the State of California and adopted intact within HSWA. The "scheduled" wastes consist of all wastes that were identified or listed as hazardous prior to November 8, 1984 but were not included in the first two categories listed above. HSWA's statutory timetable required that EPA restrict one-third of these wastes by August 8, 1988, two-thirds by June 8, 1989, and the remaining third by May 8, 1990. For hazardous wastes that are newly identified or listed after November 8, 1984, EPA is required to promulgate land disposal prohibitions within six months of the date of identification or listing (RCRA Section 3004(g)(4)). However, the statute does not provide an automatic prohibition of land disposal of such wastes if EPA fails to meet this deadline. Exhibit 1-1 summarizes the previous LDR rulemakings and their respective promulgation dates.

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

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

EXHIBIT 1-1
SUMMARY OF PREVIOUS LAND DISPOSAL RESTRICTIONS RULEMAKINGS

Rulemaking	Federal Register Notice	Promulgation Date
Solvents and Dioxins (surface disposed)	51 *FR* 40572	November 7, 1986
Solvents and Dioxins (deep well injected)	53 *FR* 28188	July 26, 1988
California List (surface disposed)	52 *FR* 25760	July 8, 1987
California List (deep well injected)	53 *FR* 30908	July 26, 1988
First Third Rule	53 *FR* 31138	August 8, 1988
First Third Rule (deep well injected)	54 *FR* 25416	June 7, 1989
Second Third Rule	54 *FR* 26594	June 8, 1989
Third Third Rule	55 *FR* 22520	May 8, 1990
Newly Listed and Identified Wastes (Phase I)	57 *FR* 37194	June 30, 1992
Interim Final Rule for Vacated Treatment Standards	58 *FR* 29860	May 24, 1993
Organic TC Wastes and Newly Listed Wastes (Phase II)	59 *FR* 47982	September 19, 1994
Decharacterized Wastewaters, Carbamate Wastes, and Spent Potliners (Phase III)[5]	61 *FR* 15565	April 8, 1996

1.2 CAPACITY ANALYSIS METHODOLOGY

In evaluating the need for national capacity variances, EPA estimates the quantities of waste requiring alternative commercial treatment as a result of the LDRs and the capacity available at commercial treatment facilities to manage the restricted wastes[6]. By comparing the capacity demand

[5] On August 26, 1996, the Agency revised the carbamate waste treatment standards for one year from the date of publication ("Emergency Revision of the Land Disposal Restrictions (LDR) Phase III Treatment Standards for Listed Hazardous Wastes from Carbamate Production," 61 FR 43923). On January 14, 1997, the Agency extended the national capacity variance for spent potliners (K088) for six months ("Land Disposal Restrictions Phase III - Emergency Extension of the K088 Capacity Variance; Final Rule," 62 *FR* 1991).

[6] EPA also derived estimates of affected facilities and waste quantities for the regulatory impact analysis (RIA). Both the RIA and the capacity analysis examined wastes in the industrial sectors likely to generate most of the Phase IV wastes. However, the goals of a capacity analysis and an RIA are very different, which often results in some differences in methodologies, data, and results. A first step to satisfying the goals of a capacity analysis is to make a "threshold" determination concerning whether a national treatment capacity variance is needed for the two years following promulgation of a waste's LDR treatment standards.

with the available commercial capacity, EPA can identify capacity shortfalls and make determinations concerning national capacity variances. This section provides an overview of EPA's methodology in estimating required commercial treatment capacity, briefly summarizes the capacity analysis conducted for today's rule, and highlights the national capacity variances that EPA is proposing in today's proposed rule.

1.2.1 Determination of Required Commercial Treatment Capacity

Required commercial treatment capacity represents the quantity of wastes currently being land disposed that cannot be treated on site and, consequently, will need commercial treatment to meet the LDR treatment standards. EPA uses the available information and best engineering judgment to develop estimates for required commercial capacity. Those wastes that are managed in on-site treatment systems are excluded from the estimates of required commercial capacity. Required commercial capacity also includes the residuals generated by treatment of these wastes (i.e., the quantity of generated residuals that will need treatment prior to land disposal).

EPA identifies the waste streams potentially affected by the LDRs by types of land disposal units, including surface impoundment, waste pile, land treatment unit, landfill, and underground injection well. Salt dome formations, salt bed formations, and underground mines and caves are additional methods of land disposal that are affected by the LDRs; however, because few wastes are disposed by these three methods, these methods typically are not addressed in the analysis of required alternative capacity.

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

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

Thus, EPA estimates the required and available commercial treatment capacity for all affected wastes and facilities, but often only to the extent needed to make this threshold determination. For example, when upper-bound estimates of required capacity are well below lower-bound estimates of available capacity, then generally a variance is not needed and the analysis can stop. Similarly, when lower-bound estimates of required capacity far exceed the upper-bound estimates of available capacity, then often the two-year maximum capacity variance is needed. Results that are between these two extremes generally require EPA to conduct further analyses. In contrast to the capacity analysis' focus on required and available capacity during the next two years and its initial focus on threshold determinations, the RIA concentrates on estimating specific potential long-term costs and benefits of the LDR treatment standards. Typically, only the significant (or dominant) costs and benefits are assessed during the RIA. In summary, therefore, differences between the goals of the capacity analysis and the RIA are expected to result in reasonable differences in the methodologies, data, and results.

1.2.2 Determination of Available Commercial Treatment Capacity

The analyses conducted to determine available commercial treatment capacity focuses on treatment capacity projected to be available for the two years following promulgation of the LDRs, starting from the baseline capacity identified in the Phase III LDR rule (61 *FR* 15565).[7]

The determination of available capacity focuses on commercial facilities. Consequently, all estimates of capacity presented in this document represent commercially available capacity.[8] In order to determine whether to grant a national capacity variance for newly listed and identified wastes regulated in today's proposed rule, EPA analyzed available commercial capacity for alternative treatment technologies capable of meeting the LDR treatment standards. This capacity analysis generally included estimating the maximum or design capacity for appropriate waste management systems and the amount of waste currently going to these systems (utilized capacity). Available capacity was estimated as the difference between maximum and utilized capacity. For today's rule, EPA analyzed commercial capacity for wastewater treatment systems, hazardous waste combustion (including incineration and reuse as fuel), stabilization, vitrification, and several metal recovery technologies.

1.3 SUMMARY OF CAPACITY ANALYSIS FOR TODAY'S PROPOSED RULE

To estimate the need for national capacity variances, EPA estimated the quantities of waste requiring alternative commercial treatment as a result of the land disposal restrictions and the capacity available at commercial treatment facilities to manage the restricted wastes. Exhibit 1-2 indicates the total quantities of surface disposed wastes that will require alternative commercial treatment capacity as a result of the rule, and whether treatment capacity is available for these wastes.

Exhibit 1-3 summarizes the wastes for which EPA is granting a national capacity variance. EPA is proposing to grant a two-year national capacity variances for mixed RCRA/radioactive wastewaters and nonwastewaters contaminated with newly listed and identified wastes for which standards are being proposed in this rule. Also, EPA is proposing to grant a two-year national capacity variance for three large volume wastes generated from elemental phosphorous processing - Medusa Scrubber blowdown, Anderson Filter media rinsate, and furnace building washdown. For TC metal wastes and the remaining newly identified mineral processing wastes, the Agency has determined that adequate treatment capacity exists and, therefore, proposes to not grant a national capacity variance.

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[7] EPA, *Background Document for Capacity Analysis for Land Disposal Restrictions -- Phase III, Decharacterized Wastewaters, Carbamate Wastes, and Spent Potliners (Final Rule)*, April 1996.

[8] Available treatment capacity can be categorized by facility status into four groups: (1) commercial capacity - capacity at facilities that manage waste from any facility; (2) on-site (private capacity) - capacity at facilities that manage only waste generated on-site; (3) captive capacity - capacity at facilities that manage only waste from other facilities under the same ownership; and (4) limited commercial capacity - capacity at facilities that manage waste from a limited number of facilities not under the same ownership. For all capacity analyses, estimates on available capacity reflect available commercial capacity.

EXHIBIT 1-2
QUANTITIES REQUIRING COMMERCIAL TREATMENT AS A RESULT OF THE LDRs

Waste Type	Quantities Requiring Alternative Capacity (mt/year)	Adequate Alternative Capacity Currently Available? (Yes/No)
Newly Identified Wastes from Elemental Phosphorus Processing	500,000 - 800,000	No
Newly Identified Mineral Processing Wastes (Including Soil and Debris)	4 - 30 million	Yes
TC Metal Wastes (Including Soil and Debris)	0.8 - 2.6 million	Yes
Mixed Radioactive Wastes (Including Soil and Debris)	Unknown[a]	No

[a] Significant uncertainty exists concerning these quantities. Despite this uncertainty, however, EPA has determined that sufficient alternative treatment capacity is not available, and thus is proposing to grant a two-year national capacity variance for mixed RCRA/radioactive wastes contaminated with wastes whose standards are being proposed today.

EXHIBIT 1-3
SUMMARY OF NATIONAL CAPACITY VARIANCES FOR PHASE IV WASTES

Waste Category	Effective Date of Land Disposal Prohibition
Newly Identified Wastes from Elemental Phosphorus Processing	Two Years from Promulgation of Final Rule
Newly Identified Mineral Processing Wastes (Including Soil and Debris)	90 Days from Promulgation of Final Rule
TC Metal Wastes (Including Soil and Debris)	90 Days from Promulgation of Final Rule
Mixed Radioactive Wastes (Including Soil and Debris)	Two Years from Promulgation of Final Rule

1.4 ORGANIZATION OF BACKGROUND DOCUMENT SUPPORTING THE CAPACITY ANALYSIS

EPA has prepared this background document to present the capacity analyses conducted for the proposed second supplemental Phase IV LDRs. This document is organized into four chapters, as described below:

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

- **Chapter 2: Available Treatment Capacity.** Describes the methodology and data used to determine available capacity for wastewater treatment, combustion of liquids and solids, stabilization, vitrification, and metals recovery.

- **Chapter 3: Capacity Analysis for Toxicity Characteristic Metal Wastes.** Describes the capacity analysis for toxicity characteristic metal wastes (D004-D011).

- **Chapter 4: Capacity Analysis for the Newly Identified Mineral Processing Wastes.** Discusses the methodology and data used to conduct the capacity analysis for the newly identified mineral processing wastes.

CHAPTER 2
AVAILABLE TREATMENT CAPACITY

This chapter presents EPA's estimates of available commercial treatment capacity for TC metal and mineral processing wastes affected by the Phase IV second supplemental LDR rule. This chapter is organized as follows: Section 2.1 describes commercial capacity for stabilization; Section 2.2 describes metal recovery capacity; Section 2.3 describes vitrification capacity; Section 2.4 describes commercial wastewater treatment systems capacity; Section 2.5 describes commercial combustion capacity; and Section 2.6 describes mixed RCRA/radioactive waste capacity.

2.1 STABILIZATION CAPACITY

Stabilization is a primary conventional commercial treatment technology for many of the wastes covered by the Phase IV second supplemental LDR rule. In analyzing alternative treatment capacity for stabilization, the Agency in part built on the capacity analysis conducted for the Third Third LDR rule (55 FR 22520, June 1, 1990). That analysis was based on data contained in the May 1990 TSDR Capacity Data Set. The TSDR Capacity Data Set contains results from the National Survey of Hazardous Waste Treatment, Storage, Disposal and Recycling Survey (the TSDR Survey). The TSDR Survey was administered in 1987 to 2,500 facilities and was designed to provide comprehensive information on current and planned hazardous waste management, and practices at RCRA-permitted and interim status treatment, storage, recycling, and disposal facilities. The TSDR Survey collected projections of capacity changes from 1986 through 1992. The TSDR Capacity Data Set includes the amount of hazardous and nonhazardous waste entering each treatment system in 1986, the maximum hazardous waste capacity, and the maximum total waste capacity.

Following the original TSDR Survey, EPA updated the TSDR Capacity Data Set for critical technologies based on confirmation of planned capacity changes, and other information received since the survey (e.g., comments on proposed rules). Updated information was obtained by contacting facilities and verifying critical projected capacities reported in the TSDR Survey. Based on the information provided by facility contacts, EPA determined whether planned facility capacity had come on line as projected. Furthermore, EPA verified various assumptions concerning treatment for the wastes addressed in this rule. A key part of this analysis was a review of 1993 BRS data. These data indicate that there are at least 30 operational facilities providing commercial stabilization and at least 60 non-commercial facilities with stabilization capacity.[1] (For a more detailed explanation of the TSDR Survey and of the Third Third Rule, refer to U.S. EPA, Background Document for Third Third Wastes to Support 40 CFR Part 268 Land Disposal Restrictions, May 1990, in the docket for the Third Third rule.)

To estimate the stabilization capacity for Phase IV wastes, the capacity demand for previous LDR rules was subtracted from the available stabilization capacity estimated from the TSDR Capacity Data Set and updates. The available stabilization capacity from the TSDR Survey and updates was 3,125,000 tons per year. EPA estimated in the Third Third rulemaking that the capacity required as a result of the Third Third and previous LDR rules was 1,921,000. Furthermore, the capacity required for

[1] Memorandum from Raghu Raghavan and Jim Laurenson (ICF) to Bill Kline and C. Pan Lee (EPA). "Status Report on the Available Capacity Assessment for TC Metal and Mineral Processing Wastes." June 14, 1996. See Appendix A.

Phase I was 77,000 tons per year, for Phase II wastes was 0 tons per year,[2] and for Phase III wastes was 0 tons per year.[3]

As a result of these analyses, EPA believes that about 1.1 million tons/year of stabilization capacity is currently available for the two main categories of wastes restricted from land disposal under the Phase IV rulemaking: (1) previously regulated wastes, which are wastes that failed (or would have failed) the Extraction Procedure (EP) test, fail the Toxicity Characteristic Leaching Procedure (TCLP), and will likely not meet the UTS; and (2) new wastes, which are defined either as wastes that did not fail (or would not have failed) the EP, but currently fail the TCLP and likely will not meet the UTS or as newly identified mineral processing wastes.

The first category comprises wastes that are currently treated and will probably meet the new treatment standards with minor modifications to treatment processes. The second category includes two types of waste: (1) wastes that are classified by current regulations as non-hazardous (e.g., Bevill wastes) and are currently being recycled or stored pending recovery activities (these wastes could become hazardous following this rule, and they could include very large quantities of untreated waste that will require on-site or off-site stabilization); and (2) wastes that are classified as hazardous, but have not been required to meet treatment standards.[4]

As part of the analysis of available capacity for the Phase IV rulemaking, the Agency conducted follow-up discussions with several commercial treaters and organizations that submitted comments to the original Phase IV proposed rule (see Appendix A). Overall, commenters indicated the widespread use of stabilization for characteristic metal wastes. All commenters who provided information on available capacity indicated that they are not utilizing their maximum practical capacity. Commercial treaters also indicated that stabilization can be readily customized in most cases to treat Phase IV wastes to the proposed treatment standards. Several commercial treaters commented that no modifications would need to be made to their treatment processes or that minimal time (e.g., four weeks) is required for very minor modifications. Most commercial treaters whom the Agency contacted indicated that the time needed and difficulty to implement changes in treatment processes will vary depending on the degree of changes. Two treaters, however, indicated that it may take several years to meet treatment standards, primarily due to changes needed in their permits, although the time needed to change treatment processes would not be great. (Note also that of all the commercial treaters interviewed, these latter facilities each stabilize the lowest annual quantities of hazardous waste.) One large commercial treater estimates that about 70 to 80 percent of the waste that they currently treat can meet UTS without additional cost. Approximately 20 to 30 percent of the waste it treats will require modification to the current treatment process to meet the UTS.

As discussed in Chapters 3 and 4, large quantity remediation sites sometimes treat on-site because of economic reasons. Mobile treatment is preferred in these cases. One industry representative described at least seven sites that use mobile commercial excavation and stabilization.[5] These data

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

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

[4] Nevertheless, this second type of waste likely is similar to the previously regulated wastes because treating the waste to decharacterize it and dispose of it as a non-hazardous wastes is believed to be preferable by generators and less expensive than disposal without treatment in a Subtitle C unit.

[5] Summary of Minutes of April 30, 1996, Meeting of EPA and Representatives of Lead Recovery from Batteries. See Appendix A.

indicate that these wastes usually go to Subtitle D landfills after treatment or are capped in place. The Agency discussions with treaters determined that mobile stabilization is commercially available to treat both the previously regulated and the new de-Bevilled mineral processing and TC metal wastes. Several commercial facilities have indicated that, similar to stabilization conducted at the commercial treaters' facilities, mobile technology could be made readily available (i.e., in a matter of weeks to months).

Some waste streams were identified by commercial waste managers as being difficult to treat. Three facilities noted, for example, that treating organic UHCs would require some type of pretreatment. One facility would incinerate these wastes, and two other facilities would send the wastes to another facility for pretreatment. The Agency received several other comments, however, indicating that these difficulties could be readily overcome. Four facilities specifically stated that organic UHCs in the wastes that they receive can be readily treated to UTS (i.e., without significant changes in their processes).

Finally, the Agency's literature review indicates that stabilization processes have been widely used and are considered a reliable and readily available treatment technology for many metal-contaminated wastes. For example, one source describes their extensive database of treatment reactions for metal-contaminated wastes in the U.S.[6] Furthermore, this source indicates that for a related type of treatment—chemical fixation—more than 700 waste streams have been evaluated and successfully treated in the U.S.; more than 400 waste streams have been treated successfully in bench-scale testing; and more than 100 waste streams have been treated in field applications. The literature also indicates that numerous commercial vendors also are available to provide on-site stabilization.[7]

2.2 METAL RECOVERY CAPACITY

Due to several factors—including (1) metal recovery treatment as one of the bases for the LDR treatment standards, (2) the basic nature of mineral processing and many TC metal industries, and (3) EPA's policy of preferring pollution prevention or recycling to treatment—EPA evaluated the potential to recover metals from the TC metal and newly identified mineral processing wastes. According to Biennial Reporting System (BRS) data,[8] at least 58 commercial facilities recovered metals from hazardous wastes and 2,789 generators recycled waste on-site using metals recovery in 1991.

EPA identified and reviewed several metal recovery technologies that are commercially available. Exhibit 2-1 provides a sample of commercial metal recovery capacity for different technologies that appear to be suitable for the TC metal and newly identified mineral processing wastes. Based on this sample, at least 800,000 mt/year of maximum metal recovery capacity exists. (Note, however, that not all of this capacity is necessarily available. Nevertheless, because of the magnitude of this maximum capacity and because Exhibit 2-1 is not a comprehensive list of available commercial metal recovery technologies, the Agency believes that some metal recovery capacity will be available to treat TC metal and mineral processing wastes that cannot be treated using stabilization or other technologies.)

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[6] Indelicato, Gregory and Gary Tipton. "Chemical Fixation Increase Options for Hazardous Waste Treatment." Environmental Solutions. May 1996. See attachment to Appendix A-2.

[7] The following is just a small sample of commercial vendors providing on-site commercial stabilization treatment: American Colloid Co.; Chemical Waste Management; Envirosource CSI; Erosion Control; Plastic Filter Company; Limestone Products Corp; Reinco, Inc.; and Stevenson Environmental Services. See Appendix A for additional vendors and facilities.

[8] U.S. EPA, "Hazardous Waste Recycling in the United States, 1989 to 1991," Office of Solid Waste, Draft, June 30, 1994.

EXHIBIT 2-1
SAMPLE OF METAL RECOVERY CAPACITY

Metals Recovery Technology	Metals Recovered	Annual Feed Capacity (tons/year)
PYROMETALLURGICAL PROCESSES		
Dakota Catalyst Products, Williston, North Dakota	Al, Co, Mb, Ni, V	20,000 tons/year, metal and alumina catalysts
Elkem Multi-Purpose Furnace	Pb, Zn, Cu	40,000[a]
Horsehead Resource Development, Flame Reactor	Zn, Pb	20,000-50,000[b]
Horsehead Resource Development, Waelz Kiln System	Zn	270,000
Bethlehem Apparatus Company, Vacuum Mercury Retort System	Hg	595
Mercury Recovery Services Process	Hg	4,500
Zia Technology Inclined Rotary Reduction System	Fe, Zn, Pb	60,000[a]
International Metals Reclamation Company (INMETCO)	Cr, Co, Cr, Fe, Mn, Mb, Ni	20,000 tons/year of K061; 20,000 tons/year of metal waste (non-hazardous) from the specialty steel industry; 10,000 tons/year of mill scale; 7,200 tons/year of K062; 6,700 tons/year of D007 from different sources in the specialty steel and alloy manufacturing industry; 3,600 tons/year of F006; 3,000 tons/year of nickel and/or chromium bearing solutions from other industries (D007, D002, and/or D001)
HYDROMETALLURGICAL PROCESSES		
AMAX (Cri-Met), Braithwaite, Louisiana	Al, Co, Mb, Ni, V	Plant presently accepts 20,000 tons/year of spent catalysts and has an annual feed capacity of 30,000 tons/year available for Ni/Co/Mo/Al-containing catalysts; also has some (additional?) capacity for processing Vanadium-containing materials

Metals Recovery Technology	Metals Recovered	Annual Feed Capacity (tons/year)
ETICAM Process	Cd, Cr, Co, Cu, Au, Mb, Ni, Pb, Ag, Ti, V, Zn	35,000 tons/year of metal-bearing solutions; 35,000 tons/year of cyanide-bearing solutions; 35,000 tons/year of acid/alkali solutions; 45,000 tons/year of metal-bearing solids
Recontek Process	Cd, Cr, Fe, Ni, Zn	60,000 tons/year
Encycle/Texas	Sb, Co, Cu, Pb, Ni	Plant reportedly received 20,000 tons/year of waste in 1991; total capacity is unknown

Sources: (1) U.S. EPA, Profiles of Metal Recovery Technology for Mineral Processing Wastes and Other Metal-Bearing Hazardous Wastes, Office of Solid Waste, December 1994.

(2) U.S. EPA, Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Petroleum Refining Process Wastes (Proposed Rule), October 1995.

2.3 VITRIFICATION CAPACITY

The Agency has determined that vitrification technology is commercially available for treating limited quantities of Phase IV wastes, such as some arsenic wastes, that are difficult to treat using stabilization. One commenter (Beazer East, Inc.), responding to the original Phase IV proposed rule (60 FR 43654), identified a commercial facility that operates a tested, full-scale vitrification process.[9] Using the ATTIC and VISITT databases,[10] EPA also identified a sample of companies conducting or selling supplies for vitrification. The Agency subsequently held discussions with several facility representatives (see Appendix B).[11] One company that EPA identified operates one vitrification system with an available capacity of 15,000 tons/year (readily expandable to three systems for a total capacity of 45,000 tons/year). A full-scale, commercial unit (MSE) treats approximately 2,000 tons/year. Bench-scale and pilot-scale systems for vitrification are known to have been underway at numerous other facilities in 1994.[12]

Notwithstanding this potentially available vitrification capacity, EPA realizes that available capacity likely is relatively low. Because EPA is setting numerical limits, however, other treatment technologies capable of achieving the UTS limits are not prohibited from being used, except for those that may constitute impermissible dilution. For example, managers of lower concentration wastes may send the waste for stabilization or other treatment technologies.[13]

[9] The commenter also notes, however, that the regulatory status of this facility (Marine Shale Processors (MSP)) remains in question.

[10] Alternative Technology Treatment Center (ATTIC) Database, U.S. EPA (see WWW.EPA.GOV/ATTIC) and the Vendors Information System of Innovative Treatment Technology (VISITT) (see WW.PRC.EMI.COM:80/VISITT).

[11] The following is a small sample of commercials vendors providing vitrification equipment or services: Geosafe Corp, Vortec Corp, Retech Inc., GTS of Duratech, and MSE.

[12] Attachment to memorandum from Bill Kline (U.S. EPA) to ICF Incorporated, March 17, 1994 (see Appendix B).

[13] See Appendix C in the Phase IV LDR BDAT Background Document for additional discussion of this issue.

2.4 WASTEWATER TREATMENT CAPACITY

EPA expects that the TC metal and mineral processing industry's predominant wastewater management practices are to treat the wastewaters in on-site tanks (or, to a limited extent, in surface impoundments that meet minimum technology requirements (MTRs)), and then either discharge to Subtitle D surface impoundments or discharge directly to surface waters under CWA or equivalent regulations. Wastewater treatment technologies such as chemical precipitation, biological treatment, steam stripping, carbon adsorption, or combinations of these and other technologies can treat organics to the concentrations regulated in this rule. These wastewater technologies are readily available to, or in use at, facilities.[14] EPA believes that—similar to stabilization for nonwastewaters—the additional treatment required to meet the UTS levels for these wastewaters could be achieved through minimal modifications in the existing on-site treatment systems (e.g., change in the reagents or increase in the quantity of reagents added). For metals in wastewaters, EPA has determined that treatment levels can be achieved by lime addition followed by sedimentation and filtration for arsenic, and on chemical precipitation followed by sedimentation for chromium. These wastewater technologies are readily available to, or in use at, facilities. Of course, since no specific method of treatment is required to be used under the promulgated treatment standards, any type of treatment other than permissible dilution may be used to achieve these concentration levels.

Notwithstanding the ability of readily available treatment systems to be optimized to meet treatment standards, EPA also evaluated the availability of wastewater treatment in terms of whether commercial vendors are available to provide on-site wastewater treatment services. This analysis used two data sources. The primary source was an Office of Water questionnaire specifically targeted to wastewater treatment systems. The second source, the 1991 BRS, was used to confirm the data provided by the first source.

In 1991, EPA's Office of Water (OW) developed the Waste Treatment Industry Questionnaire to collect information on centralized wastewater treatment capacity.[15] The information collected during this effort represents 1989 data and includes maximum and available treatment capacity. Exhibit 2-2 presents the information provided by individual facilities. All of the listed facilities have a final or interim RCRA permit. As shown, approximately 40 million tons (9.7 billion gallons) of wastewater treatment capacity are available each year at these facilities. In addition, there are 11 other treatment facilities that were not included in this estimate because they did not supply the requested capacity information. By assigning the average available capacity (638,000 tons/year) to each of the non-reporting facilities, EPA estimates a total available wastewater treatment capacity of 47 million tons each year.

[14] *Background Document for Third Third Wastes to Support CFR Part 268 Land Disposal Restrictions, May 1990,* and *Background Document for Capacity Analysis for Newly Listed Wastes and Hazardous Debris to Support 40 CFR 268 Land Disposal Restrictions*, June 1992.

[15] Memorandum from Debra DiCianna, Engineering and Analysis Division, Office of Water, U.S. EPA to Bengie Carroll, Capacity Programs Branch, Office of Solid Waste, U.S. EPA, April 20, 1993. See Appendix C.

EXHIBIT 2-2
AVAILABLE WASTEWATER TREATMENT CAPACITY

Name	EPA ID Number	Maximum Capacity (gallons)	% Used in 1989	Available Capacity (gallons)
Sloss Industries Corporation		548,000,000	33	367,160,000
Crosby and Overton, Inc.		2,340,000	100	0
Oil Process Co.	CADO5O806850	1,894,000	81	363,000
Southern California Chemical Co., Inc.		21,350,000	60	8,589,000
Romic Chem. Corp.		4,983,000	59	2,043,000
CP Chemicals		5,808,000	74	1,510,000
Chem-Tech Systems	CAT080033681	0	0	0
H&H Ship Service		0	0	0
Norris Industries, Inc.		477,791,000	45	262,355,000
Appropriate Technologies II, Inc.		8,943,000	18	7,333,000
Solvent Service Co., Inc.	CAD059494310	0	0	0
American Chemical & Refining Co.	CTD001184894	2,375,000	79	499,000
Envirite Corporation (CT)		53,500,000	30	37,552,000
Pratt & Whitney Aircraft Group MD & CPD.	CTD000844399	1,760,669,000	2	1,312,578,000
United Oil Recovery, Inc.		13,140,000	50	6,570,000
Cecos Treatment Corp.		62,500,000	6	58,738,000
Environmental Waste Resources, Inc.	CTD072138969	38,536,000	78	8,478,000
Alternate Energy Resources, Inc.		1,867,200,000	20	1,493,387,000
Pearl Hbr. Navy Public Works Ctr.		0	0	0
Maytag Co.		390,000,000	73	105,300,000
John Deere-Component Works		43,212,000	63	15,989,000
Envirite Corp. (IL)	ILD000666206	10,620,000	67	3,516,000
Peoria Disposal Co.-Pottstown		50,000,000	49	25,625,000

EXHIBIT 2-2 (Continued)
AVAILABLE WASTEWATER TREATMENT CAPACITY

Name	EPA ID Number	Maximum Capacity (gallons)	% Used in 1989	Available Capacity (gallons)
Chem-Clear, Inc.		36,000,000	47	19,080,000
Beaver Oil Co., Inc.	ILD064418353	14,000,000	20	11,200,000
Heritage Environmental Services, Inc.	IND093219012	299,290,000	30	209,443,000
Eli Lilly & Co. Tippecanoe Labs	IND006050967	0	0	0
Clean Harbors, Inc.	MDD980555189	44,100,000	12	38,808,000
American Waste Oil Corp.		6,240,000	80	1,248,000
Environmental Waste Control, Inc		60,000,000	30	42,000,000
Cyanokem		30,865,000	34	20,371,000
Dynecol, Inc.		36,320,000	50	18,291,000
Edwards Oil Co.		21,600,000	80	4,320,000
Metro Recovery Systems	MND981098478	15,130,000	50	7,565,000
Heritage Environmental Services, Inc	NCD121700777	7,500,000	72	2,100,000
Brunswick Corp.	NED043534635	244,000	3	237,000
Dupont E I De Nemours, Chamber Works	NJD002385730	14,600,000,000	78	3,212,000,000
CP Chemicals, Inc.	NJD002141950	54,000,000	90	5,400,000
Remtech Environmental Group		0	0	0
Chemical Waste Management of New Jersey	NJD089216790	52,560,000	23	40,471,000
Eticam	NVD980895338	750,000	14	647,000
Chemical Waste Management of New York		21,024,000	73	5,676,000
Cecos International	NYD080336241	0	0	0
Chemical Management, Inc.	NYD000691949	7,800,000	44	4,368,000
Envirite Corp.		63,963,000	44	35,909,000
Clark Processing, Inc.		6,500,000	86	910,000
Research Oil Co.	OHD004178612	86,300,000	49	44,013,000
Brush Wellman, Inc.		0	0	0
Cecos International, Inc.	OHD087433744	23,400,000	12	20,592,000
Clean Harbors	OHD000724153	63,000,000	65	22,050,000
Conoco, Inc. Ponca City	OKD007233836	720,000,000	92	57,600,000

EXHIBIT 2-2 (Continued)
AVAILABLE WASTEWATER TREATMENT CAPACITY

Name	EPA ID Number	Maximum Capacity (gallons)	% Used in 1989	Available Capacity (gallons)
US Pollution Control, Inc.		6,000,000	50	3,000,000
Tektronix, Inc.	ORD009020231	407,788,000	13	353,675,000
Waste Conversion, Inc.	PAD085690592	35,986,000	80	7,197,000
Envirite Corporation (PA)	PAD010154045	30,000,000	79	6,300,000
Mill Service, Inc.	PAD059087072	74,200,000	57	32,129,000
Mill Service, Inc. Yukon Plt.		164,000,000	44	91,840,000
Eticam	RID980906986	6,000,000	42	3,480,000
CP Chemicals, Inc.		45,602,000	61	17,785,000
Tricil Environmental Services, Inc.		89,712,000	9	81,638,000
TN Eastman Div. Eastman Kodak	TND003376928	8,710,000	88	1,045,000
Osco Incorporated		0	0	0
Intercontinental Terminals Co.		100,000,000	17	83,000,000
Encycle/Texas, Inc.		120,500,000	30	84,892,000
Empac, Inc. Deer Park		316,411,000	35	205,636,000
Treatment One, Div. of Set Environmental, Inc.		2,000,000	2	1,960,000
Belpar Environmental of Virginia, Inc.		390,000	70	117,000
Boeing Co.-Auburn	WAD041337130	371,935,000	42	214,123,000
Crosby and Overton, Inc. Plant 2		20,752,000	1	20,646,000
Chemical Processors, Inc.		13,142,000	40	7,830,000
Chemical Processors, Inc.		0	0	0
Chemical Processors, Inc.		17,001,000	41	10,102,000
Petroleum Reclaiming Service, Inc.		15,750,000	11	14,018,000
Northwest Enviroservice, Inc.		35,640,000	62	13,458,000
Union Carbide AGR. Prod. Co., Inc.	WVD004325353	2,102,000,000	57	903,860,000
Inco Alloys International, Inc.	WVD076826015	0	0	0
Total		**25,616,967,000**		**9,699,612,000**

EPA used the 1991 BRS to confirm available wastewater treatment capacity (see Appendix C). The BRS is a system by which RCRA-regulated treatment, storage, and disposal facilities (TSDFs) and large quantity generators provide EPA with information on their hazardous waste activities. The PS Form of the 1991 BRS contains information on the waste treatment systems, including both maximum

and utilized capacity. EPA determined the total available wastewater treatment capacity[16] reported in the BRS at facilities representing approximately 90 percent of the total operational capacity reported in the Waste Treatment Industry Questionnaire. According to the BRS, in total these facilities have 33 million tons of available capacity (7.9 billion gallons). If this estimate is adjusted to reflect the fact that it only represents 90 percent of the total operational capacity, approximately 37 million tons (33 million tons divided by 0.9) of available wastewater treatment capacity are available. This estimate is close to 80 percent of the estimate obtained from the OW Questionnaire.

2.5 COMMERCIAL COMBUSTION CAPACITY

This section summarizes the results of EPA's analysis of available commercial combustion capacity at incinerators and BIFs (primarily cement kilns that are authorized to burn hazardous wastes as fuel). This includes an analysis of incinerator and BIF combustion capacity information received from the Hazardous Waste Treatment Council (HWTC) and the Cement Kiln Recycling Coalition (CKRC) in 1993 and the Environmental Technologies Council (ETC) in 1994.[17] Data were also obtained from Rollins Environmental Services (RES) through comments and subsequent submissions of Confidential Business Information (CBI) in 1996.

2.5.1 General Methodology

In 1993, the HWTC and CKRC surveyed their membership to obtain data on combustion capacity, which was then submitted to EPA. Subsequent to the original HWTC survey, members also received a supplemental questionnaire regarding the burning of soils. In 1994, ETC submitted updates to the HWTC Survey from its members. Survey responses received from incinerators are classified as confidential business information (CBI) and thus are provided only in an aggregated form in this document. Following the receipt of the original surveys, the Agency reviewed the data submitted by each facility to evaluate the completeness, consistency, and accuracy of the information. The Agency identified and reconciled data gaps and anomalies by contacting the respective HWTC or CKRC coordinators and the individual facilities in question.

Concurrent with the receipt of surveys received from the member groups, the Agency developed a data base to track and process major data elements for the capacity analysis. The data base contains facility information (e.g., location, EPA identification number of burner, number of units currently on-line), unit specific information (e.g., type of incinerator/kiln unit, operating hours per year, types of hazardous waste feed systems, types of hazardous waste burned in 1992), and waste-type specific information (e.g., tons of hazardous waste burned in 1992, average hazardous waste feed rate, maximum practical capacity, maximum permit capacity). Subsequent updates to the original survey submissions have also been entered into this database.

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

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

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

forms grouped together. To address this interchangeability of waste forms, the Agency's LDR capacity database accommodated the reported waste groupings (e.g., by developing one capacity estimate for liquids and pumpable sludges combined).

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

The waste apportionment algorithm focuses on three primary variables: the quantity of waste burned during the year, the maximum practical capacity of the unit, and the available capacity for burning hazardous waste. The available capacity for a waste form (e.g., aqueous liquids, dry solids) is obtained by taking the difference between the quantity of the form burned (hazardous and non-hazardous waste) and the maximum capacity for the waste form. The Agency's approach assumes that a facility will not stop burning non-hazardous waste if it is currently burning non-hazardous waste but all unutilized capacity will be used for hazardous waste. Difficulties arise, however, because facilities report maximum capacities for each waste form without regard to capacity accounted for by other waste forms (e.g., some facilities report the same treatment capacities for sludges as for soils because their treatment systems can accommodate both wastes). Consequently, the sum of maximum capacities for all waste forms may exceed the total capacity.

In these cases, the Agency distributed the total maximum hazardous waste capacities reported by each facility to individual waste forms based on burning practices. The utilization rate for each waste form was calculated by dividing the larger of the quantity of hazardous waste burned or total waste burned for that waste form by the sum of the quantities burned for all waste forms. A new maximum hazardous waste capacity for each waste form was then calculated by multiplying the utilization rate for that waste form by the maximum practical capacity for the incineration unit as a whole.

If the calculated maximum capacity for a waste form exceeded the reported value for that form, EPA used the reported value. In this case, the difference between the calculated and reported value was then redistributed to other waste forms using a hierarchy based on the types of wastes in this rule for which capacity has historically been most limited relative to demand. The Agency used the following order for redistributing capacity:

- Soils;
- Bulk Solids;
- Containerized Solids;
- Nonpumpable Sludges;
- Pumpable Sludges;
- Compressed Gases;
- Non-aqueous Liquids; and
- Aqueous Liquids.

Cement kiln capacity for hazardous waste generally is limited by air emission limits (e.g., boiler and industrial furnace (BIF) limits under 40 CFR 266 subpart H), feed system limitations (e.g., particle size and viscosity limits), and product (i.e., cement clinker) quality considerations. For instance, cement quality considerations may require that wastes burned in cement kilns have a heating value of at least 5,000 BTU/lb to ensure adequate temperatures in the kiln. (Comments received by EPA in previous

rulemakings, however, indicate that some kilns accept wastes below this heating value.) Incineration capacity is also limited by air emission limits and other permit limits (such as heat release limits), and feed system limits. EPA has taken these limitations into account in its estimates of available commercial combustion capacity.

"Pre-baseline" (i.e., prior to accounting for Phases I, II, and III LDR required capacity) available combustion estimates were calculated using the above methodology. EPA then subtracted the required combustion capacity for any previously regulated wastes that are not accounted for in the data received from the incinerators or BIFs (e.g., Phase I wastes under variance and Phase II and III wastes) to derive the baseline available combustion capacity for Phase IV wastes. The capacity required for Phase II and III wastes is not reflected in the estimates of utilized capacity because the Phase II and III rules, promulgated on September 19, 1994 (59 *FR* 47982) and April 8, 1996 (61 *FR* 15566), respectively, were not in effect when the estimates were submitted to EPA. In addition, some Phase I wastes (F037 and F038 in particular) were under a variance for at least part of the period of time for which EPA received capacity estimates (see 57 FR 37194, June 30, 1992).

For this final rule, EPA conducted additional analysis by incorporating new data submitted by commenters to the proposed rule, developing assumptions to account for the uncertainty associated with the age of the bulk of the data (which are now several years old), and assessing the potential trends in combustion capacity over the next two years. Thus, this additional analysis primarily involved three activities: (1) updating available capacity where possible using facility-specific CBI submitted by Rollins Environmental Services (RES), (2) applying assumptions where necessary to obtain a range of overall available capacity, and (3) researching potential impacts of upcoming maximum achievable control technology (MACT) standards.

2.5.2 Results

Exhibit 2-3 summarizes EPA's estimate of the "pre-baseline" available commercial hazardous waste capacity by waste form for incinerators and BIFs. The following paragraphs discuss refinements of these estimates for wood preserving wastes in terms of two types of capacity: (1) liquids, and (2) pumpable/nonpumpable sludges, solids, and soils. This discussion is organized around these two types of capacity because most wastes are assigned to these two types of treatability groups.

Combustion capacity for liquid forms of hazardous wastes has historically been more readily available than capacity for sludges and solids. Using data from Exhibit 2-3, EPA estimates that the pre-baseline available commercial combustion capacity for liquids is about 1,078,000 tons per year.[18] EPA then subtracted the 11,000 tons of required capacity for liquid Phase II wastes. Because Phase III did not result in any required capacity for liquids, the result—1,067,000 tons/year—is assumed to still be available overall. In the Phase IV rulemaking for wood preserving wastes, EPA estimated that approximately 26,312 tons/year of combustion capacity is required for liquid wastes from wood preserving operations. Subtracting this required capacity results in an estimate of 1,040,688 tons/year of

[18] EPA first estimated that there is approximately 1,010,000 tons/year of available capacity for waste forms reported as "aqueous liquids" (92,000 tons/year), "non-aqueous liquids" (159,000 tons/year), and "all liquids" (759,000 tons/year). EPA then added to this quantity the estimate of available capacity to treat "liquid/pumpable sludges" (i.e., 68,000 tons/year). Because this latter quantity is for mixed forms of waste, it was excluded from the non-liquid estimate described below to avoid double counting.

EXHIBIT 2-3
PRE-BASELINE AVAILABLE COMMERCIAL HAZARDOUS WASTE
COMBUSTION CAPACITY SUMMARY

Waste Form	Incinerators			BIFs			Total Available (1000 tpy)
	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	
Liquids (aqueous)	190	92	51	NA	NA	NA	92
Liquids (non-aqueous)	346	159	54	NA	NA	NA	159
Reported as All Liquids (aqueous & non-aqueous)	82	56	31	1,548	702	55	759
Reported as Liquids & Pumpable Sludges Grouped	32	20	38	236	49	79	68
Pumpable Sludges	116	66	43	37	12	68	78
Nonpumpable Sludges	32	17	47	5	1	72	18
Reported as Solids & Nonpumpable Sludges Grouped	53	38	27	35	11	69	49
Bulk Solids	133	70	47	25	18	30	88
Dry Solids	NA	NA	NA	49	39	20	39
Containerized Solids	231	102	56	146	106	28	208
Compressed Gases	5	3	43	NA	NA	NA	3
Soils	169	157	7	NA	NA	NA	157
TOTAL LIQUIDS & PUMPABLE SLUDGES	766	393	49	1,822	763	58	1,156
TOTAL SOLIDS & NON-PUMPABLE SLUDGES	618	384	38	261	175	33	560
TOTAL	1,390	780	44	2,083	938	55	1,718

1. Values for maximum, available, and percent utilized reflect pre-baseline data (i.e., prior to accounting for Phase I, II, and III required capacity). Values estimated for Phase IV wastes are based on these data and are provided in the text. These numbers may not add due to rounding.
2. This report only includes capacity for currently operating units. The following units are not included in the roll-ups: Waste-Tech (Kimball, NE), Waste-Tech (East Liverpool, OH), CWM (Chicago, IL), and Ash Grove (Louisville, NE).
3. The following BIFs have been included in these figures based on data obtained from the September 1993 EI Digest: North Texas Cement (Midlothion, TX), Florida Solite (Green Cove Springs, FL), Carolina solite (Albermarle, NC), Solite Co. (Arvonia, VA), Solite Co. (Cascade, VA), Essroc (Logansport, IN), Giant (Harleyville, SC), Heartland Cement Co. (Independence, KS), Medusa Cement Co. (Wampum, PA), River Cement (Festus, MO), and Southdown (Fairborn, OH).

available combustion capacity for treating liquid wastes that would be restricted from land disposal by today's proposed rulemaking. EPA used data from Exhibit 2-3 to estimate that the available pumpable/nonpumpable sludge, solid, and soil commercial combustion capacity in the pre-baseline (i.e., prior to the Phase I rule) is 638,000 tons/year.[19] Post-Phase I and II but pre-Phase III data obtained from one major treater, RES, through comments and subsequent submissions of CBI, as well as extrapolation of these data to all other combustion data, were used to update this pre-baseline estimate and to simultaneously account for Phase I and II wastes. The result is approximately 489,100 tons/year,[20] with a range between about 410,400 to 568,600 tons/year.[21] For the Phase III rule wastes, EPA estimated that the relevant required sludge, solid, and soil combustion capacity is 4,600 tons/year. Therefore, the overall current (pre-Phase IV) combustion capacity for sludge, solid, and soil is estimated at 484,500 tons/year (between about 405,800 to 564,000 tons/year). In the Phase IV rulemaking for wood preserving wastes, EPA estimated that approximately 8,968 tons/year of non-liquid/nonwastewater combustion capacity is required for wastes from wood preserving operations. Thus, EPA estimates that approximately 474,532 tons/year (396,823 to 555,032) of combustion capacity is available to treat wastes restricted from land disposal by the Phase IV second supplemental rulemaking.

The estimates discussed above of available combustion capacity are expected to remain relatively steady through 1999. Although one munitions treatment facility is awaiting approval of its permit to burn military munitions and other explosives, no applications for new hazardous waste incinerators are immediately pending. Most of the proposals for new combustion capacity that have surfaced recently are for facilities that specialize in the combustion of military munitions, other explosive materials, or mixed wastes.[22] In addition, several facilities that had proposed expansion of thermal capacity have now abandoned their proposals.[23] Difficulties in permitting make it highly unlikely that other combustion units, such as mobile incineration units, could be brought on-line in the near-term (i.e., within two years). Recent industry publications, such as *The Hazardous Waste Consultant*, indicate that the public continues to oppose nearly every proposed hazardous waste management facility, and state and local legislative bodies continue to pass restrictive siting laws or permitting moratoriums. As a result, many project sponsors have already, or may eventually, find the process too costly.[24] Lastly, the final maximum achievable control technology (MACT) standards for combustors (expected in 1998; see proposed rule, 61 FR 17358) may decrease this available capacity to some degree. However, given the

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

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

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

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

[23] Aptus, Inc. (Rollins) of Coffeyville, Kansas; Holnam, Incorporated of Ada, Oklahoma; and Medusa Cement Company of Clinchfield, Georgia, as described in "Commercial Hazardous Waste Management Facilities: 1997 Survey of North America," *The Hazardous Waste Consultant*. March/April 1997. Note that the planned expansion by Aptus, Incorporated, would have added more capacity to the estimates discussed above.

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

worst-case assumptions used above, EPA does not expect the MACT standards to significantly reduce the available capacity estimated for Phase IV wastes.

2.6 MIXED RCRA/RADIOACTIVE WASTE CAPACITY

Available commercial treatment capacity for mixed radioactive waste is discussed in detail in the capacity analysis background document for the original Phase IV proposed rule (60 *FR* 43654). As discussed in detail in that capacity analysis, any commercial capacity that is available for mixed radioactive wastes must be used for mixed wastes that were regulated in previous LDR rulemakings and whose variances have already expired.

CHAPTER 3
CAPACITY ANALYSIS FOR TOXICITY CHARACTERISTIC METAL WASTES

This section presents EPA's capacity analysis for the TC metal wastes covered by the proposed Phase IV LDR second supplemental rule. TC metal wastes referred to in this analysis include all of the newly identified TC metal wastes and the characteristic wastes previously identified by the Extraction Procedure (EP). Section 3.1, Regulatory Background, provides additional detail on the wastes addressed in this analysis; Section 3.2 describes the data sources used in the analysis; Section 3.3 describes TC metal waste generation and management; Section 3.4 discusses the soil and debris contaminated with newly identified TC metal wastes; Section 3.5 provides the capacity analysis; and Section 3.6 summarizes the results of the capacity analysis.

3.1 REGULATORY BACKGROUND

On May 19, 1980 (45 *FR* 33084), the Agency promulgated the final rule on the use of the Extraction Procedure (EP) toxicity test to identify wastes that pose a hazard to human health and the environment due to their potential to leach significant concentrations of hazardous constituents. Eight metal (D004-D011) and six pesticide constituents (D012-D017) were identified, which if present in the EP waste extract in excess of specified concentrations caused the waste to be identified as hazardous. EPA determined the regulatory concentration levels by multiplying constituent-specific chronic toxicity levels (the National Interim Primary Drinking Waster Standards (DWS)) with a generic dilution/attenuation factor of 100, to reflect both the concentration at which the constituent is harmful to human health and the environment and the fate of the constituent in the environment.

On March 29, 1990 (55 *FR* 11798), the Agency, after several revisions to the existing hazardous waste identification regulations, finalized the Toxicity Characteristic (TC) rule. The TC rule replaced the EP leaching test with the Toxicity Characteristic Leaching Procedure (TCLP) and added 26 organic compounds to the list of TC constituents (D018-D043). A comprehensive list of the Federal Register notices related to the development of the TC regulations is provided in Exhibit 3-1.

Since the promulgation of the TC rule in 1990, the TCLP has been used to determine the toxicity characteristic of a metal waste. Wastes that are characteristic by the TCLP but not by the EP are considered newly identified wastes, which are currently not subject to the land disposal restrictions. On August 22, 1995 (60 *FR* 43654), the Agency proposed revised treatment standards, under the LDRs program, for all characteristic metal wastes, including those previously regulated by the EP. These revised treatment standards, for both wastewater and nonwastewater forms of D004-D011 wastes, are numerically equivalent to the universal treatment standards (UTS). A universal treatment standard is a single treatment standard established for a specific constituent regardless of the waste matrix in which it is present, i.e., the same treatment standard applies to a particular constituent in each waste code in which it is regulated.[1]

EPA received several comments on the treatability of TC metal wastes to the UTS levels. Upon additional review of the comments and data submitted by the commenters, the Agency, in today's proposed rule is proposing to revise the UTS for certain metal constituents in TC wastes and at the same

[1] A more detailed discussion of the Agency's rationale and technical support for establishing universal treatment standards for TC wastes is provided in: U.S. EPA, Final Best Demonstrated Available Technology (BDAT) Background Document for Universal Standards, Volume A: Universal Standards for Nonwastewater Forms of Listed Hazardous Wastes, and Volume B: Universal Standards for Wastewater Forms of Listed Hazardous Wastes, U.S. EPA, Office of Solid Waste, July 1994.

Exhibit 3-1
List of Federal Register Notices Addressing Toxicity Characteristic Rulemakings

TC Issue	FR Notice	Date
Final Rule for Identification and Listing of Hazardous Waste: Use of EP Toxicity Test Procedure	45 *FR* 33084	May 19, 1980
Notice of Availability of Reports that Support the TCLP	51 *FR* 24856	July 9, 1986
Proposed Revisions to the Identification and Listing of Hazardous Waste: Use of the TCLP and Addition of Constituents to the Toxicity Characteristic	51 *FR* 21648	July 13, 1986
Final Land Disposal Restrictions Approach: Use of the TCLP for Compliance with Treatment Standards	51 *FR* 40572	November 7, 1986
Supplemental Notice of the Proposed Rulemaking: Consideration of Separate Wastewater TC	52 *FR* 18583	May 18, 1987
Notice of Data Availability and Request for Comments: Supplemental to Proposed Rule: Use of a Generic DAF and Chronic Toxicity Reference Level Revisions	53 *FR* 18024	May 19, 1988
Proposed Revisions to TCLP to Replace Particle Reduction Step	53 *FR* 18792	May 24, 1988
Proposed Modifications to Groundwater Model	53 *FR* 28892	August 1, 1988
Identification and Listing of Hazardous Wastes: Toxicity Characteristic Revisions, Final Rule	55 *FR* 11798	March 29, 1990
Final Rule for Land Disposal Restrictions for Third Third Scheduled Wastes	55 *FR* 22520	June 1, 1990
Corrections to March 29, 1990 Toxicity Characteristic Revisions	55 *FR* 26986	June 29, 1990
ANPRM and Request for Comment and Data for the Approach for Establishing BDAT Treatment Standards for D004-D043	56 *FR* 55160	October 24, 1991
Land Disposal Restrictions - Phase II: Universal Treatment Standards for Organic TC Wastes and Newly Listed Wastes	59 *FR* 47982	September 19, 1994
Proposed Land Disposal Restrictions - Phase IV: Treatment Standards for TC Metal Wastes	60 *FR* 43654	August 22, 1995
Land Disposal Restrictions - Supplemental Proposal to Phase IV: Clarification of Bevill Exclusion for Mining Wastes, Changes to the Definition of Solid Waste for Mineral Processing Wastes, Treatment Standards for Characteristic Mineral Processing Wastes, and Associated Issues.	61 *FR* 2338	January 25, 1996

time re-propose the UTS for certain other metal constituents, as originally proposed, and make a national capacity variance determination.

3.2 DATA SOURCES

EPA has collected available information on Phase IV TC metal wastes, including contaminated soil and debris, from a number of sources to support the proposed LDRs. The primary data sources used in this capacity analysis are described below.

3.2.1 Information from Background Documents Developed for the Third Third Rulemaking

For the Third Third Rulemaking (55 *FR* 22520, June 1, 1990), the Agency conducted a comprehensive study on the TC metal waste generation and management at the industry and facility level. Information collected and analyzed for the Third Third rulemaking is used in the present analysis for characterizing the TC metal wastes.[2]

3.2.2 Comments from the ANPRM

On October 24, 1991 the Agency published an Advanced Notice of Proposed Rulemaking (ANPRM) (56 FR 55160) and requested comments and data on the development of treatment standards and quantities of wastes requiring alternative commercial capacity due to the LDRs for a group of newly listed wastes, including the TC metal wastes. Several commenters provided comments and data on the TC metal waste generation and management. Applicable comments and data are included in the capacity analysis described in this report.

3.2.3 Biennial Reporting System (BRS)

The 1993 BRS provides information on waste generation and management practices at the individual waste stream and facility level. The BRS is a system by which RCRA-regulated treatment, storage, and disposal facilities (TSDFs) and large quantity generators provide EPA with information on their hazardous waste activities. The BRS contains information on the waste streams generated on site and received from off site, waste physical form, waste codes, waste quantity, and the treatment systems used to treat each hazardous waste stream. Data from the BRS was the primary source for the analysis of required capacity for the TC metal wastes(Appendix D). A detailed description of the methodology and assumptions for using the BRS data are provided in Section 3.5.

3.2.4 Comments from the Original Phase IV LDR Proposed Rule for TC Metal Wastes

In the original Phase IV LDR proposal for TC metal wastes (60 *FR* 43654, August 22, 1995), EPA solicited comments on the waste quantities and management practices of the newly identified TC metal wastes that were impacted by this rule. Several commenters provided comments and data on the TC metal waste generation and management. Applicable comments and data are included in the capacity analysis described in this report.

3.2.5 Comments from the Phase IV Notice of Data Availability (NODA)

On May 10, 1996, the Agency published the NODA (61 *FR* 21418) as a supplement to the original Phase IV proposed rule. In this NODA, EPA requested additional information on the generation

[2] U.S. EPA, Background Document for Third Third Wastes to Support 40 CFR Part 268 Land Disposal Restrictions - Final Rule, Third Third Waste Volumes, Characteristics, and Required and Available Treatment Capacity, Office of Solid Waste, May 1990.

and management of the TC metal wastes and TC contaminated soil. Several commenters provided information on waste quantities generated and management practices for TC metal wastes. These comments and data are included in the capacity analysis described in this report.

3.3 WASTE GENERATION AND MANAGEMENT

TC metal wastes are generated by a wide variety of industries and in many different forms. Furthermore, the waste generation rates vary widely from industry to industry. However, the processes by which TC metal wastes are generated are similar for many of the various metals. A more detailed discussion of the potentially impacted industries, and the specific compounds of interest for each TC metal is provided in EPA's Proposed Best Demonstrated Available Technology (BDAT) Background Document for Toxicity Characteristic Metal Wastes - D004-D011, Office of Solid Waste, July 26, 1995.

As indicated in Section 3.1, two different categories of TC metal wastes exist.[3] First is the wastes that are hazardous or would be hazardous using the EP. These wastes are currently required to be treated to the TC level. Second is the newly identified TC metal wastes (i.e., they are not or would not be hazardous using the EP), which currently do not require treatment prior to Subtitle C management (see Section 3.1 for additional regulatory background); this category of waste likely is already being treated to TC levels in order to avoid the higher cost of Subtitle C disposal. In today's proposed rule, the Agency proposes to regulate both categories of TC metal wastes. The BRS data (i.e., the primary data used for the estimate of required capacity) includes information on both of these TC metal waste categories.

The Agency relied primarily on the 1993 BRS to estimate the quantity of potential Phase IV TC metal waste that is currently being generated[4] and currently being surface-disposed (and thus potentially requiring alternative treatment). The following steps describe the methodology used to identify these wastes from the BRS:

1. Data was extracted from the BRS GM Form for all of the TC metal waste streams that carried at least one TC metal code (D004-D011) and no other code. Thus, waste streams that carried a TC metal waste code along with a listed waste code or other characteristic waste code (e.g., a TC organic waste code) were excluded because the TC metals and the UHCs in these waste streams were addressed when EPA promulgated the UTS for these wastes in previous LDR rulemakings.

2. The data were aggregated according to whether the waste was managed on site or shipped off site. The on-site quantity is the "quantity treated, disposed, or recycled in 1993" from the GM form (not the "quantity generated in 1993"), while the off-site quantity is the "total quantity shipped in 1993." Total generation is the summation of these two quantities.

3. To avoid double-counting, non-primary TC metal wastes were eliminated using an origin code of 5 in the GM form.[5] Similarly, waste streams with an origin code of 4, which indicates that the waste stream was received from off site but not managed on site, were eliminated.[6]

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[3] In fact, three categories exist. The third is the EP wastes that are not TC hazardous. These wastes do not need to meet the LDRs because they are no longer considered hazardous wastes.

[4] For the purpose of this capacity analysis, and as discussed in more detail later in this section, the TC metal waste generation refers to wastes that carry only a TC metal code and that are not deep well injected or disposed without treatment under a National Pollutant Discharge and Elimination System (NPDES) permit.

[5] An origin code of 5 on the GM Form indicates that the waste stream was derived from the management of a hazardous waste. In general, non-primary waste streams (i.e., treatment residuals) are not included in the capacity

4. Deepwell/underground injection wastes (waste code M134) and wastes that are directly discharged to surface water under NPDES without prior treatment (waste code M136) were excluded. Underground injected wastes are addressed by a separate analysis, and the NPDES wastes are generally not subject to the LDRs.

5. The generated quantities were aggregated by inorganic and organic liquids, inorganic and organic solids, and inorganic and organic sludges.

6. Waste quantities were aggregated by waste code. Waste streams with multiple TC metal waste codes were grouped separately as "mixture" streams.

Exhibit 3-2 provides the TC metal-only waste quantities generated by waste code and waste type. Note, however, that this exhibit shows total waste generation, which includes wastes potentially affected by the Phase IV LDRs. To estimate the quantity of wastes potentially affected by the Phase IV LDRs, several additional steps were taken and assumptions were made. (See Appendix D for the raw data used for this analysis.)

Exhibit 3-2
1993 Generation of TC Metal Wastes (Tons)[a]

Waste Code	Inorganic Liquids	Organic Liquids	Inorganic Solids	Organic Solids	Inorganic Sludges	Organic Sludges	Total
Arsenic (D004)	162,855	789	4,039	746	520	3	168,952
Barium (D005)	66,364	260	23,822	1,077	431	234	92,188
Cadmium (D006)	1,169,776	1,435	19,173	313	132,594	83	1,323,373
Chromium (D007)	16,823,543	42,474	49,866	2,144	389,790	873	17,308,690
Lead (D008)	6,202,113	29,455	1,190,037	5,607	23,519	1,956	7,452,686
Mercury (D009)	2,690,316	469	8,634	81	95	19	2,699,614
Selenium (D010)	199,733	388	793	22	16,078	0.6	217,015
Silver (D011)	252,682	13,166	2,198	45	1,192	0.3	269,284
Mixtures	3,971,784	12,070	170,953	5,267	36,222	4,051	4,200,347
Total	**31,539,166**	**100,506**	**1,469,515**	**15,302**	**600,442**	**7,220**	**33,732,151**

[a] For the purpose of this capacity analysis, and as discussed in more detail later in this section, the TC metal waste generation refers to wastes that carry only a TC metal code and that are not deep well injected or disposed without treatment under a NPDES permit.

The first key assumption developed to identify TC metal wastes affected by the LDRs involved wastewaters. TC metal wastewaters typically are managed in tanks and discharged under Clean Water Act (CWA) or equivalent regulations or in underground injection wells, and thus would not require any additional treatment capacity or are otherwise outside the scope of this analysis of surface-disposed wastes. Therefore, wastewaters are excluded from our analysis (although liquid nonwastewaters are included). In fact, these wastewaters are likely not reported in the BRS because they do not meet the

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estimates because if management practices change as a result of the LDRs, such residuals will no longer be generated.

[6] Waste streams that are sent to a transfer facility and then sent to a hazardous waste management facility are supposed to be reported in the BRS at least twice, once by the facility generating the waste and once by the facility transferring the waste. To avoid double-counting, waste streams with an origin code of 4 (indicating that the waste was received from off site and not managed on site) were eliminated.

definition of solid waste. However, residues resulting from the treatment of these wastewaters are usually managed as nonwastewaters and thus are included in the BRS.

To develop lower- and upper-bound estimates of the quantity of surface-disposed TC metal wastes, and thus of wastes that may require alternative treatment or recovery capacity upon promulgation of the Phase IV LDR rule, the Agency applied two key sets of assumptions:

1. For the upper-bound estimate, the Agency used the conservative assumption that all of the TC metal nonwastewaters that are either surface-disposed (i.e., where the system type was landfill, land treatment, surface impoundment, or "other" disposal), shipped to transfer facilities,[7] or reported as managed in invalid system types (e.g., when M141 (transfer off site) is used as an on site treatment) will require at least some form of alternative treatment/recovery to meet the new treatment standards. The actual quantity is likely to be lower than this for two main reasons: (i) many of these waste streams are not surface-disposed and thus would not require alternative capacity; and (ii) many facilities likely will make modifications in their production processes and/or waste management in order to avoid the LDRs. EPA believes that these reasons eclipse any of the reasons that would tend to indicate that this estimate would not be an upper bound.[8]

2. For the lower-bound estimate, EPA primarily used the assumption that only the reported surface-disposed wastes would require alternative capacity. The actual quantity is likely to be higher than this because many of the waste streams that are surface-disposed (and thus would likely require alternative capacity) are not reported as such in the BRS. This non-reporting is primarily due to SQGs and to the fact that when TC metal wastes are decharacterized through treatment (e.g., stabilization), they are no longer hazardous and thus their ultimate disposal no longer needs to be reported in the BRS. EPA believes that this non-reporting eclipses any of the reasons that would tend to indicate that this estimate would not be a lower bound.[9]

Exhibits 3-3 and 3-4 provide the upper-bound and lower-bound estimates of surface-disposed TC metal wastes, or approximately 2.6 million to 0.8 million, respectively. This estimate compares favorably with a lower-bound estimate of 2.2 million tons that was obtained by summing the non-mixture quantities (converted from gallons using 8.35 pounds/gallon) of EP metal wastes requiring alternative capacity described in the Background Document for Third Third Wastes to Support 40 CFR Part 268 Land Disposal Restrictions, Final Rule, Third Third Waste Volumes, Characteristics, and Required and Available Treatment Capacity, Volume II, Chapter 3, May 1990. This (Third Third rule) is considered a lower-bound estimate for EP metal wastes at the time because it does not include EP metal wastes mixed with other EP metal wastes (nor other waste codes or organics, as with the TC metal estimates above). However, the mixture totals for each EP metal waste were consistently less (and usually much less) than the non-mixture totals, and thus the overall EP total from the Third Third LDR is believed to be less than approximately one and a half times the 2.2 million ton estimate (i.e., 3.3 million tons). Nevertheless, given the waste minimization, etc., that likely has occurred since the Third Third LDR, even one and a half times 2.2 million tons would compare favorably with the current estimates.

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[7] Given the manner in which transfers are reported, it is not always possible to identify how transferred waste streams are managed. Therefore, as a worst-case scenario, the Agency assumed that all shipments of wastes to transfer facilities require additional treatment.

[8] For example, small quantity generators (SQGs) are not required to report their wastes in the BRS. Furthermore, although many of these SQG wastes likely are transferred off site to be managed, and thus would be entered on a WR Form, only the generally smaller hazardous waste residual, if any, would be entered on a GM Form.

[9] For example, many facilities likely will make modifications in their production processes and/or waste management in order to avoid the LDRs.

Exhibit 3-3
Upper-bound Estimates of Surface-Disposed TC Metal Wastes (Tons)

Waste Code	Inorganic Liquids	Organic Liquids	Inorganic Solids	Organic Solids	Inorganic Sludges	Organic Sludges	Total
Arsenic (D004)	67	8	4,039	746	520	3	5,383
Barium (D005)	57	11	23,822	1,077	431	234	25,632
Cadmium (D006)	135,098	84	19,173	313	132,594	83	287,346
Chromium (D007)	1,399	2,400	49,866	2,144	389,790	873	446,471
Lead (D008)	46,260	1,525	1,190,037	5,607	23,519	1,956	1,268,905
Mercury (D009)	325,246	55	8,634	81	95	19	334,131
Selenium (D010)	31	7	793	22	16,078	0.6	16,932
Silver (D011)	339	10,532	2,198	45	1,192	0.3	14,306
Mixtures	1,503	987	170,953	5,267	36,222	4,051	218,983
Total	**510,001**	**15,609**	**1,469,515**	**15,302**	**600,442**	**7,220**	**2,618,089**

Exhibit 3-4
Lower-bound Estimates of Surface-Disposed TC Metal Wastes (Tons)

Waste Code	Inorganic Liquids	Organic Liquids	Inorganic Solids	Organic Solids	Inorganic Sludges	Organic Sludges	Total
Arsenic (D004)	33	0.4	2,511	57	420	0.75	3,022
Barium (D005)	0	2	556	497	24	0	1,079
Cadmium (D006)	135,050	25	12,583	84	40,302	39	188,083
Chromium (D007)	396	23	26,213	1,236	231	124	28,223
Lead (D008)	45,640	80	84,449	2,707	602	439	133,917
Mercury (D009)	325,026	0	7,145	35	0	0	332,206
Selenium (D010)	0	1	608	0.08	0	0.6	610
Silver (D011)	16	10,501	37	0.1	2	0	10,556
Mixtures	776	83	98,209	503	1,680	3,258	104,509
Total	**506,937**	**10,715**	**232,311**	**5,119**	**43,261**	**3,861**	**802,210**

3.4 SOIL AND DEBRIS CONTAMINATED WITH NEWLY IDENTIFIED TC METAL WASTES

In all of the data sources consulted by the Agency, there was little information on the amount of soil and debris that might be contaminated with the newly identified TC metal wastes. The Agency believes that most of the soil and debris will probably be generated when facilities begin closing surface impoundments to comply with the LDRs or as part of corrective action procedures where it will be necessary to remove the soils for treatment. Consequently, EPA has no estimates for the amount of contaminated soil and debris that would be subject to the LDRs for this proposed rule. Based on discussions with commercial treaters (see Chapter 2), the Agency believes that these wastes could be really treated to meet the proposed treatment standards. The Agency is seeking comments on this approach and requests the commenters to provide additional information and data on these wastes.

3.5 CAPACITY ANALYSIS

The capacity analysis for the original proposed Phase IV rule assumed that most TC metal wastes are already meeting treatment standards or will meet treatment standards once stabilization formulations and systems are optimized, and therefore no capacity variance was proposed. This section expands on that assumption and provides a waste code-specific discussion of TC metal wastes, including soils, mixtures, UHCs, and any unique features that could have a potential impact on this proposed capacity determination. Relevant comments and data submitted by the commenters in response to the ANPRM (56 *FR* 55160), the original Phase IV LDR proposal for TC metal wastes (60 *FR* 43654), and the NODA (61 *FR* 21418) are also included in this discussion.

3.5.1 Arsenic (D004)

As seen in Exhibits 3-3 and 3-4, approximately 3,000 to 5,400 tons/year of D004 wastes are surface disposed. EPA is re-proposing, as originally proposed, a UTS level of 5.0 mg/l for nonwastewater forms of D004 (Exhibit 3-5). Therefore, there is no change in the treatment standard due to this rulemaking (i.e., the TC level and the UTS level are the same) and, thus, the only potential concern for capacity for D004-only wastes appear to be for the UHCs (see Section 3.5.10). In response to the ANPRM, Chevron reported one facility that generates 30 tons per year of nonwastewaters exhibiting the TC for arsenic (D004) that were not hazardous under the EP. The proposed UTS levels for arsenic wastes are equivalent to the TC levels, however, and since the newly identified arsenic wastes likely are already being treated to the TC levels to facilitate Subtitle D management of the waste, no additional treatment would be required for these wastes as a result of today's proposed rule. Chemical Waste Management (CWM) stated that some arsenic poses technical problems in achieving UTS levels through stabilization technology, and that EPA should establish a high arsenic (> 200 ppm) subcategory. However, the Agency conducted site visits (see the site visit reports, located in the docked for today's proposed rule, for more detailed information) to the commercial treatment facilities to assess the treatability of TC metals using stabilization and collected treatment performance data, which show that arsenic could be treated to the proposed UTS levels using stabilization. Therefore, the Agency is proposing no changes to the originally proposed UTS level or variance decision for arsenic wastes.

Exhibit 3-5
TC Metal Regulatory Levels and Originally Proposed and Re-proposed Treatment Standards (Nonwastewater)

TC Metal	TC Regulatory Level (mg/l TCLP)	Originally Proposed UTS (mg/l TCLP)	Re-proposed UTS (mg/l TCLP)
Arsenic (D004)	5.0	5.0	5.0
Barium (D005)	100	7.6	**21.0**[a]
Cadmium (D006)	1.0	0.19	0.2
Chromium (Total) (D007)	5.0	0.86	**0.85**
Lead (D008)	5.0	0.37	**0.75**
Mercury-retort residues (D009)	0.20	0.20	0.20
Mercury-all others (D009)	0.20	0.025	0.025
Selenium (D010)	1.0	0.16	**5.7**
Silver (D011)	5.0	0.30	0.11

[a] Bold indicates changes to the originally proposed UTS levels.

3.5.2 Barium (D005)

As shown in Exhibits 3-3 and 3-4, approximately 1,000 to 25,600 tons/year of D005 wastes are surface disposed. EPA is re-proposing a revised UTS level of 21 mg/l for nonwastewater forms of D005. This value is about a 80 percent reduction in the treatment standard, but is significantly higher than the proposed level of 7.6 mg/l. No comments were received that provided data on or otherwise discussed the treatment capacity for this TC metal waste code. Therefore, D005-only wastes do not appear to present any particular capacity problems.

3.5.3 Cadmium (D006)

Approximately 188,000 to 287,000 tons/year of D006 wastes are surface disposed (Exhibits 3-3 and 3-4). EPA is re-proposing, a UTS level of 0.2 mg/l for nonwastewater forms of D006. This is approximately an 80 percent reduction in the treatment standard.

AFS and the TDJ Group, commenting to the original proposal, suggested that stabilization technologies have not been shown to treat cadmium to the proposed UTS level. These commenters also implied that waste streams containing cadmium along with other metal constituents present additional treatment problems. TDJ Group stated that approximately 500,000 to 1,000,000 tons of D006-D008 wastes will be affected by the proposed Phase IV rule, which is comparable to the approximately 350,000 to 2,000,000 tons of surface-disposed D006-D008 wastes that EPA estimated using the BRS (taking into account that not all of these wastes will be affected, and that the upper-bound includes a large one-time generation amount of inorganic lead solids). Furthermore, these commenters, in addition to others, suggested that HTMR is not commercially available for treatment and that stabilization is the only commercially available treatment technology for many TC metal wastes. However, no data were received specifically on the available treatment capacity for this TC metal waste. Furthermore, as indicated in Chapter 2 and in the BDAT Background Document, cadmium could be readily treated to meet the treatment standards using stabilization. Therefore, D006-only wastes do not appear to present any particular capacity problems.

3.5.4 Chromium (D007)

As seen in Exhibits 3-3 and 3-4, approximately 28,000 to 446,000 tons/year of D007 wastes are surface disposed. The Agency is re-proposing a UTS level of 0.85 mg/l for nonwastewater forms of D007 wastes. The re-proposed standard results in approximately an 80 percent reduction in the treatment standard and is approximately equivalent to the originally proposed standard of 0.86 mg/l.

AFS suggested that the originally proposed UTS (0.86 mg/l) for chromium would be difficult to achieve for chromium TC wastes (D007) in foundry sands. AFS suggested that the record was not sufficient to address known interferences with stabilization technologies. However, no data were submitted to support or refute this. Additionally, no comments were received specifically on stabilization or other treatment capacity for D007 wastes.

3.5.5 Lead (D008)

Approximately 134,000 to 1,269,000 tons/year of D008 wastes are surface disposed. The Agency is re-proposing a UTS of 0.75 mg/l for nonwastewaters of D008 wastes. This is a reduction of approximately 85 percent in the treatment standard, but is approximately two times higher than the originally proposed treatment standard of 0.37 mg/l.

In the original proposal EPA noted that, for lead wastes, the TCLP might be more aggressive in extracting lead than the EP, and therefore assumed that the additional quantities of newly identified D008 wastes will be approximately 20 percent of the quantity of D008 wastes that were hazardous by the old EP leaching procedure. Applying this 20 percent increase to the estimates EPA used for the Third Third LDR rule results in an additional 41,250 tons per year of D008 nonwastewaters that will require additional treatment. EPA requested comments on this assumption in the original proposal.

Substantial comments regarding the applicability of UTS for lead were submitted by AFS and the Association of Battery Recyclers (ABR). Both groups commenting on the treatment standards for lead suggested that the originally proposed 0.37 mg/l UTS level for lead nonwastewaters is too low and prefer a UTS between 3 and 5 mg/l. The following provide details on the data provided by industry on D008 capacity.

Foundry Sands Waste

AFS has estimated that approximately 410,000 tons of D008 foundry sands are generated each year (which is within EPA's estimated range for D008 wastes), and has stated that foundry metallic waste constituents and concentrations are highly variable. AFS also believes that the foundry sand and the emission control dust contain a significant amount of non-metallic constituents that differentiate foundry waste from K061 wastes, which EPA had used to establish high temperature metal recovery (HTMR) as the BDAT for some of the wastes. AFS believes that foundry sand differs from K061 in ways that precludes them from being treated similarly. These differences include: (1) K061 typically has a much higher concentration of recoverable heavy metals (primarily zinc); and (2) K061 does not have an extremely high sand content in its waste matrix. Emission control dust from foundries also differs from K061 because K061 typically has a much higher overall concentration of recoverable heavy metals (primarily zinc). Because of these critical differences, AFS does not believe that HTMR is available or practical for foundry wastes.

The Agency received additional data from several commenters in response to the original proposed rule. Based on these data the EPA believes that the potentially affected TC metal universe is limited to certain lead-bearing D008 hazardous wastes. The Agency estimates that there are 761 non-ferrous foundries that generate approximately 300,000 tons of hazardous foundry sands, and 9 firms owning 15 secondary lead smelters that generate approximately 198,000 tons of hazardous slags.

Commenters did not provide any comments specifically on stabilization capacity. However, data submitted by the foundry industry shows that the originally proposed UTS level for lead was sometimes achieved through stabilization, even when the treatment system (stabilization) was designed only to target the TC level and not the proposed UTS level. These facts seem to indicate that foundry sands can be treated to the proposed treatment standards using stabilization, and thus meeting the higher re-proposed UTS of 1.6 mg/l will be even less of a problem.

TC Lead Battery Slag

The Association of Battery Recyclers (ABR) and Battery Council International (BCI) submitted some stabilization data, and requested that the UTS for lead be raised to 2.97 mg/l. BCI estimates that the amount of lead slag requiring treatment is approximately 250,000 tons per year and ABR states that an estimated 260,000 tons per year of D008 slag will require treatment (which is within our estimated range for D008 wastes). EPA's preliminary analysis of the data indicated that these data would not affect the estimate of the required or available treatment capacity.

EPA received comments from the Environmental Technology Council (ETC) in response to the Notice of Data Availability (NODA) for the LDR Phase IV proposed rule that provided treatability data that demonstrated that lead battery slags and sludges can be treated by stabilization to UTS for lead and underlying hazardous constituents (UHCs).

ETC's data for lead shows that out of 36 samples of stabilized slag, 29 (80.6%) achieved a TCLP result below the originally proposed UTS for lead of 0.37 mg/l. In all cases the treatment objective was to reduce leachability to below characteristic level, since UTS levels were not applicable at the time. Nevertheless, not only did the stabilization meet the characteristic levels for these samples, it also met the proposed UTS levels for all arsenic, barium, and nickel values. Eight of the nine (88.9%) cadmium values and six of the seven (85.7%) selenium values also met the proposed UTS. Based on these treatability data, ETC believes there can be no doubt regarding the ability to meet the UTS for this slag. Hence, it is unlikely that there will be any capacity shortfalls for TC metal wastes affected by the proposed rule once stabilization "formulations" are optimized to meet UTS.

These data seem to confirm EPA's assumption that the rule would primarily only require some modification to existing stabilization "formulations" to meet UTS. Consequently, sufficient capacity likely already exists to treat these wastes.

3.5.6 Mercury (D009)

EPA is re-proposing, as originally proposed, a UTS level of 0.20 mg/l for the nonwastewater mercury retort residue subcategory and 0.025 for all other nonwastewater forms of D009. Mercury Recovery Services (MRS) provided data (see Appendix E) to show that the proposed UTS levels can be achieved and noted that MRS has the capability to provide mobile treatment units for treating mercury contaminated wastes. No other specific comments were received that would affect our estimate of the required or available alternative treatment capacity for D009-only waste. Therefore, D009-only wastes do not appear to present any particular capacity problems.

3.5.7 Selenium (D010)

Approximately 600 to 17,000 tons of D010 wastes are surface disposed. The Agency, in the original proposal, proposed a treatment standard of 0.16 mg/l for nonwastewater forms of D010 wastes. However, in today's proposal, the Agency is re-proposing a revised UTS of 5.7 mg/l for nonwastewater forms of D010, which would be significantly greater than the TC level of 1.0 mg/l.

CWM and Rollins Environmental both submitted comments that highlighted their inability to stabilize nonwastewater forms of D010 selenium-containing incineration ashes in the presence of other metals. These commenters stated that the proposed 0.16 mg/l TCLP for nonwastewater forms of D010 wastes was not routinely achievable utilizing "best operating practices". They also discussed selenium's unique pH/solubility curve, which is significantly different from other characteristic metals. Specifically, selenium's minimum solubility is at a neutral to mildly acidic pH, while it is highly soluble in the basic pH range. The other characteristic metals have a minimum solubility in the basic pH range, while their solubility increases in the neutral and acidic pH's. These commenters believe that this difference in solubilities creates a problem for treating wastes with a mixture of characteristic metals that includes selenium.

In light of these different pH/solubility curves for selenium and other characteristic metals, CWM and Rollins believe that the treatment standard for selenium should be changed to make it more

consistent with what is routinely achievable. Further, these commenters have provided treatment data on the stabilization of incineration ashes and soils that appear to support their claims regarding the enhanced mobility of selenium under normal alkaline stabilization practices. Since, the Agency has revised the proposed selenium UTS based on these comments, achieving the re-proposed UTS for selenium should not pose any difficulties and, therefore, D010-only wastes do not appear to present any capacity problems.

3.5.8 Silver (D011)

Approximately 11,000 to 14,000 tons/year of D011 wastes are surface disposed. The Agency is re-proposing treatment standards for silver at 0.11 mg/l for nonwastewater forms of D011. This is approximately a 97 percent reduction in the treatment standard, and about a 50 percent reduction from the originally proposed standard of 0.30 mg/l.

The Silver Coalition and Kodak noted that silver was included in the TC list of metals solely based on the MCL for silver under the Safe Drinking Water Act, and since the Agency deleted the silver MCL (56 *FR* 3573) and is further considering deleting silver from the TC list, any new standards for silver should be withheld until the Office of Solid Waste has completed its current review of silver's inclusion on the TC list. However, no specific treatment capacity data were submitted by the commenters. Therefore, D011 wastes do not appear to pose any capacity problems.

3.5.9 TC Metal-Only Mixtures

As seen in Exhibits 3-3 and 3-4, TC metal waste mixtures represent about 10 percent of the upper-bound estimate and 13 percent of the lower bound estimate of surface-disposed TC metal wastes. Thus, mixtures discussed above as causing treatment difficulties likely will be less than 10 percent of the wastes requiring alternative treatment. Nevertheless, several combinations of problem mixtures were identified that are routinely generated in a number of different industries.

AFS submitted comments relating to foundry sands that contain up to 5 to 6 percent lead in addition to cadmium, chromium, and selenium. ABR submitted comments regarding secondary lead smelters that generate a slag containing lead and other metals from the recycling of batteries. Mixtures with combinations of constituents that include arsenic, selenium, chromium, and cadmium probably have the greatest potential to affect capacity based on the fact that CWM and Rollins have found mixed waste streams with these constituents difficult to treat. However, ETC has been successful treating mixtures containing these constituents to UTS and believes that the problem could be totally resolved once specific stabilization "formulations" are developed to meet UTS. The Agency contacted several commercial treatment facilities to collect data to estimate the time required to comply with the proposed treatment standards (see Chapter 2). Based on the information collected from these facilities, EPA believes that the necessary changes to the treatment systems to comply with the proposed treatment standards could be made in a relatively short amount of time. The Agency encourages the commenters to provide additional technical information and treatment performance data to support or refute this analysis for the final rule.

3.5.10 UHCs

Several commenters have expressed concern regarding the treatability of all UHCs in TC metal wastes. The TDJ Group noted that it is not clear whether the Agency fully considered the feasibility of achieving the UTS for all UHCs, and, in addition, whether such requirements would be a prudent use of the waste management dollars. ABR stated that the UHCs in the lead battery slag cannot be treated to the

proposed UTS using the stabilization technology. However, no data were submitted to support these comments.

Some commenters had stated that the presence of organic UHCs interfere with the stabilization process and, therefore, the TC metals in these wastes could not be treated to the proposed treatment standards. CWM stated that new RCRA Subpart CC rules (i.e., for organic air emissions at treatment facilities) have to be complied with when considering the treatment of TC metal wastes with organic UHCs. The Agency contacted several commercial treatment facilities to obtain information on the treatability of TC metal wastes with organic UHCs (see Chapter 2). Several facilities indicated that organic UHCs can be readily treated to the UTS. CWM stated that 75 percent of the wastes managed by CWM are incinerated to meet the organic LDRs prior to metals treatment. Data obtained using the organic form code from the BRS (Exhibits 3-3 and 3-4) indicate that approximately 20,000 to 40,000 tons/year of wastes may contain organic UHCs. Wastes containing organics, however, are amenable to thermal treatment prior to stabilization, and since adequate thermal treatment (and probably some stabilization and other technologies) capacity likely are available for organics, treatment of TC metal wastes containing organic UHCs are expected to pose few problems in terms of capacity (except, perhaps, for relatively minor logistics and timing issues).

3.6 RESULTS

As discussed above, EPA estimates that approximately 0.8 to 2.6 million tons of TC metal wastes are surface disposed. Because many of these wastes are believed to already be meeting the new treatment standards, or will otherwise undergo waste segregation and minimization prior to the LDRs, a much smaller quantity likely would require alternative treatment as a result of promulgation of today's proposed rule. Furthermore, approximately 260,000 tons/year[10] of these wastes are newly identified TC metal wastes (i.e., wastes that are not or would not be hazardous using the EP), while the remainder are EP hazardous TC metal wastes. As discussed in Sections 3.3 and 3.4, both types of wastes are expected to only require optimization of existing stabilization formulations and systems. For example, the majority of the newly identified TC metal wastes are currently being treated to TC levels because it is believed to be more economical to treat the TC metal wastes to TC levels and dispose the waste in Subtitle D landfills rather than to manage the waste untreated in Subtitle C landfills. Also, for arsenic and mercury, the UTS are equivalent to the TC levels and therefore will require no changes in treatment capacity (except to the extent treatment system optimization is needed to meet UTS for UHCs). Nevertheless, as noted in Chapter 2, Available Capacity, more than one million tons/year of commercial stabilization capacity is available for the newly identified wastes (including new treatment residues resulting from thermal treatment of TC metal wastes containing organic UHCs; see below).

Regarding the EP hazardous TC metal wastes, the Agency examined data provided by commenters, obtained during site visits to selected commercial treatment facilities, and discussed in Chapter 2, and believes that the proposed treatment standards are routinely achievable using current treatment technologies such as stabilization. Also, as seen in Chapter 2, limited capacity for vitrification and HTMR also exists to treat the otherwise difficult-to-treat TC metal wastes, and sufficient combustion capacity exists to pre-treat TC metal wastes that contain organic UHCs. In addition, the majority of the TC metal wastes are already being treated to the TC and, possibly, UTS levels. Thus, any capacity variances would likely only be needed to allow treaters sufficient time to implement modifications (e.g., developing new waste-specific stabilization "formulations") to their treatment systems. Based on these results, the Agency proposes to not grant a national capacity variance for the TC metal wastes, including

[10] Based on data (primarily lead slag) provided by the commenters in response to the original proposed rule. No data was provided on other newly identified TC metal wastes, and their quantities are assumed to be much lower.

soil and debris, covered by today's proposed rule. However, the Agency notes that if generators cannot obtain adequate treatment for specific wastes, then the generators may apply for a capacity variance extension under 40 CFR 268.5. Furthermore, if treaters have difficulties in treating specific wastes and would require additional time for developing new treatment recipes, then the treaters may apply for a treatability variance under 40 CFR 268.42. EPA encourages commenters to provide data and additional information on the treatability of TC metal wastes to support the final TC metal LDR rule.

CHAPTER 4
CAPACITY ANALYSIS FOR THE NEWLY IDENTIFIED MINERAL PROCESSING WASTES

This chapter describes the capacity analysis for the newly identified mineral processing wastes that are considered potentially hazardous and thus subject to the LDRs. The main purpose of this analysis is to estimate the demand for commercial treatment/recovery for the newly identified wastes and to propose the effective date of the LDRs for these waste streams in the Phase IV second supplemental proposed rule. This chapter is organized into five sections: Section 4.1 provides the regulatory background and identifies the universe of mineral processing wastes covered by this proposed rule; Section 4.2 describes the data sources used for the capacity analysis; Section 4.3 discusses the analysis of required capacity for the newly identified mineral processing wastes; Section 4.4 discusses soil and debris contaminated with newly identified mineral processing wastes; and Section 4.5 provides a discussion of the capacity variance decisions.

4.1 REGULATORY BACKGROUND

Under section 8002 of the 1980 Amendments to RCRA, commonly referred to as the Bevill Amendment, wastes from extraction, beneficiation, and mineral processing operations were excluded from regulation as hazardous wastes under Subtitle C pending further study. The Bevill Amendment required the Agency to present its findings in a Report to Congress and to issue a regulatory determination based on this study. Mineral processing wastes were considered unique by Congress because they are often generated in large volumes and thought to be of low hazard and less amenable to standard treatment technologies than other Subtitle C wastes.

The Agency completed its study of extraction and beneficiation wastes in 1985 and issued a regulatory determination in 1986 removing these wastes from Subtitle C regulation. Several Court challenges to EPA's regulatory approach delayed completion of the Agency's study of mineral processing wastes until July 1990 and limited the study to high-volume, low-hazard wastes referred to as "special wastes".

The Agency established the criteria for what constitutes a "special waste" in a September 1, 1989 rulemaking (54 *FR* 36592) and permanently removed all but 25 mineral processing wastes from the Bevill exclusion. Five more wastes were removed from the exclusion in a second rulemaking promulgated January 23, 1990 (55 *FR* 2322). All waste streams removed from the Bevill exclusion and subsequently found to exhibit any of the RCRA hazardous characteristics (e.g., corrosivity, ignitability, reactivity, or toxicity) became subject to RCRA Subtitle C requirements.

To determine which sectors generated mineral processing wastes that meet the high-volume, low-hazard criteria, a list of 100 mineral commodity sectors was compiled based on data provided by the Bureau of Mines and additional data collected for earlier regulatory efforts. Using the definitions of mineral processing described in the 1989 rule, 50 mineral processing commodity sectors were determined to generate only extraction and beneficiation wastes and were thus excluded from Subtitle C regulations.

In addition to the above wastes, five wastes (K064-K066, K090-K091) generated from primary metal smelters were listed as hazardous wastes on May 19, 1980 (45 *FR* 33112) and on July 16, 1980 (45

FR 47832).[1] EPA suspended the listings for these smelter wastes on November 12, 1980 (45 *FR* 76618) and on January 16, 1981, because these wastes appeared to be within the scope of the Bevill exclusion.[2] During 1984, several environmental organizations challenged EPA's failure to comply with the terms of the Bevill Amendment. [Concerned Citizens of Adamstown v. EPA, Civ No. 84-3041 (D.D.C.)] As a result, the court ordered EPA to take action on a planned proposed rulemaking reinterpreting the scope of the mining waste exclusion. Under court order, EPA proposed to narrow the scope of the exclusion by relisting the five metal smelting wastes, among other things (50 *FR* 40292). On October 9, 1986, however, the Agency announced that it was withdrawing its proposed reinterpretation due to definitional problems EPA faced in determining how to group and classify the wastes (51 *FR* 36233). This withdrawal of the proposed reinterpretation effectively continued the suspension of the five smelter waste listings. This action was also challenged by environmental organizations [EDF v. EPA, No. 86-1584 (D.C. Cir.)]. The Court directed EPA to relist the smelter wastes by August 31, 1988. Therefore, EPA reinstated the hazardous waste listings for these five wastes associated with smelting operations.

The relisting was subsequently challenged by the American Mining Congress on the grounds that EPA failed to give an adequate reasoned explanation for its decision to relist the wastes [AMC et al. v. U.S. EPA, Nos. 88-1835 et al. (D.C. Cir.)]. During July 1990, the court remanded the five smelting wastes for further consideration and explanation by the Agency with respect to the basis for the relisting.

The Agency is proposing not to re-list these wastes as hazardous in the Phase IV proposed rule. The Agency will, instead, regulate these wastes according to their hazardous characteristics. Thus, the regulatory status of these wastes does not differ from the "de-Bevilled" wastes discussed above, and therefore these wastes are included in the present capacity analysis.

On January 25, 1996, EPA proposed treatment standards for the newly identified mineral processing wastes. Today's proposed rule re-proposes treatment standards for these wastes.

4.2 DATA SOURCES

EPA has collected considerable information on the mineral processing industry, including data on waste volumes generated, waste characteristics, and waste management practices. These data collection efforts have included formal and informal surveys, site visits, sampling, literature searches, and analyses of public comments to proposed rulemakings. As a result of these data collection efforts, the Agency has developed a large body of data on mineral processing industry wastes and management practices.[3] The following sections describe the primary data sources used to develop the mineral processing capacity data set, which was used to perform the capacity analysis.

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[1] A total of eight waste streams generated from metal smelting operations were listed. In 1985, however, EPA determined that K067 and K068 do not meet the current definitions of solid waste; therefore, these wastes are no longer listed (50 *FR* 40296). In addition, K088, which was relisted in 1988 and not affected by the court ruling, was addressed in the Phase III proposed rule (60 *FR* 11702).

[2] On October 21, 1980, Congress enacted a law which included various amendments to RCRA. Section 7 of these amendments (the "Bevill Amendment") amended §3001 of RCRA to exclude "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as hazardous wastes under Subtitle C of RCRA pending the completion of studies of these wastes to determine what adverse effects they had on human health and the environment, if any.

[3] U.S. EPA, 1995, *Identification and Description of Mineral Processing Commodity Sectors and Waste Streams - Interim Final Document*, Office of Solid Waste, March 15, 1995.

4.2.1 ANPRM Comments

EPA received eleven comments to the October 24, 1991 Advanced Notice of Proposed Rulemaking (ANPRM) (56 *FR* 55160) from trade associations and mineral producers relevant to former Bevill-exempt mineral processing wastes. Their comments addressed such issues as treatment standards, waste characteristics, management practices, and available and required capacity. EPA used the characterization data provided to supplement the characterization information the Agency already had on these wastes. The pertinent information on available and required capacity and waste management are discussed in the applicable sections below.

4.2.2 National Survey of Solid Waste from Mineral Processing Facilities (RTI Survey)

In February 1989, EPA administered a written questionnaire to the operators of all facilities that, to the Agency's knowledge, generated one or more of the ore and mineral processing waste streams that the Agency was considering retaining within the Bevill exclusion at that time. This survey, known as the RTI Survey (for the Research Triangle Institute, which conducted the survey), included approximately 300 questions, and was distributed to the operators of about 200 mineral processing facilities. Despite certain limitations (described below), the RTI Survey represents the single most comprehensive source of available data on mineral processing waste generation and management.

It should be noted that the RTI Survey was designed and conducted before the regulatory definition of "special waste" was finalized, and only a high volume criterion was used as a basis for inclusion. Forty-two of the wastes included in the RTI Survey have since been removed from the Bevill exclusion, and are expected to be hazardous. The Survey, however, did not include many low-volume mineral processing waste streams which comprise a significant proportion of the potentially hazardous wastes and which could be important for the capacity analysis. Available information on these waste streams is much less complete. For these wastes, EPA generally does not have recent facility-specific data on waste quantities generated.

The RTI Survey was designed to elicit information on operational characteristics of individual facilities, on sources and quantities of wastes, and on current and alternative waste management practices. Several questions requested data on waste characteristics. In each of these questions, respondents were given a list of 82 constituents and asked to report the average total concentration of up to 15 of the constituents for each waste stream (defined by the processing unit from which the waste stream was generated). Respondents were allowed to base their answers either on test results or on general knowledge of the stream in question and were not required to conduct additional testing or to document the basis for their answer. The RTI Survey consisted of nine sections, of which four sections had questions pertaining to waste characteristics. These four sections are described below:

- Section 2 - Processing units that generate a special waste. The questions in Section 2 of the RTI Survey focused on individual units in the production process. Facilities were required to complete a Section 2 question set for each special waste generated. The RTI Survey specifically requested information about 47 special wastes, although some facilities provided information about additional wastes not specifically identified in the Survey. Pertinent questions requested the name of the waste stream, the name of the processing unit generating that waste, and the characteristics of that waste stream.

- Section 3 - Processing units that receive a special waste. Section 3 asked questions about on-site operating units that utilized one or more special wastes as feedstocks, and produced final or intermediate products (i.e., materials of value). Section 3 asked respondents to identify the processing unit and as many as eight of the material inputs (special waste or not) to the unit and to list any (up to six) residues generated by the processing unit. The names of residues listed in actual survey responses varied by facility. Even facilities in the same industry sector with similar operations may have had widely differing residues due to differences in nomenclature and in interpretation of the particular question, making it difficult to identify similar waste streams. Questions in Section 3 asked for the composition of "the liquid residue" and "the solid residue" generated by the unit, but the responses often could not be traced to a precise waste stream.

- Section 4 - Wastewater treatment plants that receive a special waste. Pertinent questions in Section 4 asked facilities to identify the wastewater treatment plant in question, list up to ten inflows to the plant (special waste or not), and give characteristics of the "liquid outflows" and of the "sludge/solid outflows".

- Section 5 - Surface impoundments that receive a special waste. The format of Section 5 is similar to Section 4. Facilities were asked to identify the surface impoundment, list inflows (special waste or not), and provide characteristics of "liquids removed from the surface impoundment" and "sludge/solids removed from the surface impoundment." In many cases the inflow information indicated that special wastes were combined with other wastes (sometimes other special wastes), making it difficult to categorize the data as applying to an individual special waste stream.

4.2.3 Comments to Bevill Rules

EPA proposed, re-proposed, and promulgated several rules related to the 1980 Bevill Amendment. These regulatory actions defined the scope of the Bevill exemption and ultimately determined which waste streams would become subject to Subtitle C regulation. In response to the various proposals and specific requests for information on waste generation and management, public commenters submitted data for specific waste streams for the Agency's use in developing final regulatory actions. For some sectors, these data are the only available information on waste generation used for the present capacity analysis.

4.2.4 EPA Sampling Data

EPA's Offices of Solid Waste (OSW) and Research and Development (ORD) both conducted sampling and analysis efforts. EPA Sampling Data includes analytical data on samples obtained and analyzed by EPA in 1989.

OSW sampled 36 mineral processing facilities in 16 industry sectors as part of its effort to define the scope of the Bevill exclusion. Samples were collected for 42 waste streams at the point of waste generation from at least two facilities in each sector (except for waste types that were only generated by a single facility). In general, the wastes also were sampled as managed (e.g., after treatment or disposal).

Each sample was analyzed using EP and SPLP[4] tests and also analyzed for total concentration. In some cases, wastes were analyzed for various organics, pH, and radioactivity.

ORD collected data to support a series of reports characterizing waste streams and facilities in eight industry sectors. The types of data compiled from this effort varied with the individual report, but in most cases they were similar to that collected by OSW.

4.2.5 §3007 Data (1989)

In 1989, EPA issued a formal request, under authority of RCRA §3007, requesting all mineral processing facilities to submit any currently available information on the characteristics of the special mineral processing wastes generated at the facility. EPA requested these data as part of an effort to augment existing EPA waste characterization data and to give the facilities affected by the Mining Waste exclusion an opportunity for meaningful input into the Agency's evaluation of these wastes. Operators were notified that failure to respond to the information request might lead to penalties under RCRA §3008(a).

The §3007 letter specifically requested all existing data collected since January 1, 1984 on the physical and chemical composition, radioactivity, and pH of candidate wastes. Existing data from extraction-type tests, particularly from SPLP and EP toxicity leach tests, were also requested. In some cases, facility operators had few or none of the requested data, or had reason to believe that existing data were not representative of wastes as currently generated. In these cases, facility operators were allowed to voluntarily collect new data through sampling and analysis.

EPA received responses to its data request from 228 facilities in 22 industry sectors. Facility operators responded in a number of different ways, up to and including submitting hundreds of pages of data from weekly or daily monitoring. Although the §3007 letter requested that all data submitted indicate the type of waste to which they apply, and the analytical method(s) used, this instruction was not always followed. In some cases, the identity of the waste stream and/or the testing method used was not clear.

4.2.6 Data from Effluent Guidelines Development Documents

EPA's Office of Water collected data, under section 308 of the Clean Water Act (CWA), in support of the effluent guidelines and pretreatment standards development process. These data are presented in the effluent limitations guidelines and standards documents for each industry. The mineral processing characterization data set compiled by EPA includes data from these industry specific documents.

4.2.7 §3007 Data (1994)

In December 1994, EPA issued a formal request under the authority of RCRA §3007, requesting ASARCO to submit currently available information on the mineral processing waste generation, composition, management, and treatment practices. ASARCO submitted the requested information for

[4] The Synthetic Precipitation Leaching Procedure (SPLP, Method 1312) is the basis of one of two low hazard criteria used to define the scope of the Bevill exclusion. The second criterion is pH.

seven facilities as Confidential Business Information (CBI). These data are used in the present analysis, but masked to maintain confidentiality.

4.2.8 Data Submitted by FMC Corporation

In December 1994, FMC Corporation submitted typical analysis data on four different mineral processing waste streams from its Pocatello facility in Idaho. Also, FMC submitted additional data in response to the supplemental proposed Phase IV rule (61 *FR* 2338) and the Phase IV - Notice of Data Availability (61 *FR* 21418). These data are included in the present capacity analysis.

4.2.9 Data Submitted by Commenters in Response to the Supplemental Proposed Phase IV Rule

In the supplemental proposed Phase IV rule (61 *FR* 2338), EPA solicited comments on the waste quantities and management practices of the newly identified mineral processing wastes that were covered by this proposed rule. Several commenters provided comments and data on the waste generation and management of the newly identified mineral processing wastes. These comments and data are included in the capacity analysis described in this report.

4.2.10 Other Data Sources

Various other rulemakings and reports were consulted for this study, including the sources listed below:

- Bevill Mineral Processing Reinterpretation Rule (54 *FR* 36592), September 1, 1989, and Background Document;
- Mining Waste Exclusion Proposed Rule (54 *FR* 39298), September 25, 1989;
- Mining Waste Exclusion Final Rule (55 *FR* 2322), January 23, 1990;
- *Overview of Solid Waste Generation, Management, and Chemical Characteristics: Primary Antimony, Magnesium, Tin and Titanium Smelting and Refining Industries*, PEI Associates, December, 1984;
- Draft Report to Congress, *Solid Wastes from Selected Metallic Ore Processing Operations*, July 15, 1988;
- *Overview of Solid Waste Generation, Management, and Chemical Characteristics in the Bauxite Refining and Primary Aluminum Industry*, Radian Corporation, November, 1984; and
- *Investigative Study to Determine Viable Options to the Remand of Mining and Smelting Wastes* (unpublished draft), EPA Office of Solid Waste, Waste Identification Branch, 1992.

4.3 METHODOLOGY AND ASSUMPTIONS

This section provides an overall description of the methodology and assumptions used to estimate the quantities of newly identified mineral processing wastes that will require alternative treatment as a result of the Phase IV supplemental LDRs.

EPA used several data sources (described in Section 4.2) to characterize the affected universe. Exhibit 4-1 lists the potentially affected waste streams by mineral processing sector, shows the estimated quantity generated, and identifies whether the constituents exceed the TC metal or characteristic regulatory levels (information provided in this exhibit is based on baseline data used in the RIA). The data provided in Exhibit 4-1 are based on the following conventions:[5]

Waste Quantities:

- The waste quantity generated includes both estimated and reported values. Estimated values are provided as a range (minimum, expected, and maximum). Reported values are point estimates (and therefore the same value is used for minimum, expected, and maximum). These generated quantities may be recycled, and/or disposed.

Hazardous Characteristics:

- "Y" means EPA has actual analytical data demonstrating that the waste exhibits one or more of the RCRA hazardous characteristics.
- "Y?" means that EPA, based on professional judgment, believes that the waste may exhibit one or more of the RCRA hazardous characteristics.
- "N" indicates that the waste probably does not exhibit one or more of the RCRA hazardous characteristics.
- "N?" indicates that insufficient data are available to analyze. Based on general knowledge of the industry, however, EPA believes that the waste probably does not exhibit one or more of the RCRA hazardous characteristics.

Recycling Status:

- "Y" means that EPA has information indicating that the wastestream is fully recycled.
- "Y?" means that EPA, based on professional judgment, believes that the wastestream could be fully recycled.
- "YS" means that EPA has information to show that the wastestream is partially recycled.

[5] A detailed discussion on these assumptions can be found in the regulatory impact analysis (RIA) for this proposed rule: U.S. EPA, 1997, *Regulatory Impact Analysis of the Supplemental Proposed Rule Applying Phase IV LDRs to Newly Identified Mineral Processing Wastes,* Office of Solid Waste, U.S. EPA.

Exhibit 4-1
MINERAL PROCESSING WASTES BY COMMODITY SECTOR

Commodity	Waste Stream	Reported Generation (1000mt/yr)	Est./Reported Generation (1000mt/yr)			Number of Facilities with Process	TC Metals								Corr	Ignit	Rctv	Current Recycle	Recycled to Bevill?	Waste Form
			Min	Avg.	Max		As	Ba	Cd	Cr	Pb	Hg	Se	Ag						
Alumina and Aluminum	Cast house dust	19	19	19	19	23			Y			Y			N?	N?	N?	Y?	0	3
	Electrolysis waste	58	58	58	58	23					Y?				N?	N?	N?	Y?	0	3
Antimony	Autoclave filtrate	NA	0.32	27	54	6	Y?		Y?		Y?	Y?			Y?	N?	N?	YS?	0	1
	Stripped anolyte solids	0.19	0.19	0.19	0.19	2	Y?								N?	N?	N?	Y	0	3
	Slag and furnace residue	21	21	21	21	6					Y?				N?	N?	N?	N		3
Beryllium	Chip treatment wastewater	NA	0.2	100	2000	2				Y?					N?	N?	N?	YS?	0	1
	Filtration discard	NA	0.2	45	90	2					Y?				N?	N?	N?	N		3
Bismuth	Alloy residues	NA	0.1	3	6	1					Y?				N?	N?	N?	N		3
	Spent caustic soda	NA	0.1	6.1	12	1					Y?				N?	N?	N?	Y?	0	2
	Electrolytic slimes	NA	0	0.02	0.2	1					Y?				N?	N?	N?	Y?	0	3
	Lead and zinc chlorides	NA	0.1	3	6	1					Y?				N?	N?	N?	N		3
	Metal chloride residues	3	3	3	3	1					Y?				N?	N?	N?	N		3
	Slag	NA	0.1	1	10	1					Y?				N?	N?	N?	N		3
	Spent electrolyte	NA	0.1	6.1	12	1					Y?				N?	N?	N?	N		2
	Spent soda solution	NA	0.1	6.1	12	1					Y?				Y?	N?	N?	Y?	0	1
	Waste acid solutions	NA	0.1	6.1	12	1									Y?	N?	N?	N		1
	Waste acids	NA	0	0.1	0.2	1									Y?	N?	N?	YS?	0	1
Cadmium	Caustic washwater	NA	0.19	1.9	19	2			Y?						Y?	N?	N?	Y?	0	1
	Copper and lead sulfate filter cakes	NA	0.19	1.9	19	2			Y?		Y?				N?	N?	N?	Y?	0	3
	Copper removal filter cake	NA	0.19	1.9	19	2			Y?						N?	N?	N?	Y?	0	3
	Iron containing impurities	NA	0.19	1.9	19	2			Y?						N?	N?	N?	N		3
	Spent leach solution	NA	0.19	1.9	19	2	Y?		Y?		Y?				Y?	N?	N?	Y?	2	2
	Lead sulfate waste	NA	0.19	1.9	19	2			Y?		Y?				N?	N?	N?	Y?	0	3
	Post-leach filter cake	NA	0.19	1.9	19	2			Y?						N?	N?	N?	N		3
	Spent purification solution	NA	0.19	1.9	19	2			Y?						Y?	N?	N?	N		1
	Scrubber wastewater	NA	0.19	1.9	19	2			Y?						Y?	N?	N?	Y?	2	1
	Spent electrolyte	NA	0.19	1.9	19	2			Y?						Y?	N?	N?	N		2
	Zinc precipitates	NA	0.19	1.9	19	2			Y?						N?	N?	N?	Y?	0	3
Calcium	Dust with quicklime	0.04	0.04	0.04	0.04	1									Y?	N?	N?	Y	1	3
Coal Gas	Multiple effects evaporator concentrate	NA	0	0	65	1	Y						Y		N?	N?	N?	YS	1	2
Copper	Acid plant blowdown	5300	5300	5300	5300	10	Y		Y	Y	Y	Y	Y	Y	Y	N?	N?	YS	1	2
	WWTP sludge	6	6	6	6	10			Y?		Y?				N?	N?	N?	YS	0	3
Elemental Phosphorus	Andersen Filter Media	0.46	0.46	0.46	0.46	2			Y						N?	N?	N?	N		3

Exhibit 4-1
MINERAL PROCESSING WASTES BY COMMODITY SECTOR

Commodity	Waste Stream	Reported Generation (1000mt/yr)	Est./Reported Generation (1000mt/yr)			Number of Facilities with Process	TC Metals								Corr	Ignit	Rctv	Current Recycle	Recycled to Bevill?	Waste Form
			Min	Avg.	Max		As	Ba	Cd	Cr	Pb	Hg	Se	Ag						
	AFM rinsate	4	4	4	4	2			Y				Y		N?	N?	N?	Y	2	2
	Furnace scrubber blowdown	410	410	410	410	2			Y						Y	N?	N?	Y	2	1
	Furnace Building Washdown	700	700	700	700	2			Y						N?	N?	N?	Y	2	1
Fluorspar and Hydrofluoric Acid	Off-spec fluosilicic acid	NA	0	15	44	3									Y?	N?	N?	YS	0	1
Germanium	Waste acid wash and rinse water	NA	0.4	2.2	4	4	Y?		Y?	Y?	Y?		Y?	Y?	Y?	N?	N?	YS?	0	1
	Chlorinator wet air pollution control sludge	NA	0.01	0.21	0.4	4	Y?		Y?	Y?	Y?		Y?	Y?	N?	N?	N?	YS?	0	3
	Hydrolysis filtrate	NA	0.01	0.21	0.4	4	Y?		Y?	Y?	Y?		Y?	Y?	N?	N?	N?	N		3
	Leach residues	0.01	0.01	0.01	0.01	3			Y?		Y?				N?	N?	N?	N		3
	Spent acid/leachate	NA	0.4	2.2	4	4	Y?				Y?				Y?	N?	N?	YS?	0	1
	Waste still liquor	NA	0.01	0.21	0.4	4	Y?		Y?	Y?	Y?		Y?	Y?	N?	Y?	N?	N		3
Lead	Acid plant sludge	14	14	14	14	3									Y?	N?	N?	Y?	1	3
	Baghouse incinerator ash	NA	0.3	3	30	3			Y		Y				N?	N?	N?	N		3
	Slurried APC Dust	7	7	7	7	3			Y		Y				N?	N?	N?	Y	1	3
	Solid residues	0.4	0.4	0.4	0.4	3					Y?				N?	N?	N?	Y?	1	3
	Spent furnace brick	1	1	1	1	3					Y				N?	N?	N?	Y	1	3
	Stockpiled miscellaneous plant waste	NA	0.4	88	180	4			Y		Y				N?	N?	N?	YS?	1	3
	WWTP liquid effluent	3500	3500	3500	3500	4					Y?				Y?	N?	N?	Y	1	1
	WWTP sludges/solids	380	380	380	380	4			Y?		Y?				Y	N?	N?	Y	1	3
Magnesium and Magnesia from Brines	Cast house dust	NA	0.076	0.76	7.6	1		Y?							N?	N?	N?	Y?	0	3
	Smut	26	26	26	26	2		Y							N?	N?	N?	N		3
Mercury	Dust	0.007	0.007	0.007	0.007	7						Y?			N?	N?	N?	N		3
	Quench water	NA	63	77	420	7					Y?	Y?			N?	N?	N?	Y?	1	1
	Furnace residue	0.077	0.077	0.077	0.077	7						Y?			N?	N?	N?	N		3
Molybdenum, Ferromolybdenum, and Ammonium Molybdate	Flue dust/gases	NA	1.1	250	500	11					Y?				N?	N?	N?	N		3
	Liquid residues	1	1	1	1	2	Y?		Y?		Y?		Y?		N?	N?	N?	N		1
Platinum Group Metals	Slag	NA	0.0046	0.046	0.46	3					Y?		Y?		N?	N?	N?	Y?	0	3
	Spent acids	NA	0.3	1.7	3	3					Y?			Y?	Y?	N?	N?	N		1
	Spent solvents	NA	0.3	1.7	3	3					Y?			Y?	N?	Y?	N?	N		1
Pyrobitumens, Mineral Waxes, and Natural Asphalts	Still bottoms	NA	0.002	45	90	2									N?	Y?	N?	N		3

Exhibit 4-1
MINERAL PROCESSING WASTES BY COMMODITY SECTOR

Commodity	Waste Stream	Reported Generation (1000mt/yr)	Est./Reported Generation (1000mt/yr)			Number of Facilities with Process	TC Metals								Corr	Ignit	Rctv	Current Recycle	Recycled to Bevill?	Waste Form
			Min	Avg.	Max		As	Ba	Cd	Cr	Pb	Hg	Se	Ag						
	Waste catalysts	NA	0.002	10	20	2			Y?				Y?		N?	N?	N?	Y?	0	1
Rare Earths	Spent ammonium nitrate processing solution	14	14	14	14	1									Y	N?	N?	N		1
	Electrolytic cell caustic wet APC sludge	NA	0.07	0.7	7	1									Y?	N?	N?	Y	0	3
	Process wastewater	7	7	7	7	1					Y				Y?	N?	N?	YS?	1	1
	Spent scrubber liquor	NA	0.1	500	1000	1									Y?	N?	N?	YS?	1	1
	Solvent extraction crud	NA	0.1	2.3	4.5	1									N?	Y?	N?	N		3
	Wastewater from caustic wet APC	NA	0.1	500	1000	1				Y?	Y?				Y?	N?	N?	YS?	1	1
Rhenium	Spent barren scrubber liquor	NA	0	0.1	0.2	2							Y?		N?	N	N	Y?	2	1
	Spent rhenium raffinate	88	88	88	88	2					Y?				N?	N?	N?	N		3
Scandium	Spent acids	NA	0.7	3.9	7	7									Y?	N?	N?	N		1
	Spent solvents from solvent extraction	NA	0.7	3.9	7	7									N?	Y?	N?	Y?	0	1
Selenium	Spent filter cake	NA	0.05	0.5	5	3							Y?		N?	N?	N?	Y?	0	3
	Plant process wastewater	66	66	66	66	2					Y				Y	N?	N?	YS?	2	1
	Slag	NA	0.05	0.5	5	3							Y?		N?	N?	N?	YS?	0	3
	Tellurium slime wastes	NA	0.05	0.5	5	3							Y?		N	N?	N?	Y?	0	3
	Waste solids	NA	0.05	0.5	5	3							Y?		N?	N?	N?	N		3
Synthetic Rutile	Spent iron oxide slurry	45	45	45	45	1			Y?	Y?					N?	N?	N?	YS?	0	3
	APC dust/sludges	30	30	30	30	1			Y?	Y?					N?	N?	N?	Y	0	3
	Spent acid solution	30	30	30	30	1			Y?	Y?					Y?	N?	N?	Y	0	1
Tantalum, Columbium, and Ferrocolumbium	Digester sludge	1	1	1	1	2									Y?	N?	N?	N		3
	Process wastewater	150	150	150	150	2	Y?		Y?	Y?	Y?		Y?		Y	N?	N?	Y?	0	2
	Spent raffinate solids	2	2	2	2	2									Y?	N?	N?	N		3
Tellurium	Slag	NA	0.2	2	9	2							Y?		N?	N?	N?	YS?	0	3
	Solid waste residues	NA	0.2	2	9	2							Y?		N?	N?	N?	N		3
	Waste electrolyte	NA	0.2	2	20	2					Y?		Y?		N?	N?	N?	N		1
	Wastewater	NA	0.2	20	40	2							Y?		Y?	N?	N?	Y	0	1
Titanium and Titanium Dioxide	Pickle liquor and wash water	NA	2.2	2.7	3.2	3			Y?	Y?	Y?				Y?	N?	N?	YS?	0	1
	Scrap milling scrubber water	NA	4	5	6	1			Y?	Y?	Y?		Y?		N?	N?	N?	YS?	0	1
	Smut from Mg recovery	NA	0.1	22	45	2									N?	N?	Y	Y?	0	3
	Leach liquor and sponge wash water	NA	380	480	580	2				Y?	Y?				Y	N?	N?	YS?	0	1
	Spent surface impoundment liquids	NA	0.63	3.4	6.7	7				Y?	Y?				N?	N?	N?	Y?	0	1

Exhibit 4-1
MINERAL PROCESSING WASTES BY COMMODITY SECTOR

Commodity	Waste Stream	Reported Generation (1000mt/yr)	Est./Reported Generation (1000mt/yr)			Number of Facilities with Process	TC Metals								Corr	Ignit	Rctv	Current Recycle	Recycled to Bevill?	Waste Form
			Min	Avg.	Max		As	Ba	Cd	Cr	Pb	Hg	Se	Ag						
	Spent surface impoundments solids	36	36	36	36	7				Y?	Y?				N?	N?	N?	N		3
	Waste acids (Sulfate process)	NA	0.2	39	77	2	Y			Y			Y	Y	Y	N	N	N		1
	WWTP sludge/solids	420	420	420	420	7				Y?					N	N	N	N		3
Tungsten	Spent acid and rinse water	NA	0	0	21	6									Y?	N?	N?	YS?	2	1
	Process wastewater	NA	2.2	4.4	9	6									Y?	N?	N?	YS?	2	1
Uranium	Waste nitric acid from UO2 production	NA	1.7	2.5	3.4	17									Y?	N?	N?	YS?	0	1
	Vaporizer condensate	NA	1.7	9.3	17	17									Y?	N?	N?	N		1
	Superheater condensate	NA	1.7	9.3	17	17									Y?	N?	N?	N		1
	Slag	NA	0	8.5	17	17									N?	Y?	N?	Y	0	3
	Uranium chips from ingot production	NA	1.7	2.5	3.4	17									N?	Y?	N?	Y?	0	3
Zinc	Acid plant blowdown	130	130	130	130	1	Y		Y	Y	Y?	Y?	Y	Y	Y	N	N	Y	0	1
	Waste ferrosilicon	17	17	17	17	1					Y?				N?	N?	N?	Y?	0	3
	Process wastewater	5000	5000	5000	5000	3	Y		Y	Y	Y		Y	Y	Y	N?	N?	Y?	0	1
	Discarded refractory brick	1	1	1	1	1	Y?		Y?	Y?	Y?				N?	N?	N?	N		3
	Spent cloths, bags, and filters	0.15	0.15	0.15	0.15	3			Y?		Y?	Y?	Y?	Y?	N?	N?	N?	Y	0	3
	Spent goethite and leach cake residues	15	15	15	15	3	Y		Y	Y	Y?	Y?	Y	Y	N?	N?	N?	Y	0	3
	Spent surface impoundment liquids	1900	1900	1900	1900	3			Y?						Y	N?	N?	YS?	0	1
	WWTP Solids	0.75	0.75	0.75	0.75	3	Y?		Y?		Y?	Y?	Y?	Y?	N?	N?	N?	YS	1	3
	Spent synthetic gypsum	16	16	16	16	3	Y?		Y		Y?				N?	N?	N?	N		3
	TCA tower blowdown	0.25	0.25	0.25	0.25	1			Y?		Y?	Y?	Y?		Y?	N?	N?	YS	0	1
	Wastewater treatment plant liquid effluent	2600	2600	2600	2600	3			Y?						N?	N?	N?	YS?	0	1
Zirconium and Hafnium	Spent acid leachate from Zr alloy prod.	NA	0	0	850	2									Y?	N?	N?	N		1
	Spent acid leachate from Zr metal prod.	NA	0	0	1600	2									Y?	N?	N?	N		1
	Leaching rinse water from Zr alloy prod.	NA	34	42	51	2									Y?	N?	N?	YS?	0	1
	Leaching rinse water from Zr metal prod.	NA	0.2	1000	2000	2									Y?	N?	N?	YS?	0	1

Note: EPA does not have enough information to determine whether Bromine, Gemstones, Iodine, Lithium and Lithium Carbonate, Soda Ash, Sodium Sulfate, and Strontium produce mineral processing wastes

- "YS?" means that EPA has information to believe that the wastestream could be partially recycled.

- A value of “0” in the “Recycled to Bevill?” column indicates that the waste is recycled in a mineral processing unit.

- A value of “1” in the “Recycled to Bevill?” column indicates that the waste is recycled in a Bevill unit.

- A value of “2” in the “Recycled to Bevill?” column indicates that the waste is recycled in both mineral processing and Bevill units.

Waste Form:

- Key for Waste Form: 1 = waste with < 1% total suspended solids (TSS) (wastewater); 2 = waste with 1 to 10 % TSS (liquid nonwastewater); 3 = waste with > 10% TSS (nonwastewater).

EPA next examined the current waste management practices in the mineral processing industry. EPA had to rely upon several data sources (discussed in Section 4.2) to examine the current waste management practice since no one source provided comprehensive information.

Because of the high level of uncertainty in the current waste management practices, EPA estimated the potentially affected universe of mineral processing waste in reference to three baselines: 1) the no prior treatment baseline, 2) the modified prior treatment baseline, and 3) the prior treatment baseline. Each baseline includes different assumptions about current storage practices of recycled materials and current treatment practices of disposed materials. The no prior treatment baseline assumes that materials to be recycled are stored in unlined land based units, and the disposed portion is placed in a land based disposal unit without treatment. The modified prior treatment baseline assumes that materials to be recycled are stored in unlined land based units, while materials to be disposed are treated to TC levels prior to disposal in land based units. The prior treatment baseline assumes that materials to be recycled are stored according to RCRA requirements (spent materials are stored in tanks, containers, and buildings prior to recycling) and materials to be disposed are treated to TC levels prior to disposal in land based units. EPA chose the modified prior treatment baseline as the basis for the RIA and the capacity analysis because it was most representative of current practices. However, EPA included the other two baselines in an appendix to the RIA to bound the analysis.

EPA considered four regulatory options in the RIA, which represent a wide spectrum of management practices, based on the views of various interested parties. A detailed description of each option can be found in the RIA.[6] In short, all four options require treatment of the disposed portion to UTS levels. The differences between the options are a function of the requirements for storage prior to disposal.

[6] U.S. EPA, 1997, *Regulatory Impact Analysis of the Supplemental Proposed Rule Applying Phase IV LDRs to Newly Identified Mineral Processing Wastes,* Office of Solid Waste, U.S. EPA.

The key features of each option are summarized below:

1. **Option 1** imposes a legitimacy test for materials recycled to process units, bans the recycling of materials through Bevill beneficiation or Bevill process units, and requires materials destined for recycling to be stored in RCRA tanks, containers, and buildings.

2. **Option 2,** EPA's preferred option, bans the recycling of materials through Bevill beneficiation or Bevill process units, and requires materials destined for recycling to be stored in tanks, containers, and buildings.

3. **Option 3** requires materials destined for recycling to be stored in tanks, containers, and buildings.

4. **Option 4** allows materials destined for recycling to be stored in unlined land based units.

The Agency, in developing the RIA for this proposed rule, estimated the compliance costs for these four options. The costs were estimated as a function of three factors: 1) the expense associated with purchasing new storage units or upgrading existing storage units, 2) the expense of treating materials to be disposed, and 3) shifts of mineral processing residues either from recycling to disposal or from disposal to recycling. Based on these three factors, as well as adjustments to the input data to account for uncertainty about hazardous characteristics, EPA estimated the minimum, expected, and maximum quantities of waste that would require treatment and disposal, and the minimum, expected, and maximum quantities of waste that would require storage prior to recycling. Exhibit 4-2 provides the estimated quantities of the newly identified mineral processing wastes requiring treatment and disposal for the modified prior treatment baseline, and the four regulatory options. The estimated quantities of the newly identified mineral processing wastes requiring treatment and disposal for the no prior treatment and the prior treatment baselines are provided in Appendix E.

As indicated in the RIA, EPA assumes that because of cost and other issues, the primary techniques that are being used or will be used for waste management by the mineral processing industry are chemical precipitation (for wastewaters) and stabilization (for nonwastewaters). Since these treatments are two of the best demonstrated treatment technologies (BDATs) used as the basis for the UTS then, under the modified prior treatment baseline, most of these wastes likely are already meeting or are close to meeting the UTS levels. Even if additional treatment is required, EPA believes that this additional treatment could be achieved through minimal modifications of the existing treatment systems.

In the original proposal, the Agency noted a few exceptions to these assumptions. Based on the analysis of available data, EPA noted that some arsenic-containing wastes and high mercury-containing wastes (e.g., above the High Mercury Subcategory level of 260 mg/kg total mercury) may require alternative treatments (e.g., vitrification for arsenic and acid leaching/retorting for mercury) to meet UTS standards. EPA requested commenters to provide comments and performance data on this issue. However, comments received provided no indication that these wastes pose any treatability problems in meeting the proposed treatment standards. In addition, the Agency conducted site visits to commercial treatment facilities and collected data that indicated no treatability problems are associated with these wastestreams.

Exhibit 4-2
MODIFIED PRIOR TREATMENT (MPT) BASELINE AND OPTIONS

		MPT Baseline			Option 1 (MPT)			Option 2 (MPT)			Option 3 (MPT)			Option 4 (MPT)		
		Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector		
Commodity	**Waste Stream**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**
Alumina and Aluminum	Cast house dust	2,864	2,864	2,864	12,409	12,409	12,409	4,773	4,773	4,773	4,773	4,773	4,773	2,864	2,864	2,864
	Electrolysis waste	-	4,313	8,625	-	18,688	37,375	-	7,188	14,375	-	7,188	14,375	-	4,313	8,625
Antimony	Autoclave filtrate	-	10,800	43,200	-	13,500	54,000	-	11,475	45,900	-	11,475	45,900	-	10,800	43,200
	Stripped anolyte solids	-	-	-	-	29	57	-	-	-	-	-	-	-	-	-
	Slag and furnace residue	-	10,500	21,000	-	10,500	21,000	-	10,500	21,000	-	10,500	21,000	-	10,500	21,000
Beryllium	Chip treatment wastewater	-	40,000	1,600,000	-	50,000	2,000,000	-	42,500	1,700,000	-	42,500	1,700,000	-	40,000	1,600,000
	Filtration discard	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000
Bismuth	Alloy residues	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000
	Spent caustic soda	-	458	1,800	-	1,983	7,800	-	763	3,000	-	763	3,000	-	458	1,800
	Electrolytic slimes	-	2	30	-	7	130	-	3	50	-	3	50	-	2	30
	Lead and zinc chlorides	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000	-	1,500	6,000
	Metal chloride residues	-	1,500	3,000	-	1,500	3,000	-	1,500	3,000	-	1,500	3,000	-	1,500	3,000
	Slag	-	500	10,000	-	500	10,000	-	500	10,000	-	500	10,000	-	500	10,000
	Spent electrolyte	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000
	Spent soda solution	-	458	1,800	-	1,983	7,800	-	763	3,000	-	763	3,000	-	458	1,800
	Waste acid solutions	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000	-	3,050	12,000
	Waste acids	-	40	160	-	50	200	-	43	170	-	43	170	-	40	160
Cadmium	Caustic washwater	-	143	2,850	-	618	12,350	-	238	4,750	-	238	4,750	-	143	2,850
	Copper and lead sulfate filter cakes	-	143	2,850	-	618	12,350	-	238	4,750	-	238	4,750	-	143	2,850
	Copper removal filter cake	-	143	2,850	-	618	12,350	-	238	4,750	-	238	4,750	-	143	2,850
	Iron containing impurities	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000
	Spent leach solution	-	143	2,850	-	950	19,000	-	950	19,000	-	238	4,750	-	143	2,850
	Lead sulfate waste	-	143	2,850	-	618	12,350	-	238	4,750	-	238	4,750	-	143	2,850
	Post-leach filter cake	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000
	Spent purification solution	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000
	Scrubber wastewater	-	143	2,850	-	950	19,000	-	950	19,000	-	238	4,750	-	143	2,850
	Spent electrolyte	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000	-	950	19,000
	Zinc precipitates	-	143	2,850	-	618	12,350	-	238	4,750	-	238	4,750	-	143	2,850
Calcium	Dust with quicklime	-	-	-	-	20	40	-	20	40	-	-	-	-	-	-
Coal Gas	Multiple effects evaporator concentrate	-	-	16,250	-	-	65,000	-	-	65,000	-	-	22,750	-	-	16,250
Copper	Acid plant blowdown	1,325,000	1,325,000	1,325,000	5,300,000	5,300,000	5,300,000	5,300,000	5,300,000	5,300,000	1,855,000	1,855,000	1,855,000	1,325,000	1,325,000	1,325,000
	WWTP sludge	-	750	1,500	-	3,000	6,000	-	1,050	2,100	-	1,050	2,100	-	750	1,500
Elemental Phosphorus	Andersen Filter Media	460	460	460	460	460	460	460	460	460	460	460	460	460	460	460
	AFM rinsate	-	-	-	4,000	4,000	4,000	4,000	4,000	4,000	-	-	-	-	-	-
	Furnace scrubber blowdown	-	-	-	420,000	420,000	420,000	420,000	420,000	420,000	-	-	-	-	-	-
	Furnace Building Washdown	-	-	-	700,000	700,000	700,000	700,000	700,000	700,000	-	-	-	-	-	-
Fluorspar and Hydrofluoric Acid	Off-spec fluosilicic acid	-	1,875	11,250	-	7,500	45,000	-	2,625	15,750	-	2,625	15,750	-	1,875	11,250

Exhibit 4-2
MODIFIED PRIOR TREATMENT (MPT) BASELINE AND OPTIONS

		MPT Baseline			Option 1 (MPT)			Option 2 (MPT)			Option 3 (MPT)			Option 4 (MPT)		
		Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector		
Commodity	**Waste Stream**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**
Germanium	Waste acid wash and rinse water	-	880	3,200	-	1,100	4,000	-	935	3,400	-	935	3,400	-	880	3,200
	Chlorinator wet air pollution control sludge	-	85	320	-	106	400	-	90	340	-	90	340	-	85	320
	Hydrolysis filtrate	-	106	400	-	106	400	-	106	400	-	106	400	-	106	400
	Leach residues	-	5	10	-	5	10	-	5	10	-	5	10	-	5	10
	Spent acid/leachate	-	880	3,200	-	1,100	4,000	-	935	3,400	-	935	3,400	-	880	3,200
	Waste still liquor	-	106	400	-	106	400	-	106	400	-	106	400	-	106	400
Lead	Acid plant sludge	-	1,058	2,115	-	7,050	14,100	-	7,050	14,100	-	1,763	3,525	-	1,058	2,115
	Baghouse incinerator ash	300	3,000	30,000	300	3,000	30,000	300	3,000	30,000	300	3,000	30,000	300	3,000	30,000
	Slurried APC Dust	-	-	-	6,900	6,900	6,900	6,900	6,900	6,900	-	-	-	-	-	-
	Solid residues	-	29	59	-	195	390	-	195	390	-	49	98	-	29	59
	Spent furnace brick	-	-	-	990	990	990	990	990	990	-	-	-	-	-	-
	Stockpiled miscellaneous plant waste	320	70,400	144,000	400	88,000	180,000	400	88,000	180,000	340	74,800	153,000	320	70,400	144,000
	WWTP liquid effluent	-	-	-	-	1,760,000	3,520,000	-	1,760,000	3,520,000	-	-	-	-	-	-
	WWTP sludges/solids	-	-	-	380,000	380,000	380,000	380,000	380,000	380,000	-	-	-	-	-	-
Magnesium and Magnesia from Brines	Cast house dust	-	57	1,140	-	247	4,940	-	95	1,900	-	95	1,900	-	57	1,140
	Smut	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
Mercury	Dust	-	4	7	-	4	7	-	4	7	-	4	7	-	4	7
	Quench water	-	5,775	63,000	-	38,500	420,000	-	38,500	420,000	-	9,625	105,000	-	5,775	63,000
	Furnace residue	-	39	77	-	39	77	-	39	77	-	39	77	-	39	77
Molybdenum, Ferromolybdenum, and Ammonium Molybdate	Flue dust/gases	-	126,500	495,000	-	126,500	495,000	-	126,500	495,000	-	126,500	495,000	-	126,500	495,000
	Liquid residues	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000
Platinum Group Metals	Slag	-	3	68	-	15	293	-	6	113	-	6	113	-	3	68
	Spent acids	-	855	3,000	-	855	3,000	-	855	3,000	-	855	3,000	-	855	3,000
	Spent solvents	-	855	3,000	-	855	3,000	-	855	3,000	-	855	3,000	-	855	3,000
Pyrobitumens, Mineral Waxes, and Natural Asphalts	Still bottoms	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000	-	23,000	90,000
	Waste catalysts	-	750	3,000	-	3,250	13,000	-	1,250	5,000	-	1,250	5,000	-	750	3,000
Rare Earths	Spent ammonium nitrate processing solution	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000
	Electrolytic cell caustic wet APC sludge	-	-	-	-	105	2,100	-	-	-	-	-	-	-	-	-
	Process wastewater	5,600	5,600	5,600	7,000	7,000	7,000	7,000	7,000	7,000	5,950	5,950	5,950	5,600	5,600	5,600
	Spent scrubber liquor	-	200,000	800,000	-	250,000	1,000,000	-	250,000	1,000,000	-	212,500	850,000	-	200,000	800,000
	Solvent extraction crud	-	1,150	4,500	-	1,150	4,500	-	1,150	4,500	-	1,150	4,500	-	1,150	4,500
	Wastewater from caustic wet APC	-	200,000	800,000	-	250,000	1,000,000	-	250,000	1,000,000	-	212,500	850,000	-	200,000	800,000
Rhenium	Spent barren scrubber liquor	-	8	30	-	50	200	-	50	200	-	13	50	-	8	30

Exhibit 4-2
MODIFIED PRIOR TREATMENT (MPT) BASELINE AND OPTIONS

		MPT Baseline			Option 1 (MPT)			Option 2 (MPT)			Option 3 (MPT)			Option 4 (MPT)		
		Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector		
Commodity	**Waste Stream**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**
	Spent rhenium raffinate	-	44,000	88,000	-	44,000	88,000	-	44,000	88,000	-	44,000	88,000	-	44,000	88,000
Scandium	Spent acids	-	1,960	7,000	-	1,960	7,000	-	1,960	7,000	-	1,960	7,000	-	1,960	7,000
	Spent solvents from solvent extraction	-	294	1,050	-	1,274	4,550	-	490	1,750	-	490	1,750	-	294	1,050
Selenium	Spent filter cake	-	38	765	-	166	3,315	-	64	1,275	-	64	1,275	-	38	765
	Plant process wastewater	52,800	52,800	52,800	66,000	66,000	66,000	66,000	66,000	66,000	56,100	56,100	56,100	52,800	52,800	52,800
	Slag	-	204	4,080	-	255	5,100	-	217	4,335	-	217	4,335	-	204	4,080
	Tellurium slime wastes	-	38	765	-	166	3,315	-	64	1,275	-	64	1,275	-	38	765
	Waste solids	-	255	5,100	-	255	5,100	-	255	5,100	-	255	5,100	-	255	5,100
Synthetic Rutile	Spent iron oxide slurry	-	18,000	36,000	-	22,500	45,000	-	19,125	38,250	-	19,125	38,250	-	18,000	36,000
	APC dust/sludges	-	-	-	-	4,500	9,000	-	-	-	-	-	-	-	-	-
	Spent acid solution	-	-	-	-	4,500	9,000	-	-	-	-	-	-	-	-	-
Tantalum, Columbium, and Ferrocolumbium	Digester sludge	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000
	Process wastewater	22,500	22,500	22,500	97,500	97,500	97,500	37,500	37,500	37,500	37,500	37,500	37,500	22,500	22,500	22,500
	Spent raffinate solids	-	1,000	2,000	-	1,000	2,000	-	1,000	2,000	-	1,000	2,000	-	1,000	2,000
Tellurium	Slag	-	800	7,200	-	1,000	9,000	-	850	7,650	-	850	7,650	-	800	7,200
	Solid waste residues	-	1,000	9,000	-	1,000	9,000	-	1,000	9,000	-	1,000	9,000	-	1,000	9,000
	Waste electrolyte	-	1,000	20,000	-	1,000	20,000	-	1,000	20,000	-	1,000	20,000	-	1,000	20,000
	Wastewater	-	-	-	-	3,000	12,000	-	-	-	-	-	-	-	-	-
Titanium and Titanium Dioxide	Pickle liquor and wash water	-	1,080	2,640	-	1,350	3,300	-	1,148	2,805	-	1,148	2,805	-	1,080	2,640
	Scrap milling scrubber water	-	2,000	4,800	-	2,500	6,000	-	2,125	5,100	-	2,125	5,100	-	2,000	4,800
	Smut from Mg recovery	15	3,300	6,900	65	14,300	29,900	25	5,500	11,500	25	5,500	11,500	15	3,300	6,900
	Leach liquor and sponge wash water	304,000	384,000	464,000	380,000	480,000	580,000	323,000	408,000	493,000	323,000	408,000	493,000	304,000	384,000	464,000
	Spent surface impoundment liquids	-	257	1,008	-	1,115	4,368	-	429	1,680	-	429	1,680	-	257	1,008
	Spent surface impoundments solids	-	17,850	35,700	-	17,850	35,700	-	17,850	35,700	-	17,850	35,700	-	17,850	35,700
	Waste acids (Sulfate process)	200	40,000	78,000	200	40,000	78,000	200	40,000	78,000	200	40,000	78,000	200	40,000	78,000
	WWTP sludge/solids	-	210,000	420,000	-	210,000	420,000	-	210,000	420,000	-	210,000	420,000	-	210,000	420,000
Tungsten	Spent acid and rinse water	-	-	16,800	-	-	21,000	-	-	21,000	-	-	17,850	-	-	16,800
	Process wastewater	-	1,752	7,200	-	2,190	9,000	-	2,190	9,000	-	1,862	7,650	-	1,752	7,200
Uranium	Waste nitric acid from UO2 production	-	1,020	2,720	-	1,275	3,400	-	1,084	2,890	-	1,084	2,890	-	1,020	2,720
	Vaporizer condensate	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000
	Superheater condensate	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000	-	4,675	17,000
	Slag	-	-	-	-	1,275	5,100	-	-	-	-	-	-	-	-	-
	Uranium chips from ingot production	-	191	510	-	829	2,210	-	319	850	-	319	850	-	191	510
Zinc	Acid plant blowdown	-	-	-	39,000	39,000	39,000	-	-	-	-	-	-	-	-	-
	Waste ferrosilicon	-	1,275	2,550	-	5,525	11,050	-	2,125	4,250	-	2,125	4,250	-	1,275	2,550
	Process wastewater	765,000	765,000	765,000	3,315,000	3,315,000	3,315,000	1,275,000	1,275,000	1,275,000	1,275,000	1,275,000	1,275,000	765,000	765,000	765,000
	Discarded refractory brick	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000	-	500	1,000

Exhibit 4-2
MODIFIED PRIOR TREATMENT (MPT) BASELINE AND OPTIONS

		MPT Baseline			Option 1 (MPT)			Option 2 (MPT)			Option 3 (MPT)			Option 4 (MPT)		
		Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector			Treatment and Disposal Total Sector		
Commodity	**Waste Stream**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**	**Min.**	**Expect.**	**Max.**
	Spent cloths, bags, and filters	-	-	-	-	23	45	-	-	-	-	-	-	-	-	-
	Spent goethite and leach cake residues	-	-	-	4,500	4,500	4,500	-	-	-	-	-	-	-	-	-
	Spent surface impoundment liquids	1,512,000	1,512,000	1,512,000	1,890,000	1,890,000	1,890,000	1,606,500	1,606,500	1,606,500	1,606,500	1,606,500	1,606,500	1,512,000	1,512,000	1,512,000
	WWTP Solids	-	94	188	-	375	750	-	375	750	-	131	263	-	94	188
	Spent synthetic gypsum	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900	15,900
	TCA tower blowdown	-	31	63	-	125	250	-	44	88	-	44	88	-	31	63
	Wastewater treatment plant liquid effluent	-	1,044,000	2,088,000	-	1,305,000	2,610,000	-	1,109,250	2,218,500	-	1,109,250	2,218,500	-	1,044,000	2,088,000
Zirconium and Hafnium	Spent acid leachate from Zr alloy prod.	-	-	860,000	-	-	860,000	-	-	860,000	-	-	860,000	-	-	860,000
	Spent acid leachate from Zr metal prod.	-	-	1,600,000	-	-	1,600,000	-	-	1,600,000	-	-	1,600,000	-	-	1,600,000
	Leaching rinse water from Zr alloy prod.	-	16,800	41,600	-	21,000	52,000	-	17,850	44,200	-	17,850	44,200	-	16,800	41,600
	Leaching rinse water from Zr metal prod.	-	400,000	1,600,000	-	500,000	2,000,000	-	425,000	1,700,000	-	425,000	1,700,000	-	400,000	1,600,000
Total		4,046,959	6,688,848	15,579,851	12,680,624	17,707,297	30,249,080	10,188,948	14,859,824	26,519,341	5,221,048	8,007,420	17,302,706	4,046,959	6,688,848	15,579,851

Note: EPA does not have enough information to determine whether Bromine, Gemstones, Iodine, Lithium and Lithium Carbonate, Soda Ash, Sodium Sulfate, and Strontium produce mineral processing wastes.

Typically, liquid nonwastewaters (wastes with 1 to 10 percent TSS) are likely to be reduced in volume prior to stabilization. Therefore, as in the RIA, EPA assumed that approximately 2.25 percent of the liquid nonwastewater quantities will be stabilized (based on an 85 percent reduction of the initial amount because of treatments such as settling and neutralization, and an additional 85 percent reduction because of dewatering). The reduced waste volumes are used for estimating the potentially affected universe of the newly identified mineral processing wastes.

Wastewaters also may generate solid residues; however, these waste quantities do not result in significant quantities compared to the other nonwastewaters and therefore they are not included in this capacity analysis.

4.4 SOIL AND DEBRIS CONTAMINATED WITH NEWLY IDENTIFIED MINERAL PROCESSING WASTES

In all of the data sources consulted by the Agency, there was little information on the amount of soil or debris that might be contaminated with former Bevill-exempt wastes. The Agency believes that most of the soil and debris will probably be generated when facilities begin closing surface impoundments to comply with the LDRs or as part of corrective action procedures where it will be necessary to remove the soils for treatment. Consequently, EPA has no estimates for the amount of contaminated soil and debris that would be subject to the LDRs for this proposed rule. Based on discussions with commercial treaters (see Chapter 2), the Agency believes that these wastes could be readily treated to meet the proposed treatment standards. The Agency is seeking comments on this approach and requests the commenters to provide additional information and data on these wastes.

4.5 MIXED RCRA/RADIOACTIVE WASTES

The radioactivity posed by potentially hazardous mineral processing wastes may affect the amount of available treatment capacity for these wastes. Commercial and on-site treatment facilities for mineral processing wastes may have difficulty in managing both the radioactive and hazardous chemical components of mixed radioactive mineral processing wastes, and therefore may experience shortfalls in providing sufficient capacity for the treatment of these wastes. Adequate data on the generation of these mixed RCRA/radioactive wastes is not available. Therefore, EPA is soliciting the following types of information in this proposed rule:

- Data on the identities and quantities of newly identified mineral processing wastes that are known to be radioactive, including data on radioactivity levels (i.e., specific radioactivity, by radionuclide species), radioactive weight percent or radionuclides, and information on management difficulties, due to radioactivity, encountered with these wastes; and

- Data on the identities and quantities of newly identified, potentially hazardous mineral processing wastes, as well as other hazardous wastes that are commingled with any of the 20 mineral processing waste streams currently retained within the Bevill Exclusion (see 56 *FR* 27300, June 13, 1991).

EPA intends to use information received as a result of these requests to develop estimates of the quantities of mixed RCRA/radioactive wastes generated and accumulated at mineral processing facilities, and to estimate the amount of available capacity for the treatment of these wastes.

4.6 RESULTS

EPA's analysis of the data in Exhibit 4-1 indicates that, at most, approximately 136 facilities that generate 118 wastestreams would be affected by promulgation of today's proposed rule. The number of facilities represent the facilities in each mineral processing commodity sector. Some facilities, however, have processes that fall into more than one commodity sector. This would reduce the indicated total number of facilities affected.

Exhibit 4-3 presents ranges of quantities of newly identified mineral processing wastes that are likely to be affected by today's proposed rule for the modified prior treatment baseline and the four regulatory options. The results indicate that a total of approximately 4 million to 30 million metric tons of waste per year – the majority (approximately 85 - 90 percent) being wastewater – would require alternative treatment capacity. As discussed in Section 4.3, wastewaters are not expected to pose any capacity problems.

Exhibit 4-3
Total Waste Volumes (mt/y) Potentially Requiring Treatment Under the Modified Prior Treatment Baseline

Option	Minimum	Expected	Maximum
Baseline	4,046,959	6,688,848	15,579,851
Option 1	12,680,624	17,707,297	30,249,080
Option 2	10,188,948	14,859,824	26,519,341
Option 3	5,221,048	8,007,420	17,302,706
Option 4	4,046,959	6,688,848	15,579,851

Exhibit 4-4 provides the quantities of nonwastewaters that could require alternative treatment under the modified prior treatment baseline and the four different regulatory options. These quantities were calculated by first accounting for uncertainty in the input data. As discussed in the RIA, each waste stream's generation rate was adjusted to account for uncertainty in hazardous characteristics. The generation rate of waste streams known to be hazardous were not adjusted, while the generation rates of waste streams that were only suspected of being hazardous were reduced in the expected value case, and dropped from the minimum value case. The hazardous portion of each stream was divided into a portion sent to treatment and disposal and a portion stored prior to recycling in the baseline and in each option. Shifts in management of these streams were modeled by using different percentages treated and disposed in the baseline and various options. The quantities sent to treatment and disposal were summed in each sector by waste type (i.e., wastewaters, wastes with 1 to 10 percent solids, wastes with more than 10 percent solids), and divided by the number of facilities in that sector, to get a "model" or average facility quantity of each waste type. These types were then aggregated together based on the portion of input material for each waste type that would require neutralization, dewatering, and/or stabilization and disposal. These model facility quantities were then compared with threshold values to determine the economic feasibility of on-site treatment and disposal.

Exhibit 4-4
Quantities (mt/y) of Nonwastewaters Potentially Affected Under the Modified Prior Treatment Baseline

Option	Minimum		Expected		Maximum	
	Off-Site Stab./Disp	On-Site Stabilization	Off-Site Stab./Disp	On-Site Stabilization	Off-Site Stab./Disp	On-Site Stabilization
Baseline	6,079	129,805	10,381	742,004	17,602	1,925,885
Option 1	14,366	708,793	6,314	1,455,036	11,956	2,840,980
Option 2	7,574	647,621	23,543	1,332,622	24,055	2,618,201
Option 3	8,427	155,768	26,409	781,249	26,921	1,992,322
Option 4	6,079	129,805	17,237	742,004	17,602	1,925,885

While the cost analysis, in the RIA, is calculated on a average facility basis, the capacity analysis is based on the total industry treatment needs. Therefore, the average facility quantities requiring on- and off-site treatment and disposal in each sector were multiplied by the number of facilities in that sector to calculate the required treatment and disposal capacity. The largest increase of required treatment and disposal capacity would occur if Option 1 were chosen, as seen in Exhibit 4-4. This increase reflects a shift in management of a portion of secondary materials which are currently recycled.

As indicated in Chapter 2, for metal bearing wastes exhibiting a hazardous characteristic, the UTS treatment standards are based on chemical precipitation, high temperature metals recovery (HTMR), stabilization, slag vitrification, acid leaching, and mercury roasting and retorting, depending on the hazardous constituents and the waste form. UTS for arsenic nonwastewaters is based on vitrification, and the BDAT for high mercury subcategory wastes is retorting/roasting. All other metal treatment standards for nonwastewaters are based on HTMR and stabilization technologies. UTS for wastewaters are based on treatments such as chemical precipitation. (A detailed discussion on the methodology used for selecting UTS as the treatment standard is provided in the BDAT background document for newly identified mineral processing wastes.[7])

In the original proposal, the Agency noted a few exceptions to these assumptions. Based on the analysis of available data, EPA noted that some arsenic-containing wastes and high mercury-containing wastes (e.g., above the High Mercury Subcategory level of 260 mg/kg total mercury) may require alternative treatments (e.g., vitrification for arsenic and acid leaching/retorting for mercury) to meet UTS standards. EPA requested commenters to provide comments and performance data on this issue. However, comments received provided no indication that these wastes pose any treatability problems in meeting the proposed treatment standards. In addition, the Agency conducted site visits to commercial treatment facilities and collected data that indicated no treatability problems are associated with these wastestreams. Therefore, the Agency believes that a one year national treatment capacity variance may not be required for these wastes, and therefore, in this second supplemental rule, is proposing not to grant a capacity variance for these wastes.

[7] U.S. EPA, *Best Demonstrated Available Technology (BDAT) Background Document for Newly Identified Mineral Processing Wastes*, Office of Solid Waste, U.S. EPA, July, 1995.

For the purpose of determining the need for a capacity variance, the waste streams are grouped into three distinct categories:

(1) Wastestreams from elemental phosphorus processing. Three large-volume waste streams - Medusa Scrubber Blowdown, Anderson Filter media rinsate, and furnace building washdown - generated by the elemental phosphorus processing industry (approximately 500 to 800 thousand mt/y) appear to be lacking adequate wastewater treatment capacity. A major generator of these waste streams, the FMC Corporation's Pocatello, Idaho facility, has stated that these waste streams pose unique treatability problems (e.g., due to the presence of naturally occurring radioactive materials) and that a two-year national capacity variance is needed to develop and construct treatment capacity (Phase IV Notice of Data Availability (61 *FR* 21418, May 10, 1996)). On August 21, 1996, FMC submitted additional data to the docket for the supplemental proposed rule (61 *FR* 2338, January 25, 1996, RCRA Docket F-95-PH4A-FFFFF). After careful review of the additional data (see Appendix G for supporting materials), the Agency has determined that these wastes would require a national capacity variance, and therefore is proposing to grant a two-year national capacity variance for these three waste streams.

(2) Other newly identified mineral processing wastes (including soil and debris). EPA estimates that the quantities of newly identified mineral processing wastes that would be affected by today's proposed rule (other than the mixed RCRA/radioactive wastes discussed above) range from approximately 4 million to 30 million metric tons/year under the modified prior treatment baseline and the five different regulatory options. Of these, under a worst-case scenario, approximately 2.6 million metric tons/year of nonwastewaters would require alternative treatment under the prior treatment baseline. Most of these wastes (about 1 million metric tons/year) are expected to need either none or only relatively minor treatment to meet the treatment standards compared to existing treatment designed to meet hazardous characteristic levels. The remaining wastes (about 600,000 metric tons/year) represent an actual increase in required capacity. As shown in Exhibit 4-4, less than one percent of the nonwastewaters are expected to require commercial off-site stabilization. Given this, as well as the large amount of available off-site and on-site stabilization capacity for nonwastewaters, a national capacity variance does not appear to be warranted for these wastes under a modified prior treatment baseline option. As indicated in Section 4.4, these conclusions are expected to be similar for soil and debris contaminated with newly idendtified mineral processing wastes.

(3) Mixed RCRA/radioactive wastes (including soil and debris). Despite the uncertainty about quantities of mixed radioactive wastes containing newly identified wastes that would require treatment as a result of today's proposed rule, any new commercial capacity that becomes available will be needed for mixed radioactive wastes that were regulated in previous LDR rulemakings and whose variances have already expired. Thus, EPA has determined that sufficient alternative treatment capacity is not available, and is proposing to grant a two-year national capacity variance for mixed RCRA/radioactive wastes contaminated with newly identified mineral processing wastes. See the background document for the original Phase IV wastes for additional discussion of this issue.[8]

[8] U.S. EPA, *Background Document for proposed LDRs for Phase IV: Issues Associated with Clear Water Act Treatment Equivalency, and Treatment Standards for Wood Preserving Wastes and Toxicity Characteristic Metal Wastes (Proposed Rule)*, August 1995.

A potentially significant regulatory issue that might affect treatment capacity is EPA's possible changes to the definition of solid waste. Such changes would encourage environmentally sound recycling of mineral processing wastes. The Agency's main goal would be to remove regulatory barriers in order to allow metal and resource recovery, while at the same time improving the degree of environmental protection. However, since any modifications to the definition of solid waste and Bevill mixtures are likely to be complex, and the issues associated with such changes must be carefully analyzed by all affected parties, the Agency is deferring any changes to the definition of solid waste and Bevill mixtures for mineral processing wastes to a supplemental proposal that will be issued in the future. After considering comments received in response to this supplemental notice, the final approach to modifying the definition of solid waste will be incorporated into the Phase IV rule. EPA recognizes that changes to the definition of solid waste could affect the manner in which a facility will manage its hazardous waste (e.g., a facility may switch from land disposal to recycling). EPA requests information that could assist in determining the effect of such changes on the need for alternative treatment capacity. In particular, EPA requests data on the quantities of mineral processing wastes that are potentially recyclable, as well as information on the type of recycling process that might be used and the time required to bring these processes on line.

Exhibit 4-5 provides a summary of the results of the required (under the modified prior treatment baseline) and available capacity analysis and the capacity variance decisions for the newly identified wastes under the major treatment system categories.

EXHIBIT 4-5
CAPACITY VARIANCE DECISIONS

Waste	Required Capacity (mt/yr)	Available Capacity (mt/yr)	Proposed Variance
Wastestreams from elemental phosphorus processing	500,000 - 800,000	Low	Two years from promulgation of final rule
Newly identified mineral processing wastes (including soil and debris)	4 million - 30 million (modified prior treatment baseline)	• >800,000[a] HTMR • >1,000,000 stabilization • Optimization of on-site stabilization and wastewater treatment • >16,200 vitrification	90 days from promulgation of final rule
Mixed RCRA/radioactive wastes (including soil and debris)	Low	0	Two years from promulgation of final rule

[a] This quantity is total annual feed capacity and does not necessarily represent available capacity.